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SEP 23 2020

**HAWAII COMMUNITY DEVELOPMENT AUTHORITY**

DAVID Y. IGE
GOVERNOR

JOHN WHALEN
CHAIR

GARETT KAMEMOTO
INTERIM EXECUTIVE DIRECTOR

547 Queen Street, Honolulu, Hawaii 96817
Web site: http://dbedt.hawaii.gov/hcda/

Telephone: (808) 594-0300
Fax: (808) 587-0299

September 3, 2020

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

Dear Acting Director Kawaoka:

Subject: Hunt Kalaeloa Subdivision Roads Project
Final Environmental Assessment and Finding of No Significant Impact
TMK nos. 9-1-013:002, 003, 004, 010, 026, 093, 107, 128, 129; 9-1-015:013, 028, 029, 032; 9-1-016:027, 035; 9-1-118:013, 014; 9-1-148:011, 031; 9-1-160:006, 009, 012, 013, 015, 018, and 036

The Hawaii Community Development Authority (HCDA) is hereby transmitting the Final Environmental Assessment and Finding of No Significant Impact (FEA-FONSI) document for the Hunt Kalaeloa Subdivision Roads project in the 'Ewa district on the island of O'ahu situated at various TMKs identified above, for publication in the next available edition of The Environmental Notice.

The HCDA submitted the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) document for the subject project to the Office of Environmental Quality Control (OEQC) for publication in the February 8, 2020 edition of The Environmental Notice.

The HCDA reviewed the comments and information received after the 30-day public comment period, and in light of the significance criteria in Hawaii Administrative Rules, Section 11-200.1-13, finds that the proposed action would have a less than significant effect on the environment. We understand that publication of the FEA-FONSI will initiate a final 30-day review and judicial challenge period for the applicant's proposed action.

Enclosed is a completed OEQC Publication Form, one copy of the FEA-FONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office. If there are any questions, please contact Tesha Mālama, Kalaeloa Director of Planning and Development, at 594-0300 or by email Tesha.Malama@hawaii.gov

Sincerely,

Garett Kamemoto
Interim Executive Director

21-052

**From:** webmaster@hawaii.gov
**To:** HI Office of Environmental Quality Control
**Subject:** New online submission for The Environmental Notice
**Date:** Tuesday, September 15, 2020 1:54:21 PM

**Action Name**

Hunt Kalaeloa Subdivision Roads

**Type of Document/Determination**

Final environmental assessment and finding of no significant impact (FEA-FONSI)

**HRS §343-5(a) Trigger(s)**

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

**Judicial district**

ʻEwa, Oʻahu

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

Numerous

**Action type**

Applicant

**Other required permits and approvals**

NPDES

**Discretionary consent required**

none

**Approving agency**

Hawaii Community Development Authority (HCDA)

**Agency contact name**

Tesha Malama

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

tesha.malama@hawaii.gov

**Email address or URL for receiving comments**

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**Agency contact phone**

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**Agency address**

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United States
Map It

**Applicant**

Hunt Communities Hawaii LLC

**Applicant contact name**

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**Applicant contact email**

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**Applicant contact phone**

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

Yes

**Consultant**

R.M. Towill Corporation

**Consultant contact name**

Brian Takeda

**Consultant contact email**

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**Consultant address**

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Honolulu, Hawaii 96819
United States
Map It

**Action summary**

Hunt Communities Hawaiʻi LLC, proposes to construct improvements to roadways, intersections and utility systems within the former Barbers Point Naval Air Station property in ʻEwa, Oʻahu, Hawaiʻi. The project site is bound by the existing Franklin D. Roosevelt (FDR) Avenue to the north, Kamokila Boulevard to the west, Franklin Street to the east, and Saratoga Avenue to the south. The proposed improvements will involve an area of approximately 42.73 acres comprised of the following: approximately 32.31 acres for improvements to existing road right-of-ways (ROW), approximately 0.56 acres for installation of an on-site sewer line, and 10.42 acres for the construction off-site improvements including drainage facilities and left turn lanes, and installation or modification of traffic signals. When complete, the project will support the future development of public, residential and commercial uses within the State of Hawaiʻi, Kalaeloa Community Development District (Kalaeloa CDD).

**Reasons supporting determination**

Please see Section 10.3 Significance Criteria discussion.

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

- Hunt-Kalaeloa-Subdivision-Roads-FEAAppendices.pdf
- OEQC-FEA-FONSI-Transmittal.pdf

**Shapefile**

- The location map for this Final EA is the same as the location map for the associated Draft EA.

**Action location map**

- HUNT_PrjLocation.zip

**Authorized individual**

Colette Sakoda

**Authorization**

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

*Final Environmental Assessment*
*Prepared in Accordance with Hawaii Revised Statutes,*
*Chapter 343, and Hawaii Administrative Rules, Title 11, Chapter 200.1*

# *Hunt Kalaeloa Subdivision Roads*

*District of ʻEwa, Island of Oʻahu, Hawaiʻi*


**September 2020**

*Proposing Applicant:*
**Hunt Communities Hawaii LLC**
737 Bishop Street, Suite 2750
Honolulu, Hawaiʻi 96813

*Accepting Agency:*
**State of Hawaiʻi**
**Hawaiʻi Community Development Authority**
547 Queen Street
Honolulu, Hawaiʻi 96813

***Final Environmental Assessment***
*Prepared in Accordance with Hawai‘i Revised Statutes, Chapter 343, and*
*Hawai‘i Administrative Rules, Title 11, Chapter 200.1*

# *Hunt Kalaeloa Subdivision Roads*

*District of ‘Ewa, Island of O‘ahu, Hawai‘i*

September 2020

Proposing Applicant:
Hunt Communities Hawaii LLC
737 Bishop Street, Suite 2750
Honolulu, Hawai‘i 96813

Approving Authority:
State of Hawai‘i,
Hawai‘i Community Development Authority
547 Queen Street
Honolulu, Hawai‘i 96813

Prepared By:
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai‘i 96819-3494

Project No. 1-23105-00P

# *Table of Contents*

## List of Figures

## List of Tables



# *Appendices*

| | |
|---|---|
| Appendix A | Preliminary Construction Drawings, R. M. Towill Corporation, 2018 |
| Appendix B | Phase I Environmental Site Assessment, Element Environmental LLC, December 2017 |
| Appendix C | Biological surveys for proposed road improvements at Kalaeloa, Kapolei, O‘ahu, AECOS, Inc., January 2018 |
| Appendix D | Archaeological Literature Review and Field Inspection, Cultural Surveys Hawai‘i, Inc., December 2017 |
| Appendix E | Draft Report: Traffic Impact Analysis Report for the Development of Parcels 1, 2, and 3 in Kalaeloa. Fehr & Peers, December 29, 2017, & September 2019 Memorandum from Fehr & Peers. |
| Appendix F | Early Consultation: Comments Received during the First and Second Draft Environmental Assessment Comment Periods from February 8, 2020 to March 9, 2020 and Responses |

# *Acronyms and Abbreviations*

| | |
|---|---|
| AC | Asphalt Concrete |
| ACHP | Advisory Council on Historic Preservation |
| ADA | Americans with Disabilities Act |
| AMSL | above mean sea level |
| bgs | below ground surface |
| BMPs | Best Management Practices |
| BPNAS | Barbers Point Naval Air Station |
| BWS | Honolulu Board of Water Supply |
| CAB | Clean Air Branch |
| CDD | Community Development District |
| CFR | Code of Federal Regulations |
| cm | centimeter |
| COPC | Contaminants of potential concern |
| CWA | Clean Water Act |
| CWB | Clean Water Branch |
| CZMA | Coastal Zone Management Act |
| CZM | Coastal Zone Management Federal Consistency Review |
| CZO | Comprehensive Zoning Ordinance |
| CZMP | Coastal Zone Management Program |
| dBA | Decibels |
| DBEDT | Department of Business, Economic Development, and Tourism, State of Hawai‘i |
| DEA | Draft Environmental Assessment |
| DEAL | Direct Exposure Action Level |
| DLNR | Department of Land and Natural Resources, State of Hawai‘i |
| DOBOR | Division of Boating and Ocean Recreation, DLNR |
| DOE | Department of Education, State of Hawai‘i |
| DOFAW | Department of Forestry and Wildlife, State of Hawai‘i |
| DOH | Department of Health, State of Hawai‘i |
| DPP | Department of Planning and Permitting |
| EA | Environmental Assessment |
| ECP | Erosion Control Plan |

# *Acronyms and Abbreviations*

| | |
|---|---|
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| F | Fahrenheit |
| FEA | Final Environmental Assessment |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| FIS | Flood Insurance Study |
| FONSI | Finding of No Significant Impact |
| ft | Feet |
| GHG | Green House Gas |
| H-1 | Interstate Highway 1 |
| HAR | Hawai‘i Administrative Rules |
| HDOH | Department of Health, State of Hawai‘i |
| HDOT | Department of Transportation, State of Hawai‘i |
| HCDA | Hawai‘i Community Development Authority |
| HFD | Honolulu Fire Department |
| HPD | Honolulu Police Department |
| HRS | Hawai‘i Revised Statutes |
| HSTP | Hawai‘i State Transportation Plan |
| IMPU | Infrastructure Master Plan Update |
| JCIP | James Campbell Industrial Park |
| LOS | Level of Service |
| lf | Linear Feet |
| MP | Master Plan |
| MOU | Memorandum of Understanding |
| NFIP | National Flood Insurance Program |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollutant Discharge Elimination System |
| OEQC | Office of Environmental Quality Control |

# *Acronyms and Abbreviations*

| | |
|---|---|
| OP | DBEDT, Office of Planning |
| OR&L | O‘ahu Railway and Land Company |
| OTS | O‘ahu Transit Services |
| POLs | Petroleum, Oils, and Lubricants |
| PM | Particulate Matter |
| ppt | parts per thousand |
| PVC | Polyvinyl Chloride |
| ROW | Right-of-way |
| SCS | Soil Conservation Service, U. S. Department of Agriculture |
| SHPD | State Historic Preservation Division |
| SMA | Special Management Area |
| $SO_2$ | Sulfur Dioxide |
| SOEST | School of Ocean and Earth Science and Technology, University of Hawai‘i |
| SWPPP | Storm Water Pollution Prevention Plan |
| sy | Square Yard |
| TAM | Technical Assistance Memorandum |
| TIAR | Traffic Impact Analysis Report |
| TMDL | Total Maximum Daily Loads |
| TMP | Traffic Management Plan |
| TMK | Tax Map Keys |
| USACE | U. S. Army Corps of Engineers |
| USC | United States Code |
| USDA | U. S. Department of Agriculture |
| USFWS | U. S. Fish & Wildlife Service |
| USGS | U. S. Geological Survey |

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# *Section 1*
# *Project Summary*

| | |
|---|---|
| Project: | Hunt Kalaeloa Subdivision Roads, ‘Ewa , Island of O‘ahu, Hawai‘i |
| Project Applicant: | Hunt Communities Hawai‘i LLC |
| Approving Authority: | Hawai‘i Community Development Authority |
| Agent: | R. M. Towill Corporation |
| Location: | Kalaeloa, ‘Ewa<br>Island of O‘ahu, Hawai‘i 96707 |
| Proposed Action: | Construction of subdivision roads serving the Hunt Kalaeloa Subdivision |
| Present Use: | Existing Barbers Point Elementary School, Wakea Gardens multi-unit apartments, vacant lots |
| Tax Map Keys (TMKs): | (1) 9-1-013:002, 003, 004, 010, 026, 093, 107, 128, 129;<br>(1) 9-1-015:013, 028, 029, 032;<br>(1) 9-1-016:027, 035<br>(1) 9-1-118:013, 014;<br>(1) 9-1-148:011, 031;<br>(1) 9-1-160:006, 009, 012, 013, 015, 018, 036 |
| Land Area Used: | Approximately 42.7 acres |
| Flood Zones: | Zone D |
| State Land Use District: | Urban |
| Special Management Area (SMA): | No |
| HCDA | Kalaeloa Community Development District |
| City and County of Honolulu Zoning: | F-1 (Federal) |
| Land Ownership: | Various, State of Hawai‘i, City and County of Honolulu, and Private |
| Permits That May be Required: | STATE: Environmental Assessment (EA) under Hawai‘i Revised Statutes (HRS), Chapter 343; National Pollutant Discharge Elimination System (NPDES) permit for construction storm water. |
| Anticipated Determination | Finding of No Significant Impact (FONSI) |

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# *Section 2*
# *Project Purpose and Location*

## *2.1 Background*

Hunt Communities Hawai‘i LLC (Hunt), proposes to construct improvements to roadways, intersections and utility systems within the former Barbers Point Naval Air Station (BPNAS) property located in ‘Ewa , O‘ahu, Hawai‘i and located approximately 16 miles west of downtown Honolulu. The project site is bounded by the existing Franklin D. Roosevelt (FDR) Avenue to the north, Kamokila Boulevard to the west, Franklin Street to the east, and Saratoga Avenue to the south. See **Figure 2-1, Project Location**.

The proposed improvements will involve an area of approximately 42.73 acres comprised of the following: 32.31 acres using existing road right-of-ways (ROW), 0.56 acres for an on-site sewer line, and approximately 10.42 acres for off-site improvements including construction of drainage facilities, construction of left turn lanes, and installation or modification of traffic signals. See **Figure 2-2, Work Areas**. When complete, the project will support the future development of public, residential, and commercial uses within the State of Hawai‘i, Kalaeloa Community Development District (Kalaeloa CDD).

The site encompasses land and roadways on portions of multiple tax map keys (TMKs): (1) 9-1-013:002, 003, 004, 010, 093, 107, 128, 129; (1) 9-1-015:013, 028, 029, 032; (1) 9-1-016: 027, 035; (1) 9-1-118:013, 014; (1) 9-1-148:011, 031; (1) 9-1-160:006, 009, 012, 013, 015, 018, 036. The roadways are under various jurisdictions, including the U. S. Navy (Navy); State Department of Business, Economic Development, & Tourism, Hawai‘i Community Development Authority (HCDA); State Department of Transportation (HDOT); and, City and County of Honolulu (CCH).

The U.S. Congress authorized the closure of the BPNAS at Kalaeloa in 1993 under the Navy’s Base Realignment and Closure (BRAC) process. BPNAS at Kalaeloa is bounded by the Pacific Ocean to the south and lands within FDR Avenue, West Perimeter, East Hansen, and Essex Roads, and consisted of 3,833 acres of land, including 110 acres of non-contiguous area at Kaula Island and Iroquois Point (Department of the Navy, 1999). In 1994, the Hawai‘i State Legislature established the BPNAS Redevelopment Commission to prepare for the conveyance and reuse of the surplus lands at Kalaeloa. The commission was comprised of 15 members, including representatives from the State, CCH, neighboring communities, and representatives of the small business, labor, and the homeless communities. All meetings of the commission were open to the public. The commission adopted the Kalaeloa Community Redevelopment Plan in 1997, which served as the principal guiding document to coordinate the conveyances (Helber, Hastert & Fee, 1997). The Kalaeloa Community Redevelopment Plan was amended five times between 1997 and 2001 to respond to new site conditions and changes in interest of government agencies designated to receive surplus land.

## Figure 2-1, Project Location

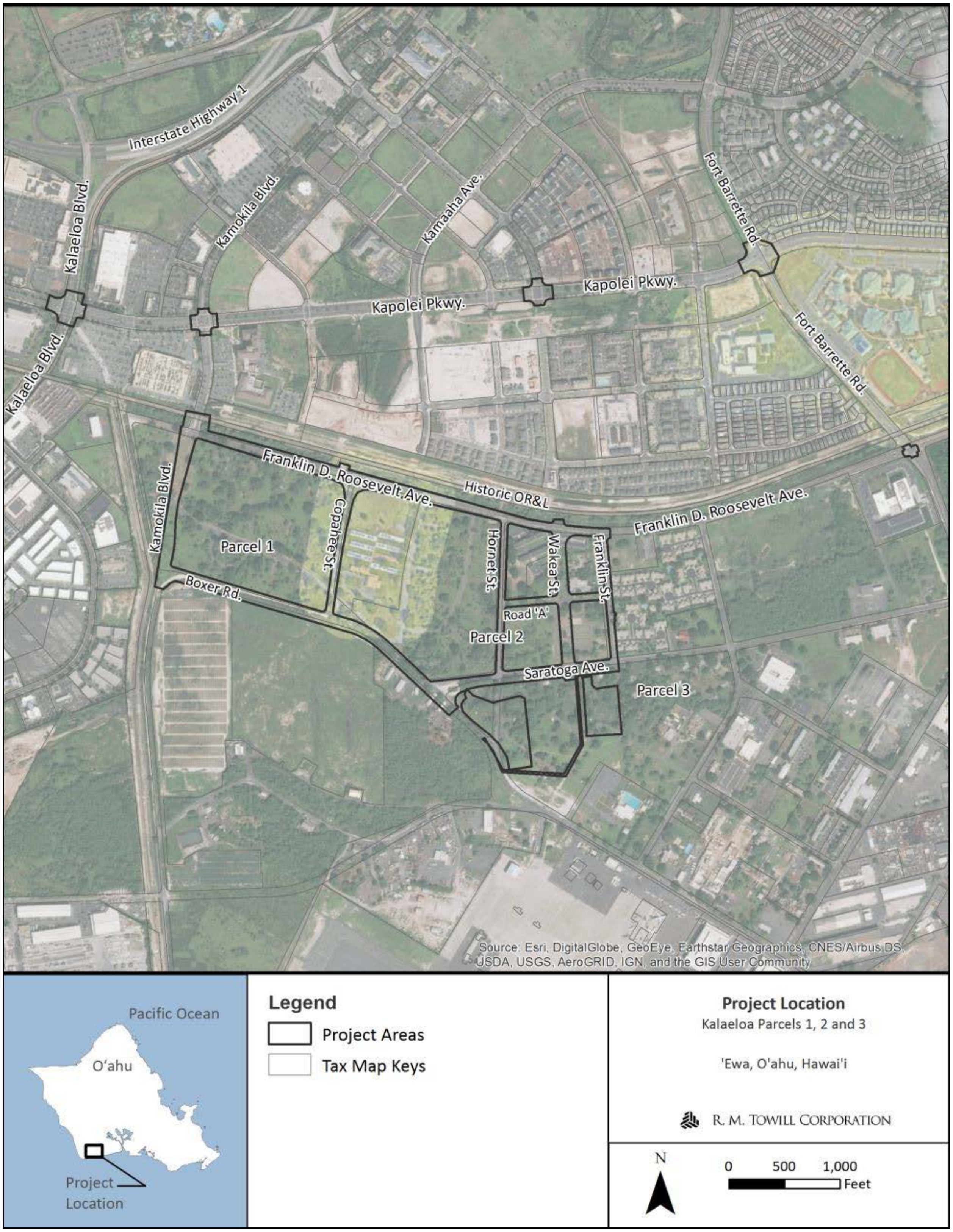
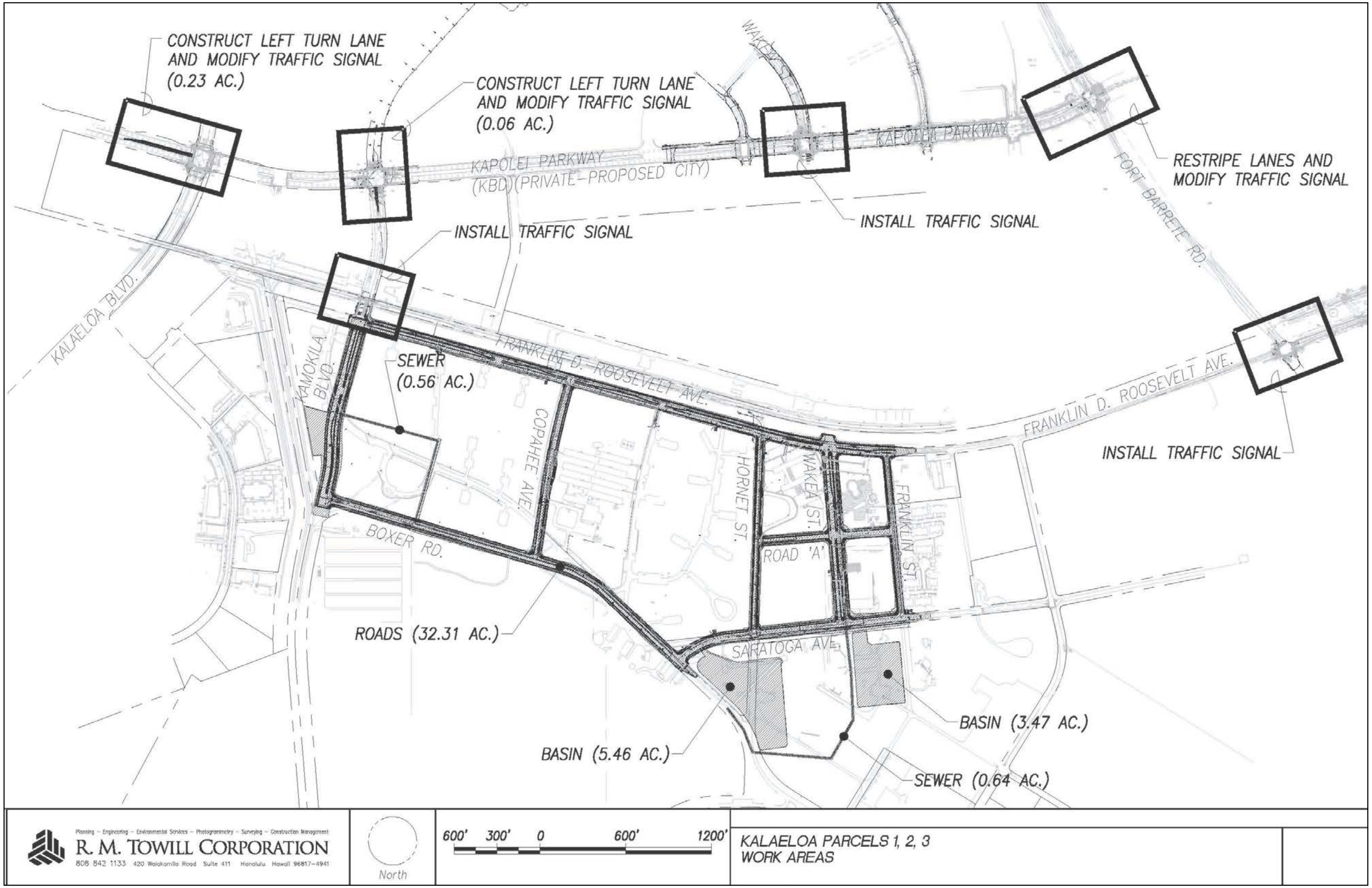


**Figure 2-2, Work Areas**



A *Final Environmental Impact Statement (FEIS) for the Disposal and Reuse of Naval Air Station Barbers Point, Hawai‘i* was published in February 1999 to assist the Secretary of the Navy in determining the environmental impacts of the disposal and alternative scenarios for the reuse of surplus properties at the BPNAS.

The Navy planned to retain 1,238 acres, convey one acre to the West O‘ahu Community Federal Credit Union, transfer 457 acres to other federal agencies, and, dispose of 2,137 acres as surplus in a manner consistent with the 1997 Kalaeloa Community Redevelopment Plan. The Navy and State-preferred alternative consisted of reusing the existing Kalaeloa Airport as a general aviation reliever airport for the Daniel K. Inouye International Airport and designating land for park and recreational uses, commercial/private recreation and light industrial uses, residential uses, and homeless providers. The remaining lands would be for public facilities, roads, open space, and utilities. A supplemental Final EA to the 1999 FEIS was published in August 2011 to evaluate changes that occurred since 1999, including the availability of five new parcels and a change in proposed land use for one parcel (Department of the Navy, 2011).

Following the formal closure of the BPNAS on July 2, 1999, the Navy finally retained roughly 1,055 acres, designated approximately 457 acres of excess land for transfer to various federal agencies, including the Veterans Administration, Federal Aviation Administration (FAA), U.S. Postal Service, National Guard Bureau, U.S. Fish and Wildlife Service (USFWS), and the U.S. Coast Guard. Roughly 2,180 acres of the remaining land were designated as surplus for State, CCH, and other private parties (HCDA, 2006).

Subsequently, Act 184 of the 2002 Hawai‘i State Legislature transferred redevelopment responsibility for Kalaeloa from the BPNAS Redevelopment Commission to the HCDA. HCDA, therefore, assumed responsibility for implementation of the Community Redevelopment Plan. HCDA presently retains development responsibility over the former BPNAS, now known as the Kalaeloa CDD. In 2004, HCDA discussed the need for establishing a vision and direction for the Kalaeloa CDD and agreed to prepare a Strategic Plan. HCDA conducted an outreach process that involved government officials, stakeholders, and the community, and incorporated comments into its Kalaeloa Strategic Plan, adopted in May 2005. The Kalaeloa Strategic Plan also established a mission statement for HCDA to lead a sustained, long-term public/private commitment for the realization of Kalaeloa as a Center for Excellence through partnerships, planning, advocacy, and stewardship.

HCDA published the Kalaeloa Master Plan in March 2006. The Kalaeloa Master Plan is intended to serve as an update to the 1997 Kalaeloa Community Redevelopment Plan. The plan now serves as the principal policy and planning document for HCDA’s use in coordinating with federal, state, and county government agencies, developers, private landowners, and the community.

Kalaeloa CDD land under development by Hunt encompasses 538 acres across 23 parcels. The Navy conveyed the properties to Hunt in 2009 as part of the Ford Island Master Development Agreement. Through the agreement, the Navy exchanged five underutilized properties on O‘ahu, including housing in and around the former BPNAS, for infrastructure work and development services on Ford Island (Hunt, 2012). In Kalaeloa, Hunt is currently undertaking a long-range planning effort as outlined in the Hunt Kalaeloa Strategic Implementation Plan (AECOM, 2013). The plan envisions a residential, mixed-use community anchored by a walkable town center in the ‘Ewa region of West O‘ahu. See **Section 7.1.11** for further discussion. In 2015, Hunt completed its first residential project in the Kalaeloa CDD by renovating and converting a former officers' quarters to 100 reserved housing units called the Wakea Garden Apartments. The proposed action involves construction of roadway and infrastructure improvements which would serve a future, proposed subdivision development of three parcels. The proposed project would lay the foundation for future residential development envisioned by the State and Hunt. By investing resources to redevelop the area, the proposed project would help to improve the social and economic outlook in Kalaeloa by enhancing security, upgrading landscaping, keeping ball fields open, and attract business tenants that employ residents into the district.

Roadways continue to be an infrastructure challenge in the Kalaeloa CDD. The existing roadways do not meet State or CCH standards and are in varied states of disrepair. On February 27, 2001, the former BPNAS Redevelopment Commission, HDOT, and CCH entered into a Memorandum of Understanding (MOU) which transferred the ownership of various roadways at Kalaeloa to HDOT and CCH. More detail regarding road ownership is further provided in **Section 3.2**. Under this MOU, the HDOT and CCH both accepted ownership and the responsibility to construct, operate, and maintain roadways, associated drainage systems, and future roadway rights. Once roads were constructed to CCH standards, it was intended that roadways transferred to HDOT would be dedicated to the CCH.

Commencing in 2014, at the request of Councilmember Kymberly Marcos Pine, quarterly meetings were held with the HCDA, HDOT, the CCH Department of Planning and Permitting (DPP), the CCH Department of Transportation Services (DTS), and the CCH Department of Facility Maintenance (DFM) to discuss the status of the roadways in Kalaeloa. On July 25, 2016, a second MOU was executed between HCDA, HDOT, and CCH to initiate a demonstration project to improve FDR Avenue. The MOU stipulated that HDOT would transfer their ownership of FDR Avenue from West Perimeter Road to Enterprise Avenue (referred to in the MOU as "FDR-West") and a portion of West Perimeter Road (referred to in the MOU as "WPR-Mauka) to HCDA. This would effectively allow the portions of the improved roads to undergo much-needed repair. Upon completion of improvements to proposed roadways, the ownership of FDR-West and WPR-Mauka would be transferred from HCDA to CCH. The improvements to FDR Avenue proposed as a component of the subject project would enable HCDA to fulfill its obligation as set forth in the 2016 MOU. See **Section 9.5. Consultation** for further outreach that has occurred to date.

The project will provide significant roadway improvements around and within the interior of the three parcels, totaling 15,100 feet (ft) or nearly three miles in length. The roadways will have ROW widths of between 50-ft and 108-ft wide. All roadways will be designed to meet CCH DPP subdivision and HCDA Kalaeloa CDD standards set forth in Hawaiʻi Revised Statutes (HAR), Chapter 15-215, <u>Rules for Health and Safety within the Kalaeloa CDD</u>, §15-215-24, <u>Thoroughfare Plan</u>. In addition, significant road reconfiguration is indicated for the following: the new southern extension of Kamokila Boulevard between Saratoga and FDR Avenues; construction of a new "Road A" connecting Hornet Street to Franklin Street; and, improvements to Copahee Avenue between Saratoga and FDR Avenues in order to conform to roadway standards set forth in HAR, §15-215-24. The proposed infrastructure improvements will also consist of regional flood control and roadway drainage systems, private potable water and sewer systems, electrical power systems, street lighting, and telecommunications systems. The total acreage for on-site improvements, including the proposed roadway system, intersection improvements, and utilities, is approximately 32.87 acres. The total acreage for off-site improvements, including construction of two drainage basins, utilities, and left turn lanes, and the modification and installation of traffic signals and pavement striping along Kapolei Parkway and FDR Avenue totals approximately 9.86 acres. The total acreage for on-site and off-site improvements is 42.73 acres.

The project location encompasses Barbers Point Elementary School, Wakea Garden Apartments, vacant lots containing remnants of the former BPNAS, and a set of Navy roads in conjunction with the conveyance of the former BPNAS to the State of Hawaiʻi. Currently, the poor condition of the existing roads reduces safe and efficient vehicular and pedestrian movement.

## *2.2 Purpose and Need for Project*

Hunt proposes to construct new access roadways, improve existing roadways to conform with HCDA and CCH standards, construct drainage, and construct pedestrian improvements to support a future residential community on its Parcels 1, 2, and 3 within the HCDA Kalaeloa CDD. Off-site installation of traffic signals and left turn lanes at six sites are also planned. The proposed project would fulfill the 2001 and 2016 MOUs between HCDA, HDOT, and CCH to improve and maintain roadways and associated drainage in the Kalaeloa CDD to enable and encourage redevelopment and new development in the district. The project would improve three of approximately 20 miles of roadways within the Kalaeloa CDD that need to meet HCDA and CCH standards. Furthermore, the project would fulfill the vision set forth in the HCDA Kalaeloa Master Plan to improve the roadway network within and adjacent to Kalaeloa as an opportunity to connect Kalaeloa to the City of Kapolei and overall enhance connectivity and vehicular circulation in the ʻEwa region (HCDA, 2006). The proposed project would also fulfill the planned extension of Kamokila Boulevard from the City of Kapolei into Kalaeloa. The project further fulfills the vision set forth in the ʻEwa Development Plan (DP) prepared by DPP in 2013. Improvements to the roadways would lay the foundation for a residential community that fosters a pedestrian- and bicycle-friendly environment that encourages public transit use envisioned by both the Kalaeloa Master Plan and the ʻEwa DP.

Kalaeloa forms a distinct district in the emerging secondary urban center taking shape in West Oʻahu. The proposed project helps Hunt achieve an initial step of constructing necessary major infrastructure system improvements that are required to provide the backbone to its future 40-acre residential subdivision reflected in the 2013 Hunt Kalaeloa Strategic Implementation Plan, which envisions a new, livable, sustainable community adjacent to and makai of Kapolei. This plan is consistent with the HCDA Kalaeloa Master Plan. The design of the community would be consistent with HAR, Chapter 15-215, Kalaeloa Community Development District Rules. Hunt's planned development on Parcels 1, 2, and 3 would be a residential community consisting of 672 single- and multi-family homes and approximately 358,934 square feet of open recreation space that will connect the neighborhoods and promote a sense of community. Hunt is working with the HCDA to obtain a Development Permit for the residential and commercial component of the development. The proposed improvements to the roadways that are the subject of this EA will also be included in that application. The future residential and commercial uses that support both the Kalaeloa and Hunt Master Plans will be analyzed in the Development Permit application.

The development responds to the shortage of housing supply in West Oahu and aims to address the market-driven demand for both single- and multi-family home product. By 2035, the population in the ʻEwa DP area is estimated to grow from 68,700 in 2000 to over 164,000 by 2035. Over 35,000 new housing units will be needed to be built in a series of master planned communities over this time to support the growing population. Furthermore, the new secondary urban center in the City of Kapolei is projected to provide 17,000 private jobs and 2,400 government jobs by 2035. When the BPNAS closed in 1999, 618 jobs were lost. However, only about 100 new jobs have been created since (HCDA, 2006). An opportunity exists for Hunt’s proposed roadways and development on Parcels 1, 2, and 3 in the Kalaeloa CDD to contribute to the projected housing need in the region, recover lost jobs, and contribute to the overall development of the secondary urban center envisioned for Kapolei. See **Section 7.1.10, HCDA Kalaeloa Reserved Housing Rules (HAR, Chapter 15-216) and Section 7.1.11, Hunt Kalaeloa Strategic Implementation Plan** for further discussion.

Future residential and commercial uses that support both the Kalaeloa (and Hunt) master plans are being analyzed in a Development Permit application, as stipulated by HCDA’s HAR, Chapter 15-215, Kalaeloa Community Development District Rules for development. These uses envisioned for future development would not contribute to potential cumulative impact in the area due to the discreet distinction in the evaluation and assessment.

## *2.3 Purpose of Environmental Assessment*

The purpose of this Environmental Assessment (EA) is to address the requirements of HRS, Chapter 343, and Hawai‘i Administrative Rules (HAR), Chapter 11-200.1. Governor Ige signed HAR, Chapter 11-200.1 into law on August 8, 2019, which repealed HAR, Chapter 11-200. This EA meets the requirements of the new law. The specific action that requires the preparation of this EA includes the use of state land and/or funds for the proposed action.

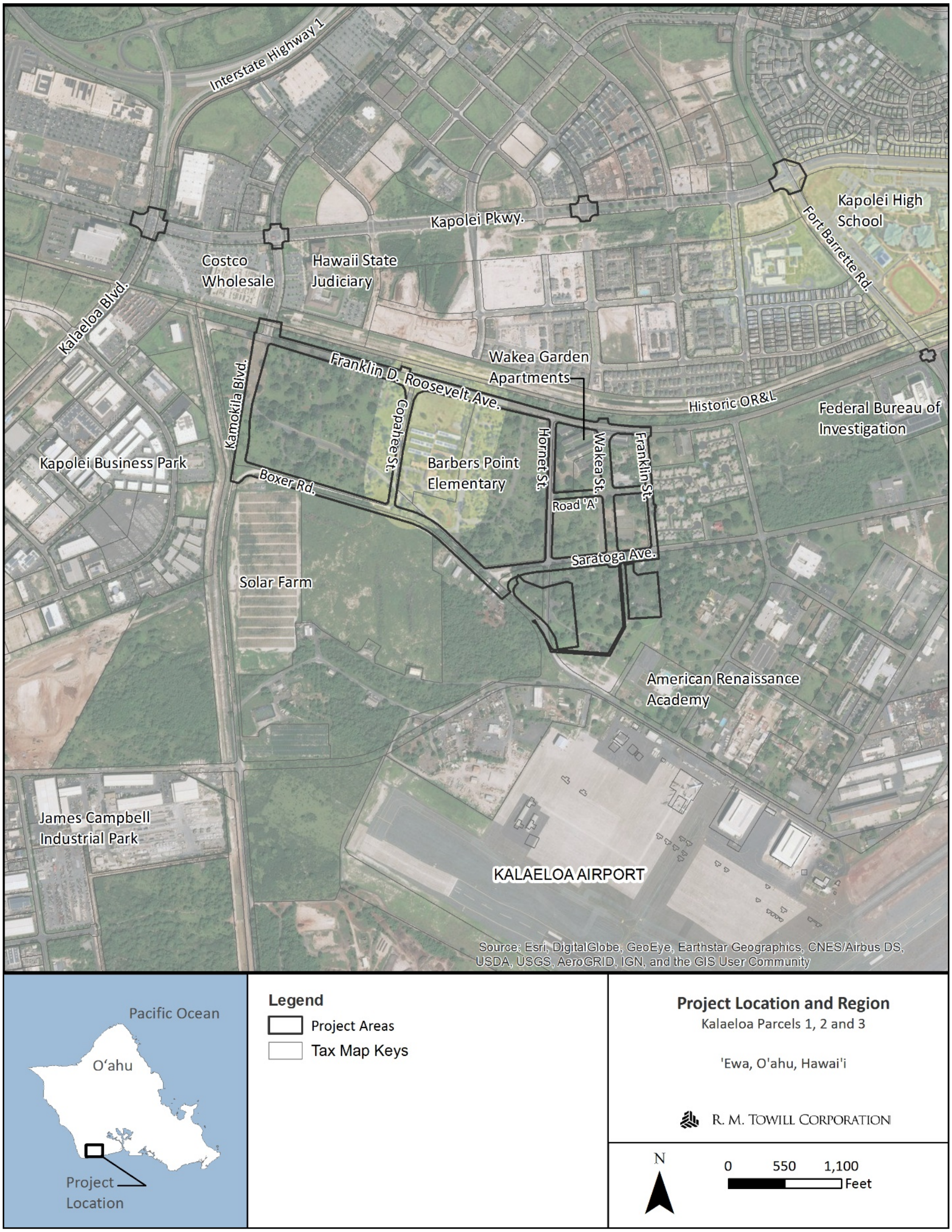
The Draft EA for this project was published in the State Office of Environmental Quality Control (OEQC) *Environmental Notice* on December 23, 2018. During the 30-day public comment period, comments were received from agencies and the public. In order to address the comments and incorporate new information regarding project background and current coordination, a reissued Draft EA was deemed warranted.

The reissued Draft EA incorporated comments received during the initial Draft EA public comment period and provided information and evaluation of the potential for adverse environmental impacts on the natural and built environment associated with the proposed project. The Draft EA-also informed interested parties of the proposed project. The publication of the Draft EA with the OEQC was in the February 8, 2020 Environmental Notice, and the 30-day public comment period ended on March 9, 2020. All relevant written public comments received during the 30-day public comment period received a written response for inclusion and use in the preparation of the project’s Final EA.

## *2.4 Project Location*

The subdivision roadways site is located in the southwest of O‘ahu along the northern perimeter of Kalaeloa and within the former BPNAS. The project site is bounded by FDR Avenue to the north, Franklin Avenue to the east, Kamokila Boulevard to the west, and Saratoga Avenue to the south. Kalaeloa Airport is located further south of Saratoga Avenue. A linear east-west drainage basin and historic railroad forms a barrier between Kapolei and Kalaeloa along much of the north side of FDR Avenue. See **Figure 2-3, Project Location and Region**, depicting the area surroundings. See **Section 5.1** for further discussion on the project location and its surroundings.

**Figure 2-3, Project Location and Region**



# *Section 3*
# *Project Description, Estimated Construction Cost and Schedule*

## *3.1 Description of Proposed Project*

The proposed improvements will involve the use 32.87 acres of existing road ROWs, and approximately 9.86 acres for off-site drainage facilities, construction of left turn lanes, and traffic signal installation. When completed the project will support the future development of public and residential land uses, schools, and commercial uses within Kalaeloa.

The Hunt Kalaeloa community goal will be to provide different ways of accomplishing short-distance trips with options that include the use of rail, bus, bicycles, and walking. The proposed subdivision roadways project will help provide an environment where it is safe and convenient for people to utilize conventional and alternative modes of transportation.

The Hunt subdivision roadway system will consist of five north-south and two east-west thoroughfares, and improvements to six intersections. Kamokila Boulevard will extend south to provide continued connectivity from Kapolei Parkway to Boxer Road, effectively connecting the City of Kapolei with Kalaeloa CDD.

Specific work activities will include the following:

> **Roadways –** On-site improvements to the 32.87-acre project area will be roughly bounded by FDR Avenue to the north, Saratoga Avenue to the south, Kamokila Boulevard to the west, and Franklin Street to the east. The length of roadway improvements will be approximately 15,100 ft and will be constructed to meet CCH standards.
>
> Off-site improvements will be to six roadway intersections: four intersections will be located along Kapolei Parkway at Kalaeloa Boulevard, Kamokila Boulevard, Wakea Street, and Fort Barrette Road. The other three intersections will be located along FDR Avenue at Kamokila Boulevard, at Copahee Avenue, and Fort Barrette Road-Enterprise Street.
>
> **Landscaping –** Will be provided within the road ROW for all areas where roadwork is proposed.
>
> **Utilities –** Improvements will be made to water, sewer, drainage, power, street lighting, cable television (CATV) and telephone systems.
>
> **Grading and Improvements –** Project related grading and improvements will support master planning for the Kalaeloa CDD. Drainage and water quality infrastructure consisting of retention basins/catch basins/rain gardens or other appropriate facilities will be designed to address this requirement.

Proposed improvements on each of the three Hunt-owned parcels are described below. Parcel 1 is bounded by FDR Avenue to the north, Saratoga Avenue to the south, Copahee Street to the east, and Kamokila Boulevard to the west. Parcel 2 is bounded by FDR Avenue to the north, Saratoga Avenue to the south, Copahee Street to the west, and Hornet Street to the east. Finally, Parcel 3 is bounded by FDR Avenue to the north, Saratoga Avenue to the south, Hornet Street to the west, and Franklin Street to the east. See **Figure 2-2, Work Areas** and **Appendix A, Preliminary Construction Drawings** for locations and details of the proposed improvements.

- FDR Avenue 10-foot widening and a 14-foot setback for a future 108-foot ROW Reserve
- Copahee Avenue 11-foot widening and an 11-foot setback for a future 66-foot ROW Reserve
- Saratoga Avenue 18-foot widening and a 24-foot setback for a future 108-foot ROW Reserve
- Kamokila Boulevard Extension from FDR Avenue to Saratoga Avenue with a 108-foot ROW
- West Perimeter Road Extension (owned by HCDA) is to be closed after the construction of Kamokila Boulevard Extension
- The GTE Building located within the former OR&L ROW and on the FDR Avenue 10-foot widening and 14-foot setback near the intersection of Copahee Avenue to remain in use

Parcel 2 roadway improvements include the following:

- FDR Avenue 10-foot widening and a 14-foot setback for a future 108-foot ROW Reserve
- Hornet Street widening to an 80-foot ROW
- Saratoga Avenue 18-foot widening and a 6-foot setback for a future 108-foot ROW Reserve
- Boxer Road 18-foot widening and a 6-foot setback for a future 108-foot ROW Reserve
- Copahee Avenue 11-foot widening and an 11-foot setback for a future 66-foot ROW Reserve
- A portion of lot 272: Transformer Station A to remain

Parcel 3 roadway improvements include the following:

- FDR Avenue 10-foot widening and a 14-foot setback for future 108-foot ROW Reserve
- Franklin Avenue 50-foot ROW
- Saratoga Avenue 18-foot widening and a 6-foot setback for future 108-foot ROW Reserve
- Hornet Street widening to an 80-foot ROW
- Construction of Road A with a 66-foot ROW
- Demolition of lot 73: Paradise West Club Complex partially within the proposed Road A ROW
- Construction of the Wakea Street Extension with a 108-foot ROW
- Demolition of lot 1906: Tennis Pro Shop within the proposed Wakea Street Extension ROW
- Demolition of lot 68C: concrete pad partially within the proposed Wakea Street Extension ROW

Typical roadway sections of the proposed roadways would vary but conform to CCH standards and HCDA thoroughfare standards set forth in HAR, §15-215-24, Thoroughfare Plan. Features of the proposed roadway sections are as follows:

- Franklin Street: 50-foot wide ROW, including one 12-foot wide travel lane in each direction; designated 8-foot wide parking lane on each side; 6-foot wide planter strip on each side; and, 5-foot wide sidewalks on each side. See **Figure 3-1, Typical Sections – 1**.
- Hornet Street: 60-foot wide ROW, including one 10-foot wide travel lane in each direction; designated 8-foot wide parking lane on each side; 7-foot wide plater strip on each side; and, 5-foot wide sidewalks on each side. See **Figure 3-1, Typical Sections – 1**.
- Copahee Avenue and Road ‘A’: 66-foot wide ROW, including one 10-foot travel lane in each direction; designated 8-foot wide parking lane on each side; 10-foot wide planter strip on each side; and, 5-foot wide sidewalks on each side. See **Figure 3-2, Typical Sections – 2**.
- Kamokila Boulevard and Wakea Street: 108-foot wide ROW, including one 10-foot wide travel lane in each direction; one 12-foot wide travel lane in each direction; 6-foot wide bike lane on each side; 10-foot wide planter strip on each side; and, 6-foot wide sidewalks on each side. See **Figure 3-2, Typical Sections – 2**.
- Saratoga Avenue and Boxer Road (Interim): 78-foot wide ROW, including one 10-foot travel lane in each direction; 6-foot wide bike lane on each side; 8-foot wide parking lane on each side; 10-foot wide planter strip on each side, and 5-foot wide sidewalks on each side. See **Figure 3-3, Typical Sections – 3**.
- FDR Avenue (Interim): 80-foot wide ROW, including a 20-foot wide median with landscaping; two 12-foot wide travel lanes for each direction of traffic; and, 6-foot wide sidewalks on each side. See **Figure 3-3, Typical Sections – 3**.

Ultimate conditions for FDR Avenue, Boxer Road, and Saratoga Avenue are proposed after construction of the subject project to bring the roadways into conformance with applicable HCDA and CCH rules and design guidelines, as further discussed in **Sections 7.1.6, Act 54, Session Laws of Hawai‘i, Complete Streets** and **7.1.9, HCDA Kalaeloa CDD Rules**. The ultimate condition of these roadways would be the same as the Kamokila Boulevard and Wakea Street roadway sections. See **Figure 3-2, Typical Sections – 2**.

In addition to conforming to CCH and HCDA roadway standards, proposed improvements would meet fire safety requirements as suggested by the Honolulu Fire Department (HFD) in its comment letters dated January 16, 2019 and March 2, 2020. All relevant CCH departments and HCDA will continue to be consulted in the review and approval process of the proposed project.

**Figure 3-1, Typical Sections – 1**

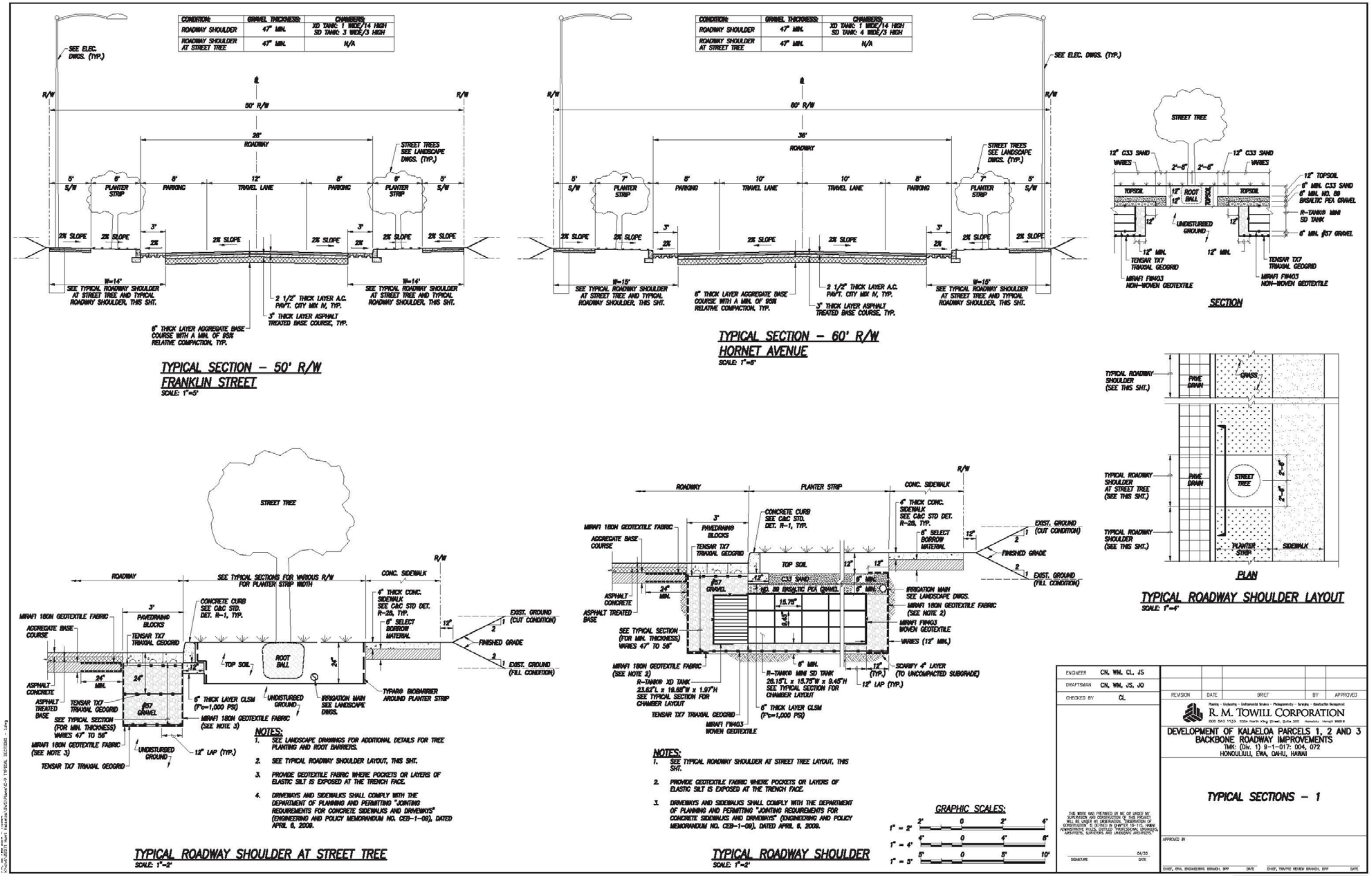


**Figure 3-2, Typical Sections – 2**

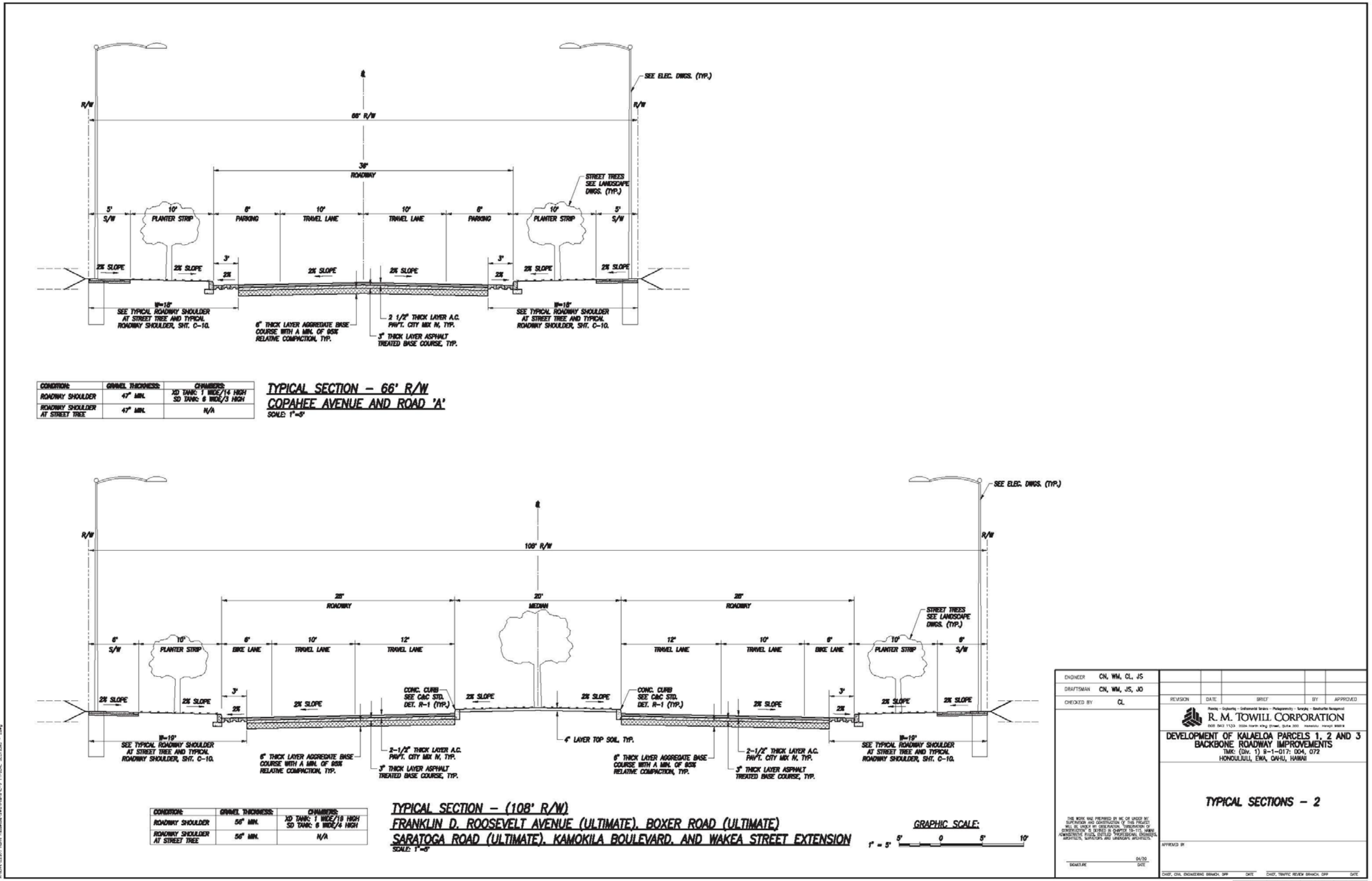
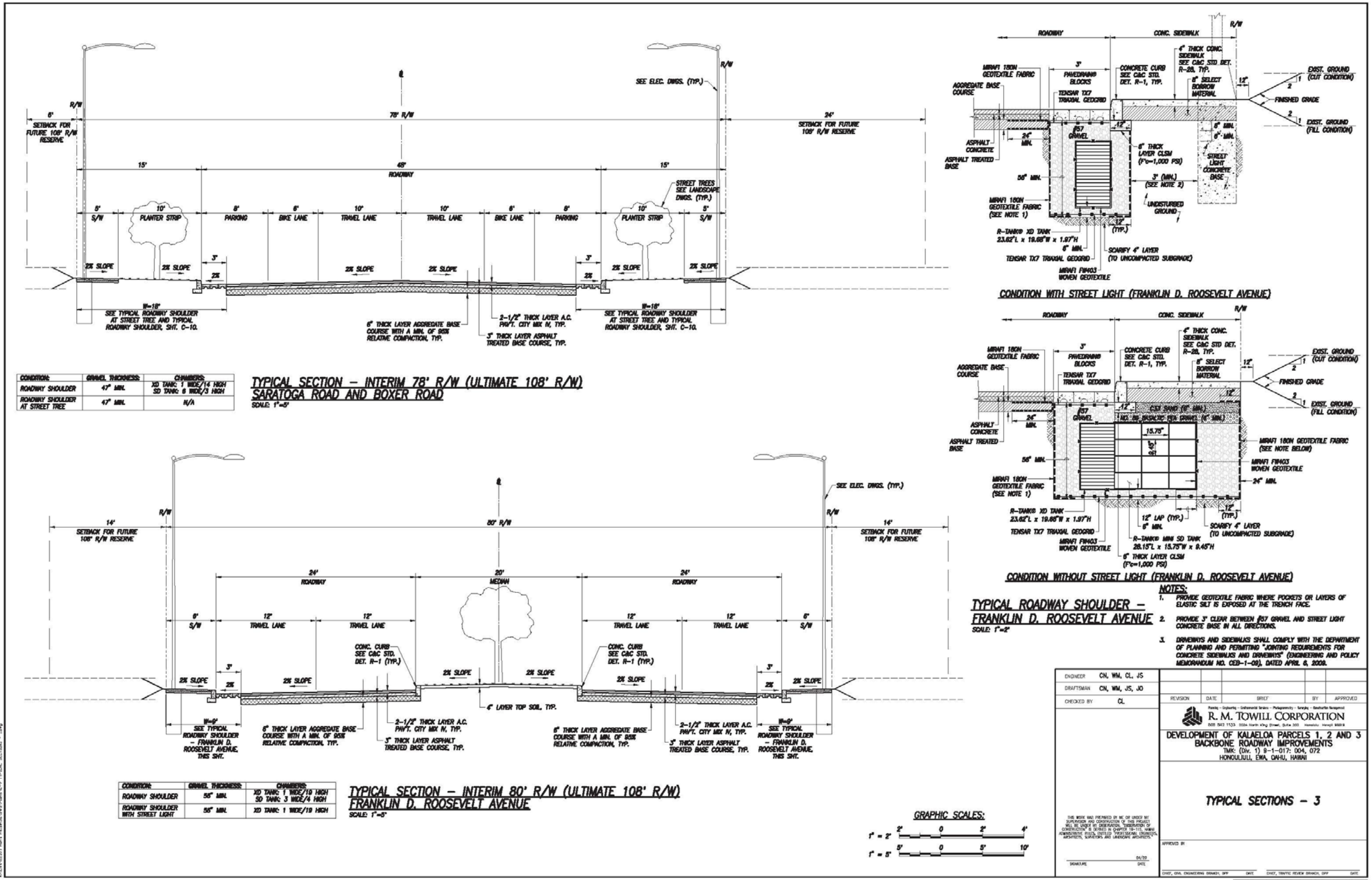


**Figure 3-3, Typical Sections – 3**



Off-site improvements are also proposed as a component of the subject project. Off-site improvements include the construction of utilities and drainage basins and improvements to various intersections to provide traffic signals**,** signal timing**,** Americans with Disabilities Act (ADA) compliance, landscaped medians, additional lanes, road widening, restriping, and sidewalk improvements at the following locations:

Intersection of Kapolei Parkway and Kalaeloa Boulevard improvements include the following:

- Removal of the existing landscaped median on the ewa-bound approach
- Construction of a second Diamond Head bound left-turn lane on Kapolei Parkway
- Optimization of a signal cycle length and splits

Intersection of Kapolei Parkway and Kamokila Boulevard improvements include the following:

- Optimization of a signal cycle length and splits to accommodate for new demand volumes at intersection

Intersection of Kapolei Parkway and Wakea Street improvements include the following:

- Installation of a traffic signal

Intersection of Kapolei Parkway and Fort Barrette Road improvements include the following:

- Restriping of Kapolei Parkway to provide a separate left-turn lane and second through lane on both the ewa-bound and Diamond Head-bound approaches
- Modification and optimization of the signal to provided protected left-turn phasing on Kapolei Parkway

Intersection of FDR Avenue and Kamokila Boulevard improvements include the following:

- Installation of a traffic signal

Intersection of FDR Avenue and Copahee Avenue improvements include the following:

- Widening of FDR Avenue to provide a refuge island median for the mauka-bound left-turn storage and an ewa-bound merge lane

Intersection of FDR Avenue and Fort Barrette Road-Enterprise Street improvements include the following:

- Installation of a traffic signal

## *3.2 Property Ownership*

The project involves improvements to roadways and installation of utilities across various parcels, as indicated in **Figure 3-4, Tax Map Key Boundaries** and **Table 3-1, Tax Map Key**. Pursuant to a 2001 MOU executed between the former BPNAS Redevelopment Commission, HDOT, and CCH, ownership of the existing roadways was transferred to HDOT and CCH as indicated in **Table 3-2, Roadway Ownership**. Note that the MOU refers to FDR Avenue as “Roosevelt Road” and Saratoga Avenue as “Saratoga Road”. HDOT accepted temporary ownership of the roadways assigned to the agency with the agreement that, upon improvements to roadways and associated drainage systems, all roadways and future ROW ownership would be transferred to the CCH. As such, all improvements to roads will be designed to meet HCDA and CCH standards.

The roadways would serve Hunt’s development on Parcels 1, 2 and 3, designated as TMKs (1) 9-1-013:002 and 004, which is privately owned by Hunt. The roadways would also serve TMKs (1) 9-1-013:128 and 129, which are owned by the Wakea Garden Apartments. Two proposed off-site detention basins and sewer line would be constructed on TMK (1) 9-1-013:010, owned by Kalaeloa Ventures, LLC. Proposed off-site improvements, including construction of left turn lanes, installation of traffic signals, and restriping, would occur at several other parcels**.**

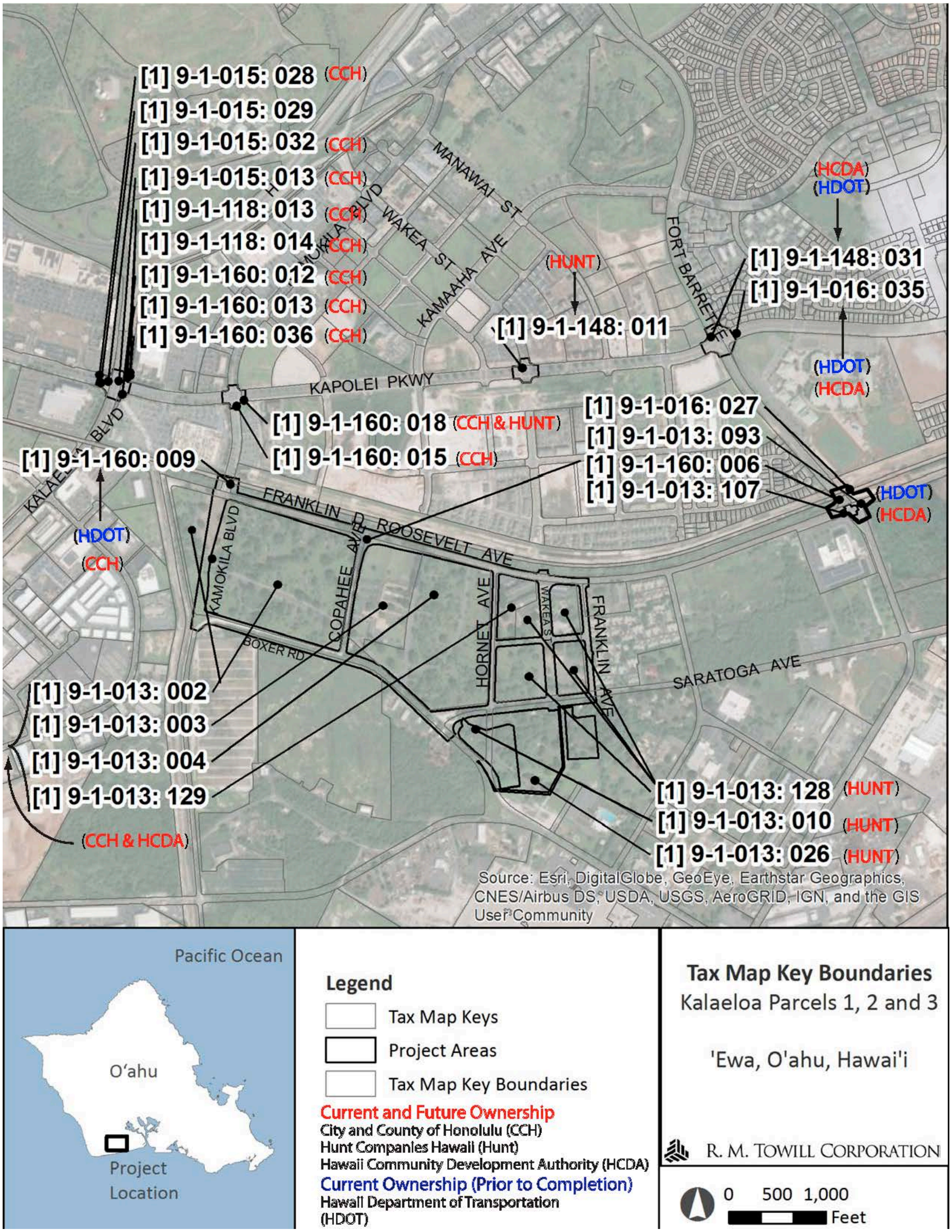
Commencing in 2014, at the request of Councilmember Kymberly Marcos Pine, quarterly meetings were held with the HCDA, HDOT, and CCH DPP, DTS, and DFM to discuss the status of the roadways in Kalaeloa. On July 25, 2016, a second MOU was executed between HCDA, HDOT, and CCH to initiate a demonstration project to improve FDR Avenue. The MOU stipulated that HDOT would transfer their ownership of FDR Avenue from West Perimeter Road to Enterprise Avenue (referred to in the MOU as “FDR-West”) and a portion of West Perimeter Road (referred to in the MOU as “WPR-Mauka) to HCDA. This would effectively allow the portions of the improved roads to undergo much-needed repair. Upon completion of improvements to proposed roadways, the ownership of FDR-West and WPR-Mauka would be transferred from HCDA to CCH. The improvements to FDR Avenue proposed as a component of the subject project would enable HCDA to fulfill its obligation as set forth in the 2016 MOU.

## *3.3 Construction Activities*

Construction related traffic, noise, and air quality (dust) disturbances are anticipated. Construction equipment used for this project may include, but are not limited to: use of a loader, bulldozers, dump trucks, loader-backhoe, trencher, grader, water trucks, concrete hauler pumper, and flatbed trucks. The contractor will be required to observe and comply with all federal, state, and CCH laws required for the protection of public health, safety, and the environment.

The contractor will prepare a Best Management Practices (BMPs) Plan for this project. The BMPs Plan will consist of erosion control measures such as planting or hydromulching grass seedling**,** erecting silt fencing/curtains, berms, and/or other applicable erosion control devices to prevent construction related soils and silt from mixing with storm water runoff.

**Figure 3-4, Tax Map Key Boundaries**



## Table 3-1, Tax Map Key of Affected Properties

| Project Component | | Tax Map Keys (TMKs) | Parcel Area (Acres) | Ownership |
|---|---|---|---|---|
| On Site: | Roadway Improv. & Sewer Installation | (1) 9-1-013:002, 003, 004, 010, 128, 129 | 32.87 | Hunt, Kalaeloa Ventures LLC, Department of Education (DOE), Wakea Garden Apartments |
| | Install traffic signal | (1) 9-1-160:009 | -- | City and County of Honolulu, Hunt |
| Off Site: | Construct left turn lane & modify traffic signal | (1) 9-1-015:013, 028, 029, 032; (1) 9-1-118:013, 014; (1) 9-1-160:012, 013, 036 | 0.23 | City & County of Honolulu; Kapolei Infrastructure LLC |
| | Construct left turn lane & modify traffic signal | (1) 9-1-160:015, 018 | 0.06 | Kapolei Properties LLC; City & County of Honolulu |
| | Install traffic signal | (1) 9-1-148:011 | -- | Kapolei Properties LLC |
| | Restripes lanes and modify traffic signal | (1) 9-1-016:035; (1) 9-1-148:031 | -- | Hawai‘i Housing Finance & Development Corporation FKA Housing & Community Development Corporation of Hawai‘i; City & County of Honolulu |
| | Install traffic signal | (1) 9-1-013:093, 107; (1) 9-1-160:006; (1) 9-1-016:027 | -- | Eagle River Investors – Hawai‘i LLC, Kalaeloa Ventures LLC, Hunt, Kapolei Infrastructure LLC |
| | Detention basin and sewer | (1) 9-1-013: 026 | 9.57 | Kalaeloa Ventures LLC |
| | | **Total Project Area:** | **42.73** | |

Notes: -- Does not include significant work area since proposed work is minor.
*TMK record not found. Area based on on-line parcel info. identified by the State of Hawai‘i GIS. See: http://planning.Hawai‘i.gov/gis/download-gis-data/.
**Approximate acreage, see above

## Table 3-2, Roadway Ownership

| Owner | Roadway |
|---|---|
| CCH | Saratoga Avenue between Midway and Boxer Road |
| | Existing portion of Independence Rd. and ROW for future extension of Independence Rd. for connection with Geiger and Midway Rds. |
| | Midway Rd. from FDR Avenue to Saratoga Avenue from Enterprise Rd. to Hornet Rd. and existing portion and ROW for future extension of Midway Rd. to Malakole Street within Campbell Industrial Park |
| | Boxer Road from Hornet to Copahee Road to West Perimeter Road |
| | Copahee Rd. from FDR Avenue to Midway Rd. |
| | Hornet Rd. from FDR Avenue to Boxer Rd. |
| | Lexington Rd. from Roosevelt Rd. to Midway Rd. |
| | Shangrila Rd. between Lexington and Enterprise Rds. |
| | Yorktown Rd. between Lexington and Enterprise Rds. |
| | Tripoli Rd. between Coral Sea and Essex Rds. |
| HDOT | Enterprise Rd. |
| | FDR Avenue |
| | Coral Sea Rd. |
| | West Perimeter Rd. |
| | Future: North-south road connector ROW and the realignment of Coral Sea Rd. to Independence Rd. |

Shoring (sheet piles or other related method), if required, will be used in accordance with the Occupational Safety and Health Administration requirements (part 3, Chapter 132). No blasting will be required or allowed.

Upon the completion of work, areas surrounding the project site that have been affected by construction will be restored as much as practicable to pre-existing conditions. The following will be required:

- All construction-related debris, including excavated material, fill material, and refuse shall be removed from the project site and disposed of properly by the contractor.
- All construction equipment shall be removed from the project site promptly after construction is complete.
- Any temporary modification to existing utilities, such as power or communications lines, shall be repaired to their pre-existing condition.
- Roadways providing access to the site shall be cleared of construction debris and any damage from construction traffic repaired.
- All areas damaged by construction staging shall be restored. Exposed ground areas shall be seeded or hydromulched as appropriate.
- Temporary utility lines will be removed from the site and all surplus excavation material and construction debris will be removed and disposed of off-site in compliance with applicable State, and City and County of Honolulu regulations.

## *3.4 Project Schedule and Cost*

The planned project schedule will include working with government agencies, perform site and environmental studies, and process the required permitting and design documents. The first increment of this project to include the roadways binding Hunt’s Parcel 1 is estimated to cost approximately $40 million, and will be borne by Hunt and other agencies/developers’ fair share contributions. Construction is tentatively scheduled to commence as early as mid-2021.

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# *Section 4*
# *Project Alternatives and Preferred Alternative*

## *4.1 Alternatives to the Proposed Action*

Alternatives to the proposed project include: (1) the No Action Alternative; (2) the Delayed Action Alternative; and (3) The Preferred Action Alternative. A description of each is provided below.

### *4.1.1 No Action*

The No Action alternative involves no action to develop the subdivision roadways. Taking No Action would avert the potential for negative adverse environmental impacts associated with construction activities and would eliminate the need for the expenditure of approximately $50 million in construction costs.

The No Action alternative, however, would fail to accomplish the project objective to improve the roadway network that would serve the planned future residential community which is consistent with the HCDA *Kalaeloa Master Plan* (HCDA, 2006) long range plan to redevelop the former BPNAS. The failure to develop the new roadway infrastructure system would also result in failure to implement the residential and recreational components of the Hunt Strategic Implementation Plan (Hunt, June 2013), intended to create new opportunities for families in the growing Kalaeloa neighborhood.

Because the No Action alternative would fail to accomplish the objective of the project to achieve development of both the Kalaeloa Master Plan and the Strategic Implementation Plan to provide subdivision roadways to support the master planned new community, it is rejected from further consideration.

### *4.1.2 Delayed Action*

The Delayed Action alternative involves the construction of the project, but at a later date. Delaying the project would temporarily avoid the potential for adverse environmental effects and the need for the expenditure of funds for planning, design, development, and construction activities. However, because the potential for environmental impacts and project costs would only be delayed, impacts and costs associated with the project would eventually be borne when the project is implemented.

Delaying the project to a later time is expected to have virtually the same effect as the No Action alternative:

- Construction costs would be averted in the short-term, but are expected to ultimately be higher due to inflation and other factors while resulting in environmental outcomes similar to the Preferred Alternative of proceeding with the proposed project.
- Delayed Action would also delay the project’s implementation schedule for improvements to existing roads, and construction of drainage and street lighting work that would fail to address the existing environmental conditions associated with untreated storm water runoff.

Because the Delayed Action alternative would fail to accomplish the project objective to provide infrastructure and drainage improvements that would support the long term goal for development of new residences, recreational, and commercial uses in Kalaeloa, it is also rejected from further consideration.

#### *4.1.3 Preferred Alternative*

Based on the above, the Preferred Alternative is to develop the Hunt subdivision roadway system as described in **Section 3, Project Description, Estimated Construction Cost and Schedule**, of this document. The Preferred Alternative is the only alternative that (1) meets the objective of addressing roadway infrastructure system development to support Hunt’s master planned residential subdivision; and (2) is consistent with the HCDA Kalaeloa Master Plan (HCDA, March 1, 2006) which envisions Kalaeloa as a “Center for Excellence” or Wahi Ho‘okela within the ‘Ewa region of O‘ahu, promoting improved conditions conducive to more efficient vehicular movement and pedestrian traffic from while meeting the need to directly connect Kalaeloa to an under construction rail transit station, as well as improve connectivity with Kapolei, the ‘Ewa region, and O‘ahu.

# *Section 5*
# *Description of Existing Site Conditions, Potential Impacts, and Proposed Mitigation*

This section summarizes the existing environmental setting, potential short- and long-term, secondary, and cumulative effects of the proposed project, and mitigation measures. Short-term effects are from construction and infrastructure improvement activities, while long-term effects continue or occur after the project is completed. Although the subject EA document does not require an assessment of impacts according to National Environmental Policy Act (NEPA) requirements, the definition of impacts, according to NEPA, provides guidance toward understanding potential environmental impacts and applicability to this project.

Secondary impacts are generally defined as those induced or caused by an action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR §§ 1500-1508). Potential cumulative effects may result from the incremental consequences of an action when added to other past, present, and reasonably foreseeable future actions (40 C.F.R. §1508.7).

## *5.1 Existing Site Conditions*

### *5.1.1 Description*

The project site is located in the southwest portion of a large urban block bounded by FDR Avenue to the north, Franklin Avenue to the east, Kamokila Boulevard to the west, and Saratoga Avenue to the south. The project site is approximately 500 meters (m) (1,640.42 ft) northwest of the Kalaeloa Airport runway in Barbers Point. The project area is within the former BPNAS area and contains vestiges of the former structures and roads associated with previous military development. The present project site contains one operating school, a rental apartment complex, and foundations of former military building sites, roads in various states of repair, and a few unpaved trails made by off-road vehicles. Thus, parts of the project site contain remnants of structures that are associated with the former military reservation.

The western third of the 35-acre project site is in the northern sector of the former BPNAS now under leasehold by Hunt since 2009. The northwestern Kamokila Boulevard and FDR Avenue corner, Lot 1C, is the future site of a Veterans’ Administration (VA) clinic. Barbers Point Elementary School is located in the approximate center of the project site. The school serves students from kindergarten to grade 5, and enrolled approximately 518 students in the 2017 to 2018 school year (DOE, 2019).

Further east of Barbers Point Elementary School and in the northeastern portion of the project site is the Wakea Apartments, a 100-unit reserved housing complex. Hunt renovated the former Navy officers’ quarters in 2015. The former BPNAS Administrative Office site and tennis courts are located off of Saratoga Avenue in the southeastern portion of the project area.

The land north of a majority of the project site was formerly used for sugarcane cultivation and is presently vacant. The land north of the northwestern portion of the site includes the Costco Wholesale and Hawai‘i State Judiciary, both located along FDR Avenue and Kamokila Boulevard. Land further north includes commercial uses and the Kapolei Satellite City Hall, located approximately 0.4 mile northwest of the FDR Avenue limit of the project site.

American Renaissance Academy, which is a Pre-K to grade 12 private school with an enrollment of approximately 110 students, is located approximately 0.2 mile southeast of Saratoga Avenue. The Kalaeloa Professional Center and various privately-owned recreation facilities, such as an airsoft park and go-kart facility, are located approximately 0.3 mile southeast of the Saratoga Avenue. The Kalaeloa Airport is located approximately 0.3 mile further south of the project limits at Saratoga Avenue. Following the BRAC closure of the airport in 1999, HDOT-Airports assumed ownership and operation of the airport. Today, the airport serves as a general aviation reliever airport for the Daniel K. Inouye International Airport. Users of the airport include the U.S. Coast Guard, Hawaiʻi National Coast Guard, and the general aviation community. Maintenance Hangars 110 and 111 remain, with Hangar 111 also provides space for the University of Hawaiʻi, Honolulu Community College Pacific Aerospace Training Center located on Midway Road.

Directly southwest of the project site, south of Boxer Road and Kamokila Boulevard, is a five-megawatt solar farm on land leased by the State of Hawaiʻi, Department of Hawaiian Homelands. Kapolei Business Park is located approximately 450 ft. west of the proposed Kamokila Boulevard extension. Industrial uses at the James Campbell Industrial Park are located further southwest of the project site.

The Kalaeloa Rental Homes residential development is located directly east of the project site, along FDR Avenue and Franklin Avenue. The development includes 120 multi-family units. Further east of Franklin Avenue is the Federal Bureau Investigation Honolulu field office is located on Enterprise Street.

#### *5.1.2 Potential Impacts and Proposed Mitigation*

The proposed project has the potential for adverse environmental impacts resulting from short term construction activities including grubbing, grading, and trenching. Safe driveway access into and out of existing uses including those of the Barbers Point Elementary School and Wakea Gardens apartments would not be seriously impacted, although drivers may experience minor delays during peak construction periods. A traffic safety and control plan will be prepared and implemented by the contractor to ensure unimpeded traffic flow through the Kalaeloa neighborhood to minimize traffic circulation problems during the period of construction.

The proposed action will have positive long-term effects on utility systems, drainage and traffic circulation and improve conditions for the Hunt planned residential community of Kalaeloa.

Upon completion of construction, all equipment and personnel will be removed, and the site will be returned to existing conditions with no permanent intrusion to the site. Because the direct impacts from the proposed action would be only short-term and other past, present, and reasonably foreseeable future actions are expected to be consistent with the existing development and use of the area, the project would make no persistent contribution to secondary or cumulative impacts.

Under the No Action Alternative, the proposed project improvements and infrastructure upgrades would not be implemented, and Hunt's plans to further its improvements of urbanization of Kalaeloa in accordance with the HCDA master plan would be delayed or not realized. Improved access (Wakea Street extension) to the planned transit station near Kapolei Parkway would not be realized. Unsafe traffic conditions may result due to the lack of traffic signals at major intersections in Kalaeloa, as well as limited accessibility to Kalaeloa Airport and shoreline and existing beach parks.

## 5.2 Climate

### 5.2.1 Description

The climate in the region of the Kalaeloa has monthly mean temperatures ranging from 62 to 88 degrees Fahrenheit (Western Regional Climate Center 2017) with an average annual rainfall of approximately 21.49 inches per year (Giambelluca et al. 2013).

The prevailing wind direction is from the east and northeast. Northeasterly trade winds prevail over Oʻahu approximately 80 percent of the time, with average wind speeds ranging from 10 to 15 miles per hour. The trade winds blow most strongly and consistently from April through November. Southerly or "Kona" winds occur roughly less than half the time during December through March.

In 2017, the *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report* was published to provide a basis for recommendations on reducing exposure and increasing adaptability to the impacts of sea level rise (SLR) resulting from human-generated global greenhouse gas (GHG) emissions, including carbon dioxide, methane, nitrous oxide, and fluorinated gases (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2017). Research is also in agreement that GHG emission are a key contributor to the unprecedented increases in global atmospheric warming over the past century. Research within the report notes that the intensity and frequency of natural disasters have increased and will continue to do so, and further provides technical projections of areas along the coast that are vulnerable to SLR based on the latest available science. The report includes recommendations to address risks associated with climate change. The report finds that for Oʻahu, with no mitigative actions, 3.2 feet of SLR, which is projected by 2100, and its associated erosion, flooding, and waves will have significant impacts to the island's land, building and land values, residents, structures, and major roadways. See **Section 5.7, Natural Hazards** for an assessment of the possible impacts of SLR on the Project Site.

### 5.2.2 Potential Impacts and Proposed Mitigation

The development and operation of the Hunt Kalaeloa subdivision roadways project will not individually affect the climate. However, the proposed action to construct improvements to existing roads on the project site would produce GHGs. Further discussion on mitigation measures is provided in **Section 5.7.2**.

The subdivision roads development is not expected to have an impact on the region's climate; therefore, no mitigation measures are warranted.

## 5.3 Geology and Topography

### 5.3.1 Description

**Geology.** The Hawaiian Islands represent the southernmost portion of the Hawaiian Archipelago, a series of northwest-trending ridges produced by a succession of volcanic eruptions during the Pliocene Epoch. The Island of Oʻahu was formed by two shield volcanoes; Koʻolau to the east and the older Wai‘anae, to the west. The volcanoes are believed to have formed during the late tertiary to early Pleistocene periods (MacDonald, Abbott, & Peterson, 1983). The Wai‘anae Volcano erupted between 3.9 and 2.5 million years ago and the Ko’olau Volcano erupted between 2.5 and 1.7 million years ago. The volcanoes are separated by the Schofield Plateau of central O‘ahu which was formed by lavas of the Ko‘olau Range banking against the older Wai‘anae Range. North and south of the Schofield Plateau is O‘ahu 's coastal plain, which is composed of marine and terrigenous sediments deposited when the sea stood at a higher level. The Project Area is located within the ‘Ewa Coastal Plain, which is comprised of interbedded coral reef and alluvial volcanic sediments (caprock) overlying basalt (volcanic rock). The caprock ranges from 50 to 400 ft (15 to 122 m) thick along the northern boundary of BPNAS and from 750 to 1,000 ft (229 to 305 m) thick along the coast. The upper 100 ft (31 m) of caprock is marine sediment, consisting mainly of coral reef with minor layers of shell fragments and beach sand. The terrain generally consists of limestone and alluvial deposits, overlying flows of the Wai‘anae volcanic series (Macdonald et al. 1983:423).

The island of O‘ahu is of volcanic origin and was built by the Wai‘anae and the Ko‘olau Volcanoes, which are now deeply eroded (MacDonald et al. 1983). The Wai‘anae Range rises 1.2 kilometers above mean sea level (AMSL), making it higher than the younger, adjacent Ko‘olau Range (MacDonald et al. 1983). The Wai‘anae and Ko‘olau Volcanic Shields were built during the late Pliocene and early Pleistocene by thin-bedded lava flows. The main shield building activities ceased approximately 3.5 to 2.5 million years ago (Stearns 1985).

The site is situated on the ‘Ewa Coastal Plain which extends seaward off the southeastern flank of the Wai‘anae Volcano and the southwestern flank of the Ko‘olau Volcano. This plain was formed by the accumulation of a thick wedge of sediments and coral reef formations on the flanks of the two volcanoes.

High sea level stands during the Pleistocene Epoch caused the formation of reef deposits at correspondingly higher elevation. Subaerial exposure of the sediments and calcareous materials caused consolidation of the lagoonal deposits and induration of the reef materials.

Sinkholes, depressions in the surface of the earth where there is little fill over the coral reef limestone, are found across the ‘Ewa Plain. Unique anchialine pools, which are sinkholes that connect to the ocean through cracks in the substrate, are preserved at the Kalaeloa Unit of the Pearl Harbor National Wildlife Refuge, approximately 1.4 miles south of the proposed roadways.

**Topography.** Topographic map coverage of the site is included on the U. S. Department of the Interior Geological Survey (USGS) 7.5-minute Ewa quadrangle map. The property is located approximately 1.5 miles north of the shoreline. The site is located at 21° 19’ 23.95” north latitude and 158° 4’ 45.66’’ west longitude. Kalaeloa is relatively flat, with an average slope across the entire area of about 0.5 percent (%). The ground surface slopes gently southward with an elevation of approximately 52 ft AMSL.

The project area is generally level, with an elevation of approximately 48 to 55 ft (14.6 to 16.8 m) AMSL. U.S. Department of Agriculture (USDA) soil survey data shows that sediments consist of Mamala stony silty clay loam (MnC) within the western 75 percent of the project area, and Coral (limestone) Outcrop (CR) in the eastern 25 percent of the project area (Foote et al. 1972). It is believed that the limestone coral outcrop is the base material and that the overlying stony silty clay loam may be of no great thickness. Furthermore, commercial agriculture sought to transport soil onto the limestone coral outcrop plains and it may be that soil cover in the western project area is only about a century old.

#### *5.3.2 Potential Impacts and Proposed Mitigation*

The potential for significant adverse effects to topography and geology are not anticipated based on the limited scope and scale of the proposed project. The total project area is approximately 35 acres and includes the area required for earthwork, construction, and staging and storage of construction equipment and materials. Activities will be limited to the general vicinity of existing roadways and involve clearing and grading, and the construction of the roadway surface, walkway, concrete slab, utilities, and drainage features. The new pavement will be at or near their existing elevation and would not affect the geology or topography of the area. No mitigation measures are necessary or recommended. See **Section 5.5, Soils and Potential for Hazardous Materials**, for further discussion. No secondary or cumulative impacts to topography and geology are expected during the operation of the proposed project, or during the implementation of other past, present, and reasonably foreseeable future actions.

### *5.4 Water Resources and Hydrology*

#### *5.4.1 Surface Water*

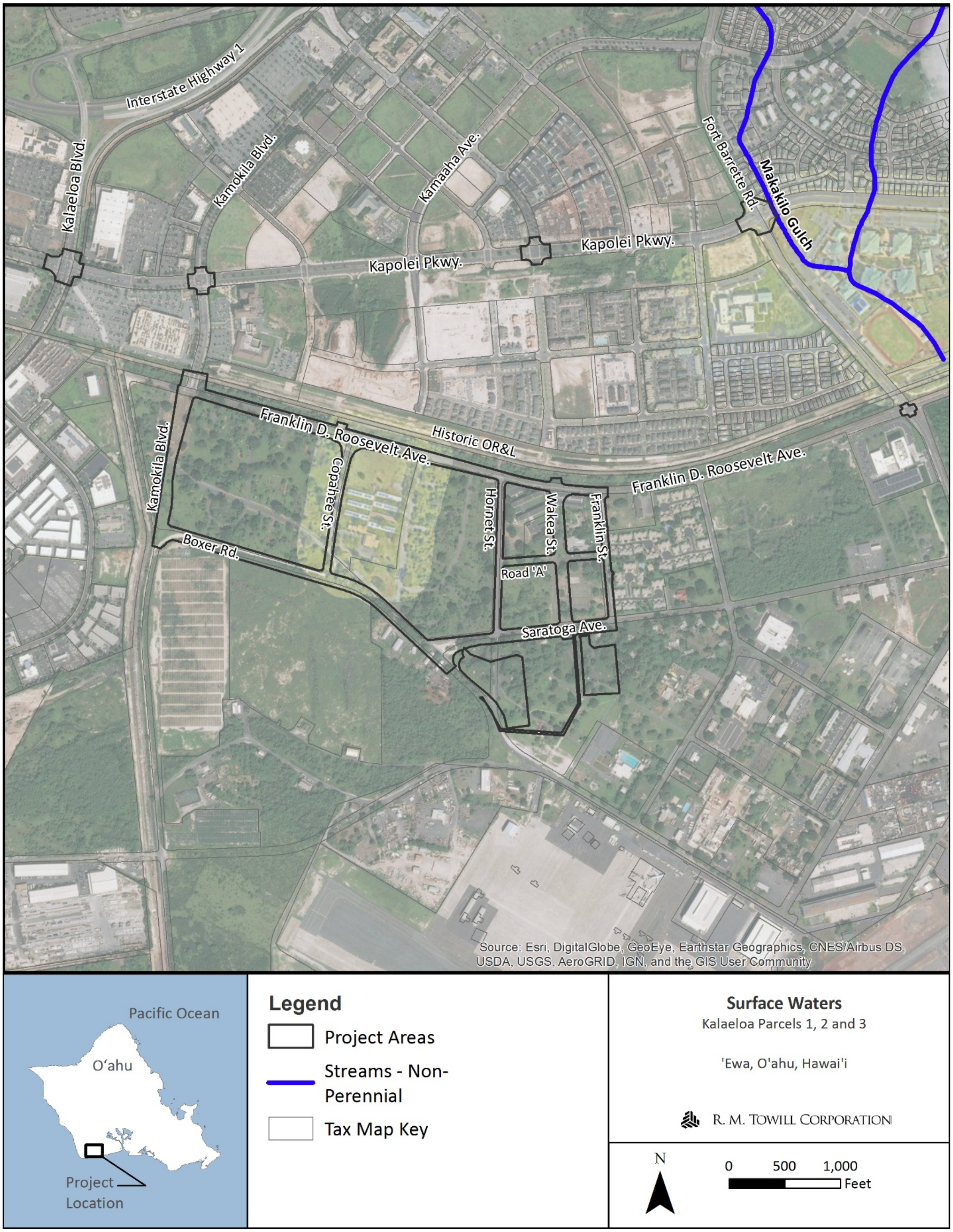
##### *5.4.1.1 Description*

There are no surface waters in the form of perennial stream flows throughout the proposed project site bordered by Roosevelt, Franklin, Saratoga Avenues, and Kamokila Boulevard. Makakilo Gulch skirts the western boundary of the proposed improvements at the Fort Barrette Road-Kapolei Parkway intersection. See **Figure 5-1, Surface Waters**. The closest surface water body to the site is the James Campbell Industrial Park (JCIP) Drainage Canal adjacent to the west of the property. Makakilo Gulch is located parallel to the far northeastern boundary of Fort Barrette Road where traffic signal improvements are planned at Fort Barrette Road-Kapolei Parkway and Fort Barrette Road Enterprise Street-FDR Avenue intersections. Kalaeloa is relatively dry, with little precipitation, and the soils in the area are well-drained. There are no streams or rivers in the Kalaeloa area. The Barbers Point portion of the Pacific Ocean is located approximately 1.3 miles to the south of the proposed roadways. During use of the former BPNAS by the Navy, more than 250 dry wells were installed, primarily for regional stormwater drainage. Sixteen of the dry wells are identified within the area bounded by the proposed roadways project.

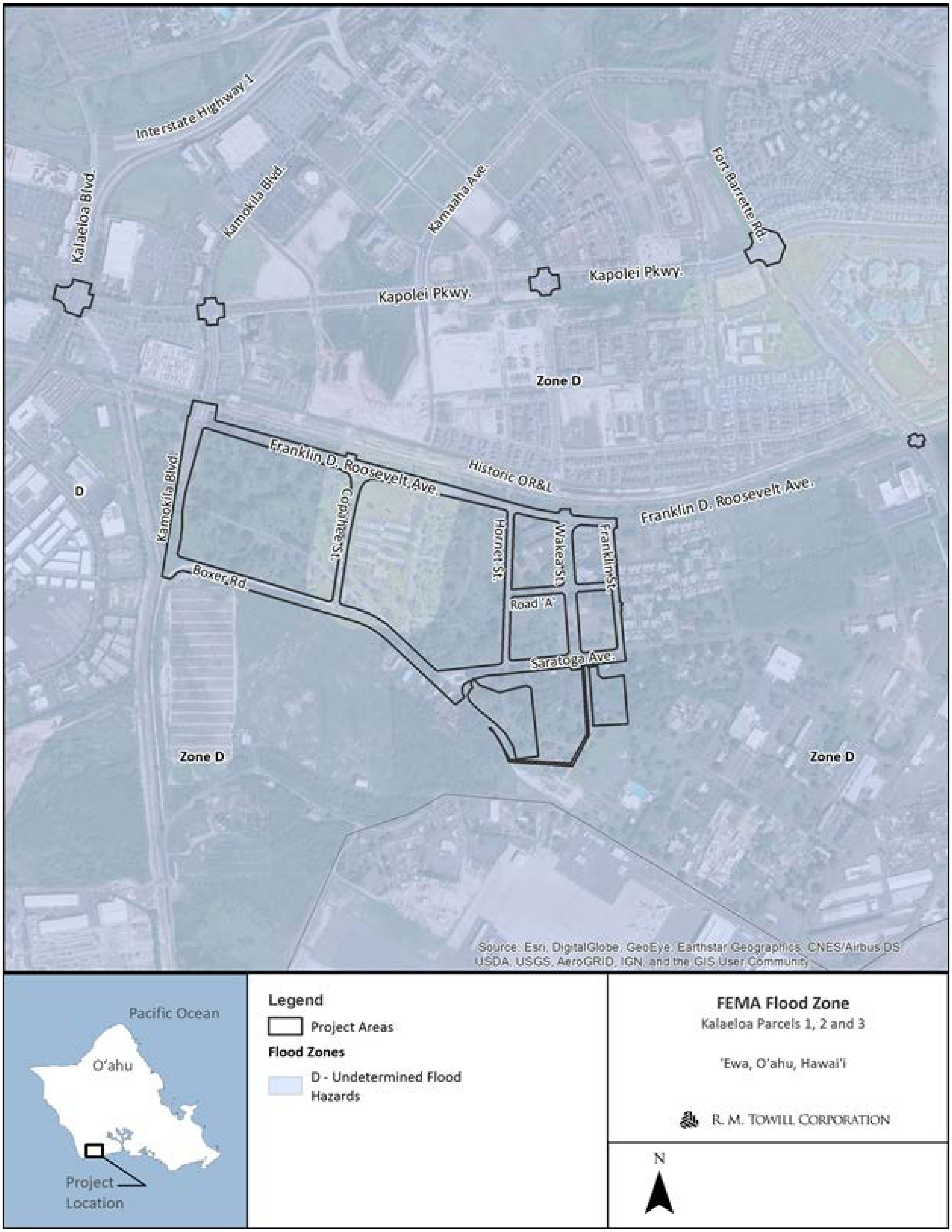
The flat topography of the project area combined with the highly permeable soil and rock, allow storm water runoff to readily infiltrate and collect in man-made detention basins, dry wells, natural sinkholes, or pits for infiltrating into the subsurface. During extreme precipitation events however, storm water typically overflows and sheet-flows into the ocean.

The Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA 2011), identifies the entire project area within Zone D, which denotes areas in which flood hazards are undetermined, but possible. There are no streams or surface water features in or near the subject lots that could cause potential flood hazards. See **Figure 5-2, FEMA FIRM**.

## Figure 5-1, Surface Waters



## Figure 5-2, FEMA FIRM



### *5.4.2 Potential Impacts and Proposed Mitigation*

The proposed project will not impact any perennial stream flows or channels. In addition, the proposed infrastructure will not come into contact with any 303(d) Water Quality Limited Segment waters, and thus would not burden waters that are already impaired. Some of the proposed road alignments will be located in areas that are already developed, while others will be in areas where development is forthcoming. In both instances, proposed underground utilities will be designed within road ROWs to the extent possible, so as to confine the area of potential impact(s). Whether a particular alignment is located in an existing or future ROW, necessary approvals and permits will be obtained during planning and design phases covering federal, state, and county requirements to address water quality regulations (i.e., HAR, Chapter 11-54, Water Quality Standards). In addition, the contractor will be required to adhere to temporary erosion control BMPs and must retain a storm water pollution prevention plan (SWPPP) on-site during construction to document the maintenance of all storm water controls. Special attention will address work at the Fort Barrette-Kapolei Parkway and Fort Barrette Enterprise Street-FDR Avenue intersections due to their proximity to Makakilo Gulch.

Positive long-term cumulative effects would result from the proposed action in conjunction with ongoing projects in the watershed to improve water quality.

During construction, pollution control measures will be implemented and included in the filing of a National Pollutant Discharge Elimination System (NPDES) Construction Storm Water Permit, in accordance with Clean Water Act regulations. As required Site-Specific Construction Storm Water BMPs and SWPPP will be prepared and followed by the project contractor to handle the treatment of storm water runoff, erosion, and sediment control[1].

### 5.4.2 Groundwater

#### *5.4.2.1 Description*

Mink and Lau (1990) identify the following two types of groundwater beneath the majority of the subject property: a shallow, predominantly caprock groundwater system and an underlying deep basal aquifer. They classify the groundwater as within the Ewa Aquifer System of the Pearl Harbor Aquifer Sector:

- The uppermost member is characterized as an unconfined basal aquifer contained in sedimentary nonvolcanic lithology layers. This caprock groundwater is given a Status Code of 13321 which indicates that the groundwater has moderate salinity (i.e., with a chloride content of 1,000 to 5,000 milligrams per liter [mg/L]). Under the Mink and Lau system, the code indicates that the shallow caprock groundwater is currently used but not as a drinking or ecologically important groundwater source, is a replaceable resource, and has a high vulnerability to contamination.
- The deep, underlying aquifer is characterized as a confined basal aquifer contained in dike compartments. Under the Mink and Lau system, the groundwater contained in the deep aquifer is given a Status Code of 13213, indicating that the groundwater has

[1] The project’s BMPs and SWPPP will be provided as part of the NPDES general construction storm water permit (NOI Form C) in accordance with HAR Chapter 11-55, Water Pollution Control.

a low salinity (i.e., with a chloride content of 250 to 1,000 mg/L). Under the Mink and Lau system, the code indicates that the deep groundwater is currently used as neither a drinking-water or ecologically important source and has a low susceptibility to contamination because of confinement and the overlying caprock.

Up to about 1,650 ft from the coast, the water table is from 3 to 10 ft below the surface and thus is accessible from sinkholes.

The Underground Injection Control (UIC) line was established by HDOH to protect the quality of Hawaiʻi's underground sources of drinking water from chemical, physical, radioactive, and biological contamination that could originate from injection well activity. The UIC line is used to determine the level of protectiveness afforded an aquifer as reflected by water quality standards criteria. In general, groundwater situated mauka of the UIC line is considered a potential source of drinking water. Groundwater situated makai of the UIC line is generally considered not to be a potential source of drinking water. The subject site lies mauka of the UIC line and groundwater beneath the site is considered a potential source of drinking water.

#### *5.4.2.2 Potential Impacts and Proposed Mitigation*

Groundwater would not be significantly impacted by the proposed project. The project area is situated over deep confined basalt aquifers and overlying shallow caprock aquifers. The basalt aquifer of the ʻEwa System is considered too deep to be contaminated from the surface. The shallow aquifer of the ʻEwa System, although considered highly vulnerable to contamination, is brackish and not suitable for consumption or irrigation without desalination.

*No short- or long-term,* secondary*, or cumulative adverse impacts to groundwater resources are anticipated during construction or operation of the proposed project, or during the implementation of other past, present, and reasonably foreseeable future actions*.

## *5.5 Soils and Potential Hazardous Materials*

### *5.5.1 Description*

According to the U.S. *Department* of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the soil in the area of the site is classified as follows:

- Coral outcrop land consists of coral or cemented calcareous sand (CR). The coral reefs formed in shallow ocean water during the time the ocean stand was at a higher level. Small areas of coral outcrop are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. This type of land is used for military installations, quarries, and urban development.
- Mamala cobbly silty clay loam, 9 to 12 percent slopes (MnC), consists of shallow, well-drained soils along the coastal plains formed in alluvium deposited over coral limestone and consolidated calcareous sand. Runoff is very slow, the erosion hazard slight to moderate, and the permeability is moderate. In a representative profile, the surface layer is dark-reddish-brown stony silty clay loam about 8 inches thick. The subsoil is dark reddish-brown silty clay loam about 11 inches thick. The substratum is coral limestone and consolidated calcareous sand.

Land under off-site improvements is comprised of CR, MnC, and the following:

- Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes (EmA), characterized by very slow runoff, and an erosion hazard that is no more than slight. The depth to coral limestone is 20 to 50 inches. This soil is typically used for sugarcane, truck crops, and pasture.
- Honouliuli clay, 0 to 2 percent slopes (HxA) occurs in the lowlands along the coastal plains. The soil is characterized by moderately slow permeability, slow runoff, and an erosion hazard that is no more than slight. This soil is used for sugarcane, truck crops, and pasture.

See **Figure 5-3** for soil types located within the project site.

*Potential Hazardous Materials*

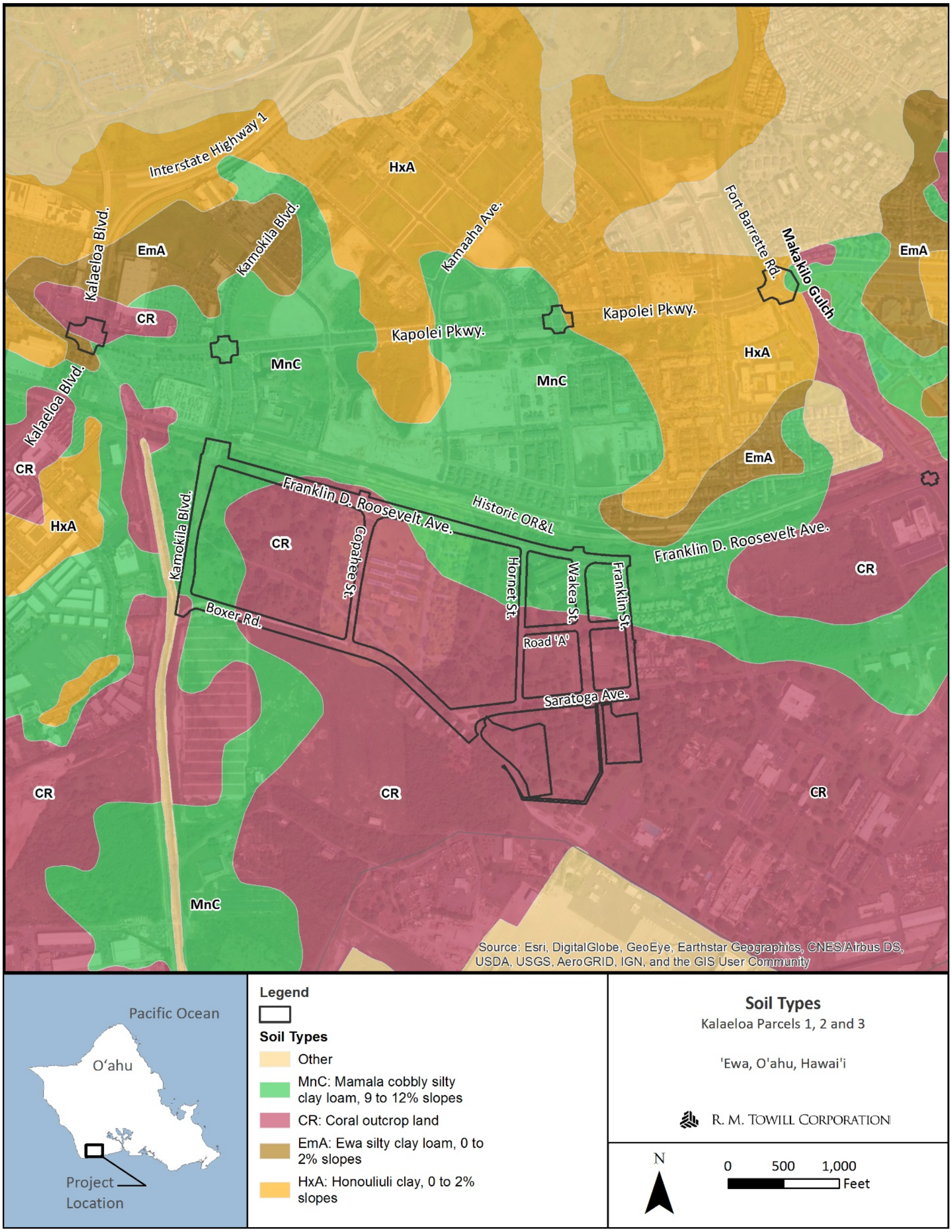
On December 2017, a draft Phase 1 Environmental Site Assessment (ESA) was completed by Element Environmental, LLC, to identify presence of any environmental issues associated with the proposed roadways on four parcels (TMKs) of developed land. The ESA included literature and records research, field investigation, and personal interviews with individuals familiar with past usage of the project site. The findings of data collected in the 2016 timeframe are summarized below. See **Appendix B, Phase I Environmental Site Assessment** (Element Environmental, LLC December 2017).

*Area of Study*

The subject property is located within the Kalaeloa CDD, designated as TMKs: (1) 9-1-013: portions of parcels 002, 003, 004, 010, 128, and 129. The parcels are located on former BPNAS property and are owned by the U. S. and leased by Kalaeloa Ventures, LLC (for Hunt). The roadways are under various jurisdictions, including the Navy; HCDA; HDOT, and the CCH. The subject property is identified as three distinct areas:

- Parcel 1 includes proposed roadway and TMK: (1) 9-1-013: parcel 002, including:
  - Copahee Avenue, West Perimeter Road, and the Kamokila Boulevard Extension and
  - Portions of Saratoga and FDR Ave, and OR&L utility corridor (including GTE bldg.).
- Parcel 2 includes proposed roadway and TMK: (1) 9-1-013: parcel 003, 004, and 010, including:
  - Portions of Hornet Street, FDR Avenue, Saratoga Avenue, Boxer Road, and 272: Transformer Station A.
- Parcel 3 includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcels 128 and 129, including:
  - Road “A” and the Wakea Street Extension;
  - Portions of Hornet Street, FDR Avenue, Franklin Avenue, Saratoga Avenue, and the OR&L utility corridor;
  - 1906: Tennis Pro Shop; and
  - Portions of 73: Paradise West Club Complex, 68C: concrete pad, and 713: tennis courts.

## Figure 5-3, Soil Types



*Findings*

The assessment identified evidence of Recognized Environmental Conditions (RECs), as defined by the American Society for Testing and Materials (ASTM). ATSM guidance defines an REC as the presence or likely presence of any hazardous substances or petroleum products, in, on, or at the property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment.

ASTM defines a Controlled REC (CREC) as a REC resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority, with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (Element Environmental, LLC December 2017).

A summary of the identified RECs indicated the following on-site and off-site sources and potential sources:

On-Site Sources and Potential Sources of RECs

| |
|---|
| Site Listing on Environmental Databases:<br>BPNAS - It is possible that historical military use has negatively impacted the soil and groundwater beneath the site. |
| "Barbers Point Central Office” (GTE Building) (Parcel 1) on the UST database. The underground storage tank (UST) and associated piping at the site poses a risk of future release of hazardous substances and/or petroleum products to the site. |
| Pipelines:<br>“Black oil” and “white gas” pipelines are located within the subject property ROWs on FDR Avenue and the OR&L utility corridor. It is possible that soil and groundwater beneath the site have been or may be impacted by releases associated with the pipelines. |
| Releases:<br>272: Transformer Station A: Transformer 444, installed in the early 1940s, was retro-fitted in 1988 because PCBs were detected in the dielectric fluid and wipe samples collected from the concrete pad. No additional information was available. It is possible that historical releases from the transformer have negatively impacted surface materials in the vicinity of the transformer as well as the soil and groundwater beneath the site. |

| |
|---|
| Solid Waste:<br>Evidence of illegal dumping of miscellaneous debris and litter adjacent to the ROWs included but was not limited to general household trash, 1-gallon paint cans, several cans of brake fluid, wooden pallets, and electronics. It is possible that illegal dumping activities have negatively impacted soil and groundwater beneath the site. |
| Hazardous Substances and Petroleum Products:<br>Hazardous and/or regulated substances (e.g., oils, gasoline, grease, petroleum-based products) may be used/stored within the GTE Building (Parcel 1) and 272: Transformer Station A (Parcel 2). The nature of the activities conducted in these two areas poses a material threat of a future release to the environment. |

Off-Site Sources and Potential Sources of RECs

| |
|---|
| Leaking UST (LUST):<br>Adjacent Structure 77 Wakea Garden Apartments (former BOQ) (interior of Parcel 3) previously had diesel and fuel oil USTs (BP19 and BP20) (installed in 1958). The tanks, boilers, and piping were removed in October 1991, at which time visual evidence of soil contamination was noted. No additional information was available. It is possible that contamination associated with the release(s) remains in the soil and groundwater beneath the site. |
| Releases:<br>Contaminated surface soil (arsenic and selenium) and groundwater (TPH-DRO and TPH-ORO) were identified on an adjacent property to the northwest of Parcel 1 hydraulically upgradient (now occupied by Costco). It is possible that contamination from this site is migrating to the subject property. |
| Soil sampling conducted within Parcel 1 in 2016 indicated the presence of elevated pesticide concentrations in some areas, which will require management during redevelopment. It is possible that subject property is negatively impacted by historical pesticide use on Parcel 1. |
| Soil sampling conducted within drywells located within Parcel 1 and potentially within the proposed roadway expansion indicates the presence of elevated chromium concentrations in well L18-01. It is possible that contamination from this dry well is on or migrating to the subject property. |

A summary of the identified CRECs indicated the following sources:

| |
|---|
| LUST Sites:<br>The LUST associated with former Building 74 (exact location is unknown; approximated to be within the southwest interior portion of Parcel 3) (Facility ID 9-103191, Release ID 030039), located within the interior of Parcel 3, is listed as Site Cleanup Completed (NFA). |

The ESA's literature and records research noted that during a site investigation in 2016, discrete soil samples were collected from soil borings taken adjacent to Parcels 1, 2, and 3. Contaminants of potential concern (COPCs) were identified in soil to a depth of 4 ft below ground surface (bgs) at concentrations that exceeded HDOH environmental action levels for unrestricted land use, including chromium, arsenic, chlordane (technical), heptachlor, and heptachlor epoxide (Element Environmental, LLC December 2017).

The data generated during the 2016 site investigation is not adequate to evaluate potential environmental hazards, associated risk, and construction/trench worker exposure. However, none of the five COPCs identified in soil at the site, with the possible exception of chromium, exceed their respective HDOH Direct Exposure Action Levels (DEALs) for Construction/Trench Worker exposure. The ESA notes that for chromium, the levels are within the background level range.

As the soil samples were collected in accordance with HDOH guidance, and were considered to be representative of the soil conditions, the sample results would indicate that construction/ trench worker exposure is not a concern in soils to a maximum depth of 5 ft bgs. Thus, to minimize construction worker exposure to potential soil hazards during construction, trenching to a maximum depth of 5 ft bgs should be maintained.

- It is possible that soil and groundwater beneath the site's rights-of-way on FDR Avenue and the OR&L utility corridor have been or may be impacted by releases associated with the pipelines, that historical releases from the transformer station site have negatively impacted surface materials in the vicinity of the transformer as well as the soil and groundwater beneath the site.

- It is possible that illegal dumping activities have negatively impacted soil and groundwater beneath the site.
- It is possible that contamination from an adjacent Costco site north of the project site, is migrating to the project site.
- It is possible that Parcel 1 may be negatively impacted by historical pesticide use on it, or contamination from a dry well on the same parcel could be migrating to the project site.

*Recommendations*

1. Complete a Phase II ESA to characterize soil within the subject property to evaluate potential environmental hazards, associated risks, and potential construction/trench worker exposure. Soil sample results can also be used to characterize soil for on/off-site reuse and/or disposal.
2. If COPCs are detected in soil at concentrations exceeding HDOH EALs, complete an Environmental Hazard Evaluation (EHE) to evaluate potential environmental hazards, associated risks, and construction/trench worker exposure.
3. If potential environmental hazards, associated risks, and/or construction/trench worker exposure are identified by the EHE, prepare an Environmental Hazard Management Plan to manage contaminated soil and mitigate potential environmental hazards and exposure risks.

#### *5.5.2 Potential Impacts and Proposed Mitigation*

The proposed project will involve minor grading, excavation and backfill activities to prepare the site for development. Earthwork will consist of minor grading to prepare the paving of existing and new roads, construction of the new walkways, and installation of utilities (i.e., drainage and electrical). Prior to construction all known utilities and underground pipelines shall be identified by the contractor and shall be subsequently disconnected, removed, or avoided.

Based on preliminary engineering and environmental site assessment and planning, construction/trench worker exposure is not a concern in soils to a maximum depth of 5 ft bgs. Excavation at the site will be accomplished using conventional excavating equipment. It is expected that most of the excavated materials will be returned to trenches, safely covered on-site, or disposed of at an approved State or City and County of Honolulu facility.

During construction, the potential for release of sediments in storm water runoff from excavated areas and stockpile material sites will be addressed through a City and County of Honolulu-approved Erosion Control Plan (ECP) that will be secured for this project. A NPDES permit will be obtained for this project from the DOH, CWB. The ECP and NPDES permit applications will provide for the use of BMPs to prevent or mitigate the potential for impacts to State waters as a result of storm water runoff from the construction site.

There is a possibility that surface soils may be impacted due to hazardous substances or petroleum products that may have migrated from mauka upland properties to the project site.

If contaminated materials are detected, construction will cease immediately and standard protocols for soil contamination will be followed, including the implementation of mitigation measures to ensure no further adverse impact to the soil conditions on the project site or to worker health and safety.

The contractor shall be responsible for taking safety, contamination management, and documentation actions as required by HRS, Chapter 396, Occupational Safety and Health, and HAR, Chapter 12-8, Hawaiʻi Occupational Safety and Health. Compliance with the guidance provided in these regulations involves the protection of workers and public health and safety; and immediate notification of the DOH including monitoring requirements. Other controls may be implemented in accordance with a Soil Management Plan or a site-specific Health and Safety Plan, prepared if required by Hunt Kalaeloa for this project.

Any contaminated materials to be removed from the project site will be sampled, analyzed, and appropriately disposed of at a DOH-approved facility. The transport of the materials shall comply with State and Federal regulations regarding the transportation of hazardous or petroleum contaminated materials.

Engineered controls to mitigate against potential exposure pathways will include paving of the site with concrete and/or AC pavement, and the use of clean, uncontaminated soil cover. The implementation of these controls is expected to be sufficient to reduce the potential threat to human health and the environment by eliminating the exposure pathway.

Other impacts to soils include the potential for erosion and the generation of dust during grading and construction. Clearing and grubbing activities will temporarily disturb the soil retention values of existing vegetation and expose soils to erosional forces. Some wind erosion of soils could occur without a proper watering and regrassing program. Heavy rainfall could also cause erosion of soils within disturbed areas of land. BMPs to minimize impacts may include the following:

- Minimizing the time of construction;
- Retaining existing ground cover as long as possible;
- Constructing drainage control features early;
- Using temporary area sprinklers in non-active construction areas when ground cover is removed;
- Providing a water truck on-site during the construction period to provide immediate sprinkling, as needed;
- Using temporary berms and cut-off ditches, where needed, for erosion control;
- Watering graded areas when construction activity for each day has ceased;
- Grassing or planting all cut and fill slopes immediately after grading work has been completed; and
- Installing silt fences, sediment traps, and diversion swales, where appropriate.
- Employee training on proper use of BMPs

After construction, the new improvements will provide long-term erosion control. Construction activities will comply with all applicable Federal, State, and City and County regulations and rules for erosion control. A grading permit will be procured from the City and County of Honolulu. Compliance with the NPDES permit program will be required.

Adherence to the above mitigation measures and provisions of law are expected to maintain public and worker health and safety and mitigate against the potential for significant short or long term adverse environmental impacts. No secondary or cumulative impacts to soils are expected from the proposed action.

## *5.6 Wetlands*

### *5.6.1 Description*

Wetlands play an integral role in the environment. They prevent erosion in the surrounding area through the presence of wetland associated plants with root systems that hold soil in place. The plants also serve as a physical barrier and absorb energy from waves. Wetlands also provide a natural filtration system for runoff. Nutrients swept into the wetland from runoff are absorbed by plant roots and microorganisms that live in the soil, or stick to the soil particles themselves. Through this process, most of the nutrients and pollution in the water are absorbed and retained and are prevented from entering the ocean (EPA, 2016). Executive Order 11990, Protection of Wetlands, directs federal agencies to take action to minimize the destruction, loss, or degradation of wetlands on their properties and mandates the review of the impact of proposed actions on wetlands through NEPA.

There are no known wetlands in or adjacent to the project site.

### *5.6.2 Potential Impacts and Proposed Mitigation*

There would be no impact to wetlands because none exist in the project area.

If water is encountered and removed while digging foundations for the proposed roadway, walkway, concrete slab, and drainage facilities, any such discharged water must comply with federal NPDES requirements. During operation of the proposed project, a BMPs plan and an ECP will be implemented to protect against inadvertent spills or releases of contaminants. **Section 5.4.1.2** addresses preventive measures to be taken by the construction contractor to avoid spills into Makakilo Gulch, which is the nearest groundwater resource northeast of the Fort Barrette Road intersection improvements work during construction.

No direct, secondary, or cumulative adverse impacts to the area wetlands are anticipated and no further mitigation is anticipated to be required. All work proposed would adhere to City and County of Honolulu regulatory requirements.

## *5.7 Natural Hazards*

### *5.7.1 Description*

Hawai’i is susceptible to potential natural hazards such as flooding, hurricanes, earthquakes, and tsunamis. This section provides an analysis of the Site’s vulnerability to such hazards.

*Floods*

As indicated in **Section 5.4.1, Surface Waters**, the proposed project site is located in flood hazard Zone D, defined as areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted in Zone D as reflected in FEMA-FIRM Map No. 15003C0310G (HI-NFIP, 2011). See also **Figure 5-2, FEMA FIRM Map**.

*Hurricanes*

Hawaiʻi's hurricane season is between June and November, when the sun can heat the ocean enough to produce strong storms (University of Hawaiʻi at Hilo, 2013). Hurricanes are not very common in Hawaiʻi (as opposed to, for example, the Caribbean). This is because the ocean around the islands is relatively cool and wind patterns are more likely to create shear, which tears storms apart. However, since 1950, when reliable recordkeeping on hurricanes began, five hurricanes have caused major damage to Hawaiʻi. Causing an estimated $2.3 billion in damages, Hurricane ʻIniki (1992) is the worst storm to have hit Hawaiʻi (Williams, 2013). No hurricanes or tropical storms have caused substantial damage since ʻIniki.

*Seismic Hazards*

In Hawaiʻi, most earthquakes are linked to volcanic activity, unlike other areas where a shift in tectonic plates is the cause of an earthquake. Each year, thousands of earthquakes occur in Hawaiʻi, the vast majority of which are so small they are detectable only with highly sensitive instruments. However, moderate and disastrous earthquakes have occurred in the islands.

*Tsunami Hazard*

The project site is located well outside the tsunami evacuation zone designated by the Hawaiʻi State Civil Defense agency.

*Climate Change*

According to recent findings by researchers at the Hawaiʻi Climate Change Commission and University of Hawaiʻi (IPRC, 2013, var.), the effects of climate change are increasingly evident in Hawaiʻi: air temperature has risen; rain intensity has increased while total rainfall has decreased; stream flows have decreased; sea surface temperatures and sea levels have increased; and the ocean is becoming more acidic (Hawaiʻi Climate Change Commission, 2017 and SB No. 2745, 2012).

Research is also in agreement that GHG emissions, including carbon dioxide, methane, nitrous oxide, and fluorinated gases, are a key contributor to the unprecedented increases in global atmospheric warming over the past century (EPA, 2011 and IPRC, 2013). These trends are projected to continue to increase in the future posing unique and considerable challenges to Hawaiʻi. Research at the University of Hawaiʻi, School of Ocean and Earth Science and Technology (SOEST) indicates that sea level has risen in Hawaiʻi by approximately 0.6 inches per decade (1.5 mm per year) over the past century (SOEST, 2012). Research in the 2017 *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report* finds that 3.2 feet of SLR is expected by year 2100 (Hawaiʻi Climate Change Mitigation and Adaptation Commission, 2017).

According to the Intergovernmental Panel on Climate Change's Fifth Assessment Report, Climate Change 2013, Chapter 13, Sea Level Change, released in 2014, it is estimated that at most, a global sea-level rise of approximately 0.45 -0.82 m (1.48 – 2.70 ft) is likely to occur for the period of 2081-2100. There will be deviations of local and regional sea level change from the global change – it is estimated that about 70% of coastlines are projected to experience a relative sea level change within 20% of the global mean sea level change.

The project site elevation is 52 ft above sea level and direct inundation due to sea level rise is not anticipated in the context of 21st century sea level rise projections. Furthermore, according to the Hawaiʻi SLR Viewer (accessed 2019), the project site is not within the 3.2-feet SLR Exposure Area. The Center for Island Climate Adaptation and Policy and the University of Hawaiʻi Sea Grant note that sea level is expected to rise one foot by 2050 and three ft by 2100, and recommends that state and local governments plan accordingly (Center for Island Climate Adaptation and Policy, 2011). While an accelerating rise in local sea level should be planned for, specific water levels should not be anticipated because sea level rise models are inherently uncertain. Sources of this uncertainty include sparse local data, intrinsic uncertainty in climate warming and ice melt models, and prospective shifts in human behavior to curb green-house gas emissions.

### *5.7.2 Potential Impacts and Proposed Mitigation*

The proposed project will have beneficial impacts for the community when considering natural hazards. The Subdivision roadways will be a hardened public infrastructure system from which the developer and CCH can respond to water system service needs during natural hazard events. Further, the development of a water source through capture of brackish water will provide additional supply to an area that may experience increased drought in the future.

The occurrence of a natural disaster cannot be predicted, and should one occur, it could pose a risk of life and property at the Site. Because the Subdivision roadways will provide efficient access to services related to the water security of the Kalaeloa community, it is important that the roads be protected from natural disasters so that its resources are available to assist in impacted areas.

To protect against natural hazards (particularly hurricanes and earthquakes), the proposed new roadway system will be constructed in compliance with requirements of the Uniform Building Code and other county, state, and federal standards.

*Climate Change*

The proposed Hunt Kalaeloa subdivision roadway improvements project would not result nor constitute a source of impact to the climate of the project area or region, and does not propose activities that will lead to an increase in the generation of GHGs. Because the project would not increase the use of machinery in the project area, it is not anticipated to result in a persistent contribution to long term or secondary impacts.

Potential impacts associated with climate change are being addressed through long-range planning. No significant secondary or cumulative impacts at the project site are anticipated from climate change, as plans for adaptation are established, e.g., Act 286, Session Laws of Hawaiʻi 2012.

The development and operation of the Hunt Kalaeloa subdivision roadways project will not individually affect the climate. However, Global Warming theory postulates that human activities cumulatively affect the climate through the creation of GHGs. GHGs will be produced in the construction and operation of the Project. Strict adherence to State DOH policy guidance regarding Contractor BMPs during construction will help to mitigate the Project’s “carbon footprint” through careful selection and practice of recycling and the use of renewable, energy efficient materials and practices. During operation of the roadways, the greenhouse effect is expected to also be mitigated through efficient energy use strategies, including the use of natural as opposed to mechanical ventilation and renewable onsite energy generation.

Microclimates can be affected on a local scale. The urban heat island effect is when the built environment causes urban areas to be warmer than surrounding areas. The main cause of the urban heat island effect is from the modification of land surfaces with materials that effectively store short-wave radiation, such as pavement. Roadway improvements include increased access for bicycles, pedestrians, and the mauka extension of Wakea Road for the future Honolulu Authority for Rapid Transportation (HART) transit station. The long-range project impact of increasing access to public transit would contribute to the incremental reduction of the carbon footprint.

## *5.8 Flora and Fauna*

The biological communities of potential concern in the project area are botanical, and terrestrial and avian faunal organisms. Biological surveys occurred in December 2017. Based on information contained in the floral and faunal biota assessment, there are no threatened or endangered floral or faunal species in the area of the Hunt Kalaeloa subdivision roads project. A description of the terrestrial flora and terrestrial and avian fauna that were observed as well as anticipated to be present in the vicinity of the proposed project is discussed in detail below. See **Appendix C, Biological surveys for proposed road improvements at Kalaeloa, Kapolei, O‘ahu** (AECOS 2017).

### *5.8.1 Terrestrial Flora*

An area south of Boxer Road just outside the survey area is designated Critical Habitat for selected plants listed on O‘ahu (Lowland dry habitat Unit 10). The endangered *‘akoko (Euphorbia skottsbergii var. skottsbergii)* is known to occur in this designated area (USFWS, 2011).

#### *5.8.1.1 Potential Impacts and Proposed Mitigation*

No adverse effects to rare, threatened or endangered flora are anticipated from construction of the proposed improvements as all work will be within an area that has been previously subjected to extensive disturbance associated with the development and maintenance of BPNAS. In a March 9, 2020 letter, the Outdoor Circle recommended that a qualified and certified arborist should be present during planning and construction to ensure that tree canopies and roots are not impacted negatively during this, nor future development plans. The proposed project would not result in significant adverse secondary or cumulative impacts to flora resources.

### *5.8.2 Fauna*

#### *5.8.2.1 Description*

*Terrestrial Mammals*. Feral and domestic (pet) cats (*Felis catus*) were observed occasionally throughout the survey area, but were most frequently observed in the scrub- shrub outlying residential areas adjacent to the survey area. One domestic (pet) dog (*Cannis l. familiaris*) was being walked along Franklin Avenue. Other mammals likely to frequent the area include the small Asian mongoose (*Herpestes javanicus*), a small Asian rodent species introduced to Hawaiʻi from South and Southeast Asia.

The findings of mammals during the survey are consistent with the location of the survey area and habitats present. Both dogs and cats are alien to the Hawaiian Islands. Other mammal species not observed during the survey but likely to occur in the area include the small Asian mongoose and various rodents, all of which are considered alien to the Hawaiian Islands, and deleterious to native ecosystems and native faunal species.

The Hawaiian hoary bat or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*) is the only Endangered Species Act (ESA) listed terrestrial mammal in Hawaiʻi. Surveys for the bat were not included in the scope of this survey, as detection requires specialized acoustic equipment deployed over multiple nights. Given the scarcity of records of this species from the ʻEwa Plain, it is unlikely that bats use resources in the project vicinity. Numerous potential roosting trees (trees in excess of 4.6 m [15 ft]) are present on the property.

*Avian Fauna*. A total of 247 birds representing 22 species were observed during the avian survey. The fauna listing includes one endemic and two indigenous migratory species, as well as 19 species alien to the Hawaiian Islands.

Three individuals of the endemic Hawaiian Black-necked Stilt or ʻaeʻo (*Himantopus mexicanus knudseni*) were observed foraging on the lawn of Barbers Point Elementary School at Station 8, before being flushed by school children coming out to recess. A single Wandering Tattler or ʻūlili (*Tringa incana*), an indigenous migrant shorebird, was incidentally observed in flight, transitioning through the Project area in a west-bound direction near Boxer Road. A total of 17 Pacific Golden Plover or kōlea (*Pluvialis fulva*), another indigenous migratory species, were observed at five of nine point-count stations. Kōlea are commonly found on lawns and other open grassy areas throughout the project site. The presence of both the Wandering Tattler and Hawaiian Black-necked Stilt may be partly attributed to the drainage canal to the west of the project site, as the riparian and estuarine habitats in the canal are attractants for the two species.

The avian diversity and density at the project site are fairly typical of highly disturbed dry lowlands and urbanized developments on the ʻEwa Plain of Oʻahu. Of the total individual birds observed, approximately 92% are non-native alien species. The species most observed were Common Waxbill (*Estrilda astrild*), Common Mynah (*Acridotheres tristis*), Zebra Dove (*Geopelia striata*), and Spotted Dove (*Streptopelia chinensis*). Combined, these four species constituted 55% of the total birds observed during the survey, with each species counted at seven or more of the nine point-count stations.

Only the Hawaiian Black-necked Stilt is listed as an endangered species under both the federal ESA of 1973 and the State of Hawaiʻi endangered species statutes (USFWS, 2014; DLNR, 2015). Project activities are not anticipated to directly impact foraging habitat; the birds were observed on a playground field at Barbers Point Elementary School, a location unlikely to be disturbed. Construction-related noise may be an indirect impact influencing foraging behavior, an impact already occurring when students play on the field. Suitable alternative foraging habitat is abundant in nearby areas, and no long-term impacts to the species are anticipated. This species does not actively nest in the area due to a lack of suitable nesting habitat.

Seven of the 22 bird species observed are protected by the Migratory Bird Treaty Act of 1918 (MBTA): Black-necked Stilt; Wandering Tattler; Northern Mockingbird (*Mimus polyglottos*); Cattle Egret (*Bubulcus ibis*); House Finch (*Carpodacus mexicanus*); Northern Cardinal (*Cardinalis cardinalis*); and Pacific Golden Plover (USFWS, 2013). It is unlawful to pursue, hunt, take, capture, kill, or sell birds species protected under the MBTA without a permit. The statute also protects bird parts, including feathers, eggs, and nests.

The Pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) is a state-listed endemic sub-species (on Oʻahu only) and has been recorded on undeveloped lands mauka (inland) of Kapolei. While not observed during this survey (these birds are crepuscular, active mostly in the evening and early morning hours), it is possible that this owl may hunt over grassy fields in the Project area. With the exception of "new" roadways proposed for the far western end, Pueo feeding and ground-nest sites would be unlikely due to extensive development and regular disturbing activities associated with urban development.

No seabirds were observed during the survey, and no evidence of seabird nesting colonies were discovered, nor are any such colonies currently known in this area. However, seabirds may overfly the site on occasion.

#### *5.8.2.2 Potential Impacts and Proposed Mitigation*

*Avian Resources.* The potential impact to seabirds would be the installation of outdoor lights. Night lights can disorient nocturnally-flying seabirds, particularly fledglings, resulting in their potential downing and harm from collision with objects and/or predation by feral dogs and cats if downed. Mitigation measures are planned to include:

- During construction, the presence of any ESA-listed species within 50 m (164 ft) of the project work area would necessitate halting of work until the animal voluntarily leaves the work area.
- Immediately prior to the start of grading at the far western end of the site, a survey for Pueo ground-nesting activity would be undertaken. If a nest is discovered, The Department of Land and Natural Resources (DLNR) must be notified before proceeding with grading or grubbing that could disturb nesting activity.
- If night-time construction activity and/or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.
- If streetlights or exterior facility lighting are installed in conjunction with the project, it is recommended that the lights be shielded to reduce the potential for interactions between nocturnally flying seabirds and external lights and/or man-made structures (Reed et al., 1985; Telfer et al., 1987).

*Mammalian Resources.* To avoid potential impacts to roosting Hawaiian hoary bats with pups, it is recommended that no woody vegetation taller than 4.6 m (15 ft) be removed during the pupping season, from June 1 to September 15.

## *5.9 Archeological and Historic Resources*

### *5.9.1 Description*

*Introduction*

An Archaeological Literature Review and Field Inspection (ALRFI) Report was prepared by Cultural Surveys Hawai‘i, Inc., for the proposed project. The project area subject to archaeological field inspection comprised approximately 39 acres with field work conducted between October 17 and 18, 2017. See **Appendix D, Archaeological Literature Review and Field Inspection** (Cultural Surveys Hawai‘i, 2017).

The investigation was designed based on detailed historical, cultural, and archaeological background research and field inspection of the project area. The purpose was to determine the likelihood that historic properties may be affected by the project and, based on findings, to provide cultural resource management recommendations. The ALRFI is intended to facilitate the project’s planning and support compliance requirements for historic preservation and environmental review in HRS, Chapter 6E and HRS, Chapter 343.

*Findings*

Background research and review of previous archaeological studies has identified the area as not having been heavily used in the pre-Contact and post-Contact periods for habitation. In pre-Contact periods, the area is associated with various gods. The Pu‘u o Kapolei Heiau is located to the northeast of the project area. In the post-Contact period, the area was used for domestic animal husbandry and was later heavily utilized for military purposes, including the Barbers Point military complex.

During the field inspection, several remnants of historic foundations were documented and designated as CSH 1. See **Figure 5-4, Aerial photograph showing the location of sites CSH 1, CSH 2, and CSH 3** and **Table 5-1, CSH 1 - Archaeological Features** for additional detail concerning site features (Cultural Surveys Hawai‘i, 2017). These features correspond with the historic military buildings built in the 1940s to 1950s. A filled-in well (CSH 2) of indeterminate age was documented along FDR Avenue. A former road (CSH 3) was also documented along Saratoga Avenue near the area of CSH 1. CSH 3 corresponds with a road seen on historical maps. Consultation with SHPD is recommended regarding formal historic property designation for CSH 2 due to the historic nature of artesian well drilling in the area.

**Figure 5-4, Aerial photograph showing the location of sites CSH 1, CSH 2, and CSH 3 (Cultural Surveys Hawaiʻi, 2017).**

**Table 5-1, CSH 1 – Archaeological Features**

| Feature | Location | Orientation | Measurement | Associated Features/Artifacts | Condition |
|---|---|---|---|---|---|
| 1 | Roosevelt Ave | East-west | 23 m by 8 m | Rusted metal debris | Poor |
| 2 | Roosevelt Ave | North-south | 16 m by 6 m | Rusted metal debris | Poor |
| 3 | Roosevelt Ave | North-south | 18 m by 6 m | Rusted metal debris | Poor |
| 4 | Roosevelt Ave | North-south | 16 m by 6 m | Rusted metal debris | Poor |
| 5 | Roosevelt Ave | North-south | 12 m by 6 m | Rusted metal debris | Poor |
| 6 | Roosevelt Ave | East-west | 17 m by 6 m | Rusted metal debris | Poor |
| 7 | Roosevelt Ave | East-west | 20 m by 5 m | Rusted metal debris | Poor |
| 8 | Roosevelt Ave | East-west | 23 m by 10 m | | Poor |
| 9 | West Perimeter Rd | North-south | 17 m by 6 m | | Poor |
| 10 | Kamokila Blvd | North-south | 30 m by 8 m | | Poor |
| 11 | Kamokila Blvd | N/A | 2.5 m by 2.3 m | | Poor |
| 12 | Kamokila Blvd | East-west | 21 m by 6 m | Rusted metal debris | Poor |
| 13 | Kamokila Blvd | East-west | 30 m by 8 m | Circular concrete depression, four concrete and metal postholes, rusted metal debris | Poor |
| 14 | Kamokila Blvd | East-west | 21 m by 6.5 m plus extension of 9 m by 6.5 m | | Poor |
| 15 | Kamokila Blvd | East-west | 23.5 m by 8 m | Rusted metal debris | Poor |
| 16 | Kamokila Blvd | East-west | 20 m by 6.5 m | Rusted metal debris | Poor |
| 17 | Copahee Ave | North-south | 8 m by 6 m | Rusted metal and ceramic utility debris | Poor |
| 18 | Copahee Ave | North-south | 13 m by 6 m | | Poor |

No historic properties were identified or designated in the project site by this study.

*Conclusions*

Based on an assessment of the history, cultural background, and existing cultural and historical sites in the Hunt Kalaeloa project area, the following conclusions are made.

While the features of CSH 1 are older than 50 years of age, they appear to lack integrity due to the buildings and foundations having been removed and only remnants of base course and debris remaining. Consultation with SHPD is recommended regarding formal historic property designations for these remnant foundations and the former road (CSH 3). CSH's informed opinion is that the CSH 1 features do not fulfill the criteria pursuant to HAR §13-275-6. Consultation with SHPD is recommended regarding formal historic property designation for the filled-in well (CSH 2) due to the historic nature of artesian well drilling in the area.

Based on the results of the study, early consultation with SHPD is recommended to determine what (if any) further archaeological study is indicated. CSH recommends a combination of on-site and on-call monitoring with on-site monitoring limited to the southern extension of Kamokila Boulevard, the Wakea Street Extension, and "Road A" and on-call monitoring for all other areas of the project that are current roadways. The reasoning for this recommended plan for monitoring is due to the potential for historic surface and subsurface sites to be encountered within areas previously utilized by the BPNAS. Due to the heavily disturbed nature at the intersections, it is unlikely that historic properties would be encountered.

In the unlikely event that cultural deposits and/or human skeletal remains are encountered during ground disturbing activities, work should be stopped immediately in that area and the SHPD notified of the nature of the discovery.

### *5.9.2 Potential Impacts and Proposed Mitigation*

The potential for adverse effects to archaeological and historical resources are not anticipated as no historic properties were encountered or discovered during past surveys in the vicinity of the project site. An important factor for the lack of archaeological and historical resources present includes the past extensive use of the area by the BPNAS which would have otherwise removed or destroyed any resources that may have once been present.

No secondary or cumulative effects to archeological or cultural resources are anticipated from the proposed project. However, because there is always the potential for the discovery of ‘iwi or other cultural remains, any inadvertent finds will immediately result in the cessation of work and the immediate reporting of the find to the SHPD at (808) 692-8015 (Main Office, O‘ahu). SHPD will provide further instructions regarding the treatment of the find and the conditions when work may be resumed.

## *5.10 Noise Conditions*

### *5.10.1 Description*

The regulation of noise is governed by HAR, Chapter 11-46, Community Noise Control. Allowable day and nighttime noise standards for sensitive receptors have been established for conservation, residential, apartment, hotel, business, agricultural and industrial districts. Current noise sources in the project vicinity include the Barbers Point Elementary School, vehicular traffic, aircraft traffic, and equipment use associated with residential and business uses, and grounds and building maintenance.

The DOH Indoor and Radiological Health Branch and the U. S. Environmental Protection Agency (EPA) have established guidelines and standards for assessing environmental noise impacts and establish noise limits as a function of land use. The project site is located in a developing urban environment where certain levels of environmental noise are acceptable.

### *5.10.2 Potential Impacts and Proposed Mitigation*

Existing sources of noise in the area include motor vehicle and aircraft traffic, and the periodic use of combustion and electric powered equipment associated with nearby area businesses and residences. The Barbers Point Elementary School is not considered a major source of noise.

Construction associated noise is anticipated to result from proposed clearing, grading, road paving, and installation of utilities and drainage. Construction equipment is expected to include, but not be limited to, the use of bulldozers, excavators, graders, pavers, dump trucks, concrete delivery trucks, jackhammers and related powered hand tools used in road construction.

Short-term noise impacts are expected during the construction period and may have an impact on nearby residents and businesses. Construction noise however will be short-term and limited to daytime hours. Proper mitigation measures will be implemented to minimize noise impacts, and all work will comply with DOH noise limits. All construction activities will be monitored to ensure compliance with HAR, Chapter 11-46.

Nighttime work in residential areas is not anticipated for this project and the DOH will enforce the provisions its noise regulations. Compliance with DOH noise regulations is not expected to result in significant noise-related impacts.

Nearby areas which include residential, commercial and light industrial uses may be temporarily affected by construction generated noise. However, noise generated from construction activities will for the most part not radiate or extend beyond the immediate surrounding project site. Construction related noise is expected to be temporary, of limited duration, and restricted to daytime hours. The area affected would be limited to the area immediately adjacent to the project site, and noise impacts are not considered significant as it will be consistent with other exiting noise generating sources that include the Kalaeloa Airfield and the Kalaeloa Harbor.

The proposed project will facilitate the future development of residential units as a part of the Hunt Kalaeloa plan which will help to fulfill the HCDA Kalaeloa Master Plan for development of a new community adjacent to and makai of Kapolei. Within this land use context, the project is not expected to result in adverse indirect (secondary) effects to a larger area, as all work to support roadway construction would be part of a designated plan for land development (HCDA, March 1, 2006). The scope of the proposed project would facilitate this future development and will be limited in scale to support an existing land use plan for community development.

The potential for cumulative impacts could occur if construction of the proposed project results in significantly prolonged construction that may coincide with residential development in the area and surroundings. However, roadway construction and the generation of noise within the project site are expected to be short-term, lasting only long enough to complete the proposed project. This action would therefore make no persistent contribution to cumulative impacts, and upon completion, ambient noise levels in the area would return to pre-existing background levels.

Mitigation measures to address the generation of short-term construction related noise include:

- All equipment will be properly muffled in accordance with DOH noise regulations.
- All combustion and air-powered equipment will be maintained in proper working order.
- Work will be limited to weekdays during daylight hours between 7:00 am and 6:00 pm. No work will be scheduled on federal or state holidays.
- The contractor will secure a noise permit, as required, from the DOH prior to the initiation of construction.

No adverse noise impacts associated with this project are anticipated. Mitigation measures as described will be employed to minimize and reduce the potential for such impacts. No further mitigation measures are anticipated to be required.

## *5.11 Air Quality*

### *5.11.1 Description*

The DOH, Clean Air Branch (CAB) has identified the following four potential sources of air pollution in the vicinity of the proposed project: (1) industrial sources, such as power plants and refineries; (2) mobile sources, such as motor vehicles; (3) agricultural sources, such as cane burning (no longer practiced on O‘ahu); and (4) natural sources, such as wind-generated dust and volcanic activity (DOH, 2013, 2014b, 2015b). Air quality around the project site and Kalaeloa surroundings is generally excellent year-round. The prevailing northeasterly trade winds tend to push any human-made or natural pollutants out to sea. However, during certain periods winds can shift from a southeasterly direction causing the air flow to carry volcanic smog (more commonly referred to as vog) over and toward the ‘Ewa region leading to an increase in pollution and a decrease in visibility.

According to the State of Hawai‘i, Annual Summary 2015 Air Quality Data, air quality levels for the monitoring station closest to the project site is the Kapolei Station. Air quality data is recorded for levels of ozone, PM2.5, PM10, carbon monoxide, sulfur dioxide, ozone, NO2, and lead, and remain below the state and federal ambient air quality standards.

Air quality in the vicinity of the project site is primarily affected by construction activities (i.e. fugitive dust) and by vehicular emissions generated along surrounding streets. Among the various air pollutants for which State and National standards have been established, the level of carbon monoxide is the primary concern when it is near locations with heavy traffic flow. According to the DOH Clean Air Branch, air quality near the Kapolei Station, located at the Kapolei Business Park on Lauwiliwili Street, is within the range considered as good.

### *5.11.2 Potential Impacts and Proposed Mitigation*

Construction activities are expected to have little to no impact based on the limited duration and scope of the project. Where engine exhausts may be a potential source of air pollution, all internal combustion equipment will be governed in accordance with applicable state regulations in HAR, Chapters 11-59 and 11-60, Air Pollution Control.

It is expected that no State or Federal air quality standards will be violated during or after construction. Construction activities such as site clearing and grading will be temporary, and all construction activities will comply with the provisions of HAR, Chapter 11-60.1-33, Fugitive Dust. An effective dust control plan will be implemented, as necessary. Measures to control dust during various phases of construction include:

- Providing an adequate water source at the site prior to start-up construction activities.
- Irrigating the construction site during periods of drought or high winds.
- Controlling dust debris being hauled away from the project site.
- Providing adequate dust control measures during weekends, after hours, and before daily start-up of construction activities.
- Installing silt screening in the areas of disturbance.

During construction, fugitive dust is expected to be generated. Fugitive dust will be controlled with regular wetting of the soil by the contractor and/or with the use of dust screens, as required. There will be no long-term or secondary effects to air quality once construction is completed.

In the long-term, increased vehicular traffic volumes on the Hunt Kalaeloa subdivision roads project may result in an increase in emissions; however, improved operational efficiencies, equipment, and technology, as well as the use of cleaner-burning fuels and adherence to air pollution controls and regulations would help to offset the increased emissions. Construction and operational impacts are not expected to be significant.

Contributing more substantially to air quality concerns would be other sources of air pollutants, such as those from transiting trucks and passenger vehicles, cargo and fuel facilities, and related commercial and business activities associated with the James Campbell Industrial Park and Kalaeloa Harbor.

Other past, present, and reasonably foreseeable actions have used and may use heavy machinery in the future. Eventually the project site is expected to be fully developed as the proposed roadway project would facilitate future planned residential development. This would limit opportunities for other future projects, and therefore the use of heavy machinery contributing to air quality impacts. Cumulatively, however, the impact on air quality from all future planned projects, including the proposed project, is not considered as significant due to the limited intensity and duration of construction.

## *5.12 Visual Resources*

### *5.12.1 Description*

Significant views and vistas within the area of the proposed project are identified in the CCH ‘Ewa DP (2013) and include:

*Significant Views and Vistas*

1. *Distant vistas of the shoreline from the H-1 Freeway above the ‘Ewa Plain;*
2. *Views of the ocean from Farrington Highway between Kahe Point and the boundary of the Wai‘anae Development Plan Area;*
3. *Views of the Wai‘anae Range from H-1 Freeway between Kunia Road and Kalo‘i Gulch, and from Kunia Road;*
4. *Views of Nā Pu‘u at Kapolei, Pālailai, and Makakilo;*
5. *Mauka and makai views; and*
6. *Views of central Honolulu and Diamond Head, particularly from Pu‘u O Kapolei, Pu‘u Pālailai, and Pu‘u Makakilo.*

### *5.12.2 Potential Impacts and Proposed Mitigation*

No adverse impacts to scenic and visual resources are anticipated. Vistas of the shoreline from the Interstate Highway 1 (H-1) Freeway above the ‘Ewa Plain and views toward Honolulu and Diamond Head would be mostly unaffected as the nature of the roadways project would principally involve at-grade construction of roads and some below grade installation of utilities. Limited views of street lights and traffic signals for nighttime visibility and safety of roadways, however, may be observable but would not be considered to be an adverse negative impact to views. Views of the ocean and the Wai‘anae Range from Farrington Highway and other vantage points would similarly be unaffected and would not be considered an adverse negative impact.

The proposed project has been designed to be consistent with the master planned residential community for which the project roadways are being improved to Kalaeloa CDD and CCH standards to maintain safe and efficient mobility and access into, out of, and through the Kalaeloa neighborhood.

The project would not result in significant adverse secondary visual and aesthetic resource impacts. Upon the completion of construction, all equipment and personnel will be removed and the environmental conditions of the site will be permitted to return to existing conditions with no significant visual impact. No mitigation measures are anticipated to be required. Because other past, present, and reasonably foreseeable future actions are expected to be consistent visually with existing development no cumulative visual impacts are anticipated.

## *5.13 Socio-Economic Environment and Demographics*

### *5.13.1 Description*

Kalaeloa is situated within the ‘Ewa region of the City and bounded by residential development to the north and east, and by the James Campbell Industrial Park to the west. Communities in the region, consisting of predominantly single-family residences, include Kapolei, Makakilo, Honokai Hale, ‘Ewa Beach, ‘Ewa by Gentry, ‘Ewa Villages, Ocean Pointe, and other single and multifamily developments. Commercial areas, schools, and parks support the residential neighborhoods. The northeastern corner of Kalaeloa is adjacent to the Honouliuli Wastewater Treatment Plant. The State’s Kalaeloa Harbor and the Ko Olina Resort are located west of the James Campbell Industrial Park. The recently constructed University of Hawai‘i, West O‘ahu campus is located north of Kalaeloa in the eastern portion of Kapolei.

The Hunt Kalaeloa property slated for residential development is located along the northern perimeter of Kalaeloa between FDR Avenue and Saratoga Avenue, and the Kalaeloa Airport. The eastern portion of the property includes portions of the former Marine Corps Air Station ‘Ewa. A linear east-west drainage basin and remnants of the former OR&L railroad forms a barrier between Kapolei and Kalaeloa along much of the north side of FDR Avenue.

There is an established residential community in Kalaeloa that rents apartments and homes that were once a part of the Marine Corps Air Station ‘Ewa. The Kalaeloa Professional Center is home to various businesses and services, including a U. S. Army Medical Clinic. Additionally, the Federal Bureau of Investigation (FBI), Army National Guard, U. S. Coast Guard, and the Kalaeloa Airport, are all government agencies located in Kalaeloa that provide jobs for the community.

Kalaeloa is also home to businesses that include K-1 Speed Hawai‘i and the Coral Crater Adventure Park catering to active families. White Plains Beach is a family friendly beach and is used for surfing and military Morale, Welfare and Recreation (MWR) program facilities are located near the coastline.

Much of the ʻEwa region was once dedicated to the cultivation of sugar cane up until the closure of the Oʻahu Sugar Company in the early 1990s. During the 1990s, the cane fields yielded to newly constructed homes with much of the new development east of Kalaeloa along Fort Weaver Road. The region is now home to approximately 70,000 people, while the larger Leeward Oʻahu area (ʻEwa, Central Oʻahu, North Shore and Waiʻanae) has nearly 300,000 residents.

The ʻEwa region is growing into a new urban center and is the location on Oʻahu most likely to accommodate population growth. While the Oʻahu-wide population increase is forecast at 1.6 percent annually, ʻEwa could experience a 3.6 percent average annual growth rate. Of the 200,000 additional residents expected on Oʻahu (between 2000 and 2025), about 30 percent are expected to live in the ʻEwa region. The City's ʻEwa DP contemplates a resident population in the year 2020 of almost 125,000.

Tourism is the primary economic engine of Oʻahu, but the public sector also plays a major role in the island's economy. According to the Hawaiʻi Tourism Authority, in 2012, the number of visitors to Oʻahu was 5,065,645, an 11.9 percent increase from 2011. This is 62.3 percent of all the visitors to the state in 2012. Visitors that year expended $7.7 billion on Oʻahu.

According to the U.S. Census American Community Survey, median household income in the Site census tract was estimated at $86,085 (in 2014) and per capita income was $22,235 (in 2014). Median household income in Honolulu County was $91,139 and per capita income was $30,735.

### *5.13.2 Potential Impacts and Proposed Mitigation*

The economic viability and potential for growth of the Hunt Kalaeloa Community and ʻEwa neighborhoods are closely tied to the capacity of essential infrastructure. This includes the proposed Kalaeloa subdivision roadways project. The economic impact is expected to be favorable based on the benefit of promoting more efficient use of the roadway system, and the improvement of connectivity with the surrounding transportation network.

In the short term, construction expenditures will have a beneficial impact on the local construction industry, and construction activities will benefit the community indirectly through the creation of jobs.

In the long term, improving the condition of the Kalaeloa transportation network will provide for more efficient access to and from employment centers as well as to schools, services, and community and recreational activities including shopping. In turn, this is expected to stimulate direct service-related expenditures.

Implementation of the proposed project will result in potential secondary beneficial impacts by stimulating local business enterprises and increasing local employment. Combined increased business activities will result in increased state revenues in the form of excise, individual, and corporate taxes.

Combined with other past, present, and reasonably foreseeable future actions the proposed project would support the local economy and anticipated increased area population. Because population growth on Oʻahu is anticipated to occur with or without implementation of the proposed project no significant adverse cumulative impacts to the socio-economic environment are anticipated.

## *5.14 Public Facilities and Services*

### *5.14.1 Roads and Transportation*

#### *5.14.1.1 Description*

The following section summarizes the Hunt Kalaeloa roadway, public transit, bicycle, and pedestrian system as described in a Traffic Impact Analysis Report (TIAR) conducted by Fehr and Peers in December 2017. Per a comment letter received by DTS on January 31, 2019 (File No. TP12/18-755262R), the report is provided in its entirety in **Appendix E**.

*Roadway Network:*

The TIAR prepared in 2017 analyzed the impacts of two residential development scenarios on Parcels 1, 2, and 3 on the surrounding transportation system. The report analyzed level of service[2] (LOS) at 12 intersections within and around the project site, and evaluated weekday morning (AM) peak (6:30 AM to 8:30 AM) and weekday evening (PM) peak (3:30 PM to 5:30 PM) hours for the existing conditions, Near Term (2020) Baseline Conditions, and Near Term (2020) plus Project Conditions. Traffic counts were collected during the weekday peak periods at the study intersections in December 2017, when local schools were in session. The following discussion summarizes the analysis of existing roadways within the project area provided in the TIAR.

<u>Mauka/Makai Roadways</u>

Kalaeloa Boulevard begins at Olai Street at the makai end and extends mauka of the H-1 Freeway to Farrington Highway. Kalaeloa Boulevard is located west of the project site and generally contains four lanes (two in each direction) with a raised landscaped median. The speed limit on this facility is 25 miles per hour (mph). Regional access is provided via the Kalaeloa Boulevard and H-1 interchange.

Fort Barrette Road extends from Farrington Highway in the makai direction to FDR Avenue and is generally bounded by residential units on the Diamond Head side of the road. Within the study area, it generally includes two travel lanes with a posted speed limit of 35 mph. The roadway widens at intersections to provide separate turn lanes. Fort Barrette is proposed to be widened to four-lanes from Farrington Highway to the Barbers Point Gate.

Wakea Street connects H-1 and Farrington Highway to Kapolei Parkway. This roadway has four lanes, two lanes in each direction, and is separated by a landscaped median with a posted speed limit of 25 mph. Additionally, the Wakea Street and H-1 interchange will be expanded to include new ramp connections, an off-ramp from ewa-bound H-1, a frontage road from Makakilo Drive to Wakea Street, and a new connection to ewa-bound Farrington Highway. A discontinuous segment of Wakea Street is located makai of Kapolei Parkway which would eventually connect Kapolei Parkway to FDR Avenue.

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[2] Level of service (LOS) is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents “at-capacity” operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions.

The segment of Fort Barrette Road between Farrington Highway and the main gate serves the growing Villages of Kapolei residential area. Geiger Road west of Fort Weaver Road also serves portions of the ‘Ewa by Gentry residential development, and the clubhouse for the Coral Creek Golf Course.

‘Ewa/Diamond Head Roadways

Farrington Highway is an ewa-Diamond Head major arterial that provides connection from Waipahu to Kapolei. It begins at H-2 in Waipahu and extends ewa-bound to Kapolei where it turns at Kamokila Boulevard Diamond Head of Manawai Street. Within the study area, Farrington Highway is generally a four-lane divided roadway and has a posted speed limit of 35 mph.

Kamokila Boulevard is generally an ewa-Diamond Head roadway that is located mauka of the project site and extends between Kapolei Parkway and Farrington Highway (approximately 350 ft Diamond Head of Manawai Street). The roadway has four lanes, two in each direction, and a raised landscaped median for most of its length. The roadway becomes Farrington Highway further Diamond Head. Within the study area, Kamokila Boulevard is generally fronted by retail on the mauka side of the roadway.

FDR Avenue starts at Kamokila Boulevard at the west end and extends Diamond Head where it transitions to Geiger Road at Essex Road. It has a posted speed limit of 25 miles per hour (mph) with unsignalized intersections at all cross streets. FDR Avenue is the mauka boundary of the project site.

Saratoga Avenue is a two-lane local road that starts at Boxer Road on the west side and extends Diamond Head bound to its current terminus at Independence Avenue. It has a posted speed limit of 25 mph and is immediately makai of the project site.

Existing intersection LOS during weekday AM and PM peak traffic at the study intersections are provided in Table 3 of **Appendix E**. The results of the LOS calculations indicate that all study intersections operate at an overall desirable service level (LOS D or better) with the exception of the following three analyzed intersections: Kapolei Parkway and Kalaeloa Boulevard, Fort Barrette Road and Kapolei Parkway, and Fort Barrette Road-Enterprise Street and FDR Avenue. The remaining 9 study intersections operate at a desirable LOS D or better at an overall intersection-level during both peak hours. However, it should be noted that it is possible for individual turning movements/approaches to operate below LOS D (the HDOT desired minimum operating level) even when the overall intersection is operating at a desirable LOS.

Ownership and maintenance of each roadway within the project site is illustrated in **Table 3-2**. In its comment letter on the project dated February 7, 2019, the CCH Department of Design and Construction (DDC) informed HCDA that Kapolei Parkway from Kalaeloa Boulevard to Kamokila Boulevard, Boxer Road, Hornet Street, and Saratoga Avenue were recently paved by the CCH.

*Existing Transit Services*

“The Bus” is O‘ahu’s primary form of public transit provided by the CCH. This system provides access within the greater urban area of Honolulu, as well as in communities on the ‘Ewa plain, North Shore, Leeward Coast, and Windward Coast. There are currently no bus stops or transit services directly serving the project site. The closest bus stop is located approximately 0.4 miles from the project site in the mauka-ewa direction, near the intersection of Kapolei Parkway and Kalaeloa Boulevard. Additional transit services are provided on Haumea Street, Kamokila Boulevard, Fort Barrette Road, Kalaeloa Boulevard, FDR Avenue east of Fort Barrette Road, and Kapolei Parkway east of Fort Barrette Road. Transit service is expected to be expanded with increased adjacent development, especially with the future expansion of the HART rail project. The planned East Kapolei rail station will be located approximately 2.7 miles northeast of the project site.

There are eight (8) fixed-route bus lines that serve the study area:

- Route C
- Route 40
- Route 41
- Route 411
- Route 412
- Route 413 (peak periods only)
- Route 414
- Route 415 (peak periods only)

*Existing Bicycle Facilities*

Bicycle facilities generally consist of three types of facilities, which are outlined below:

- Bike or Shared Use Paths provide a completely separate ROW and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized. Generally, the recommended pavement width for a two-directional shared use path is ten (10) ft.
- Bike Lanes provide a restricted ROW and are designated for the use of bicycles with a striped lane on a street or highway. Bicycle lanes are generally five (5) ft wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.
- Bike Route or Signed Shared Roadways provide for a ROW designated by signs or shared lane pavement markings, or “sharrows,” for shared use with pedestrians or motor vehicles.

Currently, no bicycle infrastructure is provided on or within the direct proximity of the project site, though existing bicycle facilities do serve adjacent community areas. Class II bicycle lanes, which provide for a striped lane for one-way bike travel on a street or highway, are present along both sides of Kapolei Parkway, Kama‘aha Avenue, Kamokila Boulevard, and Wakea Street.

*Existing Pedestrian Facilities:*

Pedestrian facilities consist of sidewalks, crosswalks, and pedestrian signals at signalized intersections. Pedestrian facilities do not currently exist within the project site since Parcels 1, 2, and 3 consist of vacant and/or underutilized land. However, all study intersections have pedestrian facilities and connect to the sidewalk network on one or more of the approaches. The one exception is the intersection of FDR Avenue and Copahee Avenue. There are no sidewalks or crosswalks present at this intersection.

The following streets have sidewalks along both sides:

- Kamokila Boulevard
- Wakea Street
- Manawai Street
- Nau Place
- Alohikea (north of Haumea)
- Haumea Street
- Ala Kahawai Street (east of Wakea)

*5.14.1.2 Potential Impacts and Proposed Mitigation*

The major source of disturbance to traffic is anticipated from construction activities during deliveries and transit of vehicles to and from the job site. Occasional increases in construction traffic may also result from the periodic movement of vehicles to and from the job site to dispose of demolition debris. Safe driveway access into and out of existing operations including those of Barbers Point Elementary School and Wakea Gardens apartments, would be temporarily impacted during regular school morning rush hours as drivers may experience minor delays during peak construction, especially along FDR Avenue, Copahee Avenue, and Hornet Street.

These impacts however will be short term in duration and will cease with the completion of the road improvements. Mitigative measures will include the planning of construction activities during the daytime hours with no night work anticipated to be required, and the use of flagmen and/or traffic controls to maintain accessibility for businesses and residents who may use the surrounding area roads. As recommended by DTS, construction materials and equipment will be transferred to and from the project site during off peak traffic hours (8:30 AM to 3:30 PM) to minimize any possible disruption to traffic on the local streets, and after the morning school rush to minimize impacts to schools in the area. A Traffic Management Plan (TMP) including BMP controls and ADA compliance requirements would be prepared for review and approval by appropriate State and CCH agencies, including DTS and DPP. The TMP would be implemented by the contractor to ensure unimpeded traffic flow through the Kalaeloa neighborhood to minimize traffic circulation problems. Any damage to State and CCH-owned roadways caused by the project would be repaired to current CCH standards as well as meet ADA requirements. Project plans (interior and exterior layouts, vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, reduced-width traffic lanes, etc.) would be reviewed and approved by the Disability and Communication Access Board to ensure full compliance with the ADA. The contractor would obtain street usage permits from DTS for any construction-related work that may require temporary closure of any traffic lane on a CCH street. Hunt and its contractor would continue to apprise the Kapolei/Makakilo/Honokai Hale Neighborhood Board No. 34, area businesses and schools, emergency services, and OTS of its construction plans, schedule, and any changes throughout the project planning and implementation process.

In the long-term, eight of the 12 study intersections analyzed as a part of the TIAR are forecasted to operate at LOS D or better under the Near Term (2020) Baseline Conditions. Projected LOS reported in the TIAR is provided in Table 6 of **Appendix E**. Intersections projected to operate at LOS E or F include the following: Kapolei Parkway and Kalaeloa Boulevard, Kapolei Parkway and Wakea Street, Fort Barrette Road and Kapolei Parkway, and Fort Barrette Road and FDR Avenue. The majority of the poorly operating movements are left-turn movements. The project includes improvements to these intersections, including the construction of left turn lanes two intersections, installation of traffic signals, and lane restriping. These improvements would serve as mitigation for projected lower LOS operation at these intersections, especially improving operation on Kamokila Boulevard, FDR Avenue, and Fort Barrette Road. Additionally, the realignment of Boxer Road may eliminate one of two driveways into Barbers Point Elementary School. During further design of the project, Hunt will work with the DOE to ensure that an alternative access is provided and that adverse impacts will be avoided. The proposed project's long-term contribution to cumulative impacts is anticipated to be minimal, when taken in concert with other past, present, and reasonably foreseeable future actions. The proposed project would result in short-term cumulative effects to the regional transportation of the area, however, cumulative impacts to transportation would not be considered significant.

The proposed project is not expected to substantially increase the walking, biking, or transit demand to a level where it could not be accommodated by existing or planned facilities, nor is it expected to conflict with any existing facilities and planned improvements. In the long term, the proposed project would confer a beneficial impact in terms of transportation as better pedestrian, bicycle and traffic flow would be facilitated. The project would support Hunt's planned residential development on Parcels 1, 2, and 3, and would be utilized by the growing Kalaeloa community. The development is expected to enhance and promote multi-modal facilities and services, especially the use of passive and active spaces and non-motorized modes. The improvements to and along roadways, along with utility systems and drainage improvements provided by the proposed project would offset a cumulative projected decline in safe access within the project extents. The proposed project would not result in significant adverse cumulative transportation impacts.

### *5.14.2 Utilities*

A portion of the utilities within the Kalaeloa CDD that were once part of the BPNAS is described as follows:

#### *5.14.2.1 Description*

*Electrical Supply*

Existing Electrical System – The existing electrical distribution system on the former BPNAS is owned and operated by the Navy. Electrical power is received through a Hawaiian Electric Company (HECO) substation located near the main gate along the northern property line. Power distribution is through a combination overhead and underground power lines (Department of the Navy, 2011). Hawaiian Telcom and Oceanic Time Warner Cable (now Spectrum) and Sandwich Isles provide telephone and broadband internet cable service.

Proposed Electrical System – The proposed electrical power for Parcels 1, 2, and 3 will be from a HECO source located at Kamokila Extension on the makai side of the OR&L railroad tracks. Cable will be provided by the existing Hawaiian Telcom system.

*Water Supply*

Existing Water System – The former BPNAS potable water system consists of a deep well pumping facility, treatment facilities, two underground storage tanks, a transmission main line and associated distribution lines. The source well is located approximately 3 miles north of the former BPNAS.

The Kalaeloa Water Company recently acquired the Navy water system which had been operating in “caretaker mode.” The Kalaeloa Water Company has invested resources to repair leaks and bring the water system to an acceptable level. Potable water is currently in use throughout Kalaeloa.

Proposed Water System – While the Honolulu Board of Water Supply (BWS) does not have a water system within the project site, the existing Kalaeloa water system will require improvements to meet BWS Standards to accommodate the anticipated water demand from the future development of Parcels 1, 2 and 3.

The new Kalaeloa water system will be constructed to BWS Standards. The proposed water lines will be designed to meet fire and domestic flow demands, and will be designed in a loop system around each of the parcels slated for development.

The proposed Kalaeloa water system will split potable and non-potable water uses. Potable water will be provided by the Kalaeloa Water Company and non-potable water will be provided by the BWS. The proposed project will connect to the BWS non-potable water system along the west Kalaeloa project boundary, approximately 1,000 lf makai of FDR Avenue. Water supply approved CCH, capable of supplying the required fire flow for fire protection, shall be provided.

*Wastewater*

Existing Wastewater (Sewer) System – The majority of Kalaeloa’s sewer collection system is assumed to have been built in the early 1940s at about the time that BPNAS was being established. The collection system was constructed according to Navy design standards and may not comply with City standards. The wastewater collection system is currently owned, operated, and maintained by the Kalaeloa Water Company.

The existing sewer system consists of:

- Over 15 miles of gravity sewer lines ranging in size from 6-inches to 30-inches in diameter;
- Approximately 475 sewer manholes (SMHs);
- 12 sewage pump/lift stations; and
- Approximately 7 miles of 4-inch to 18-inch diameter gravity and force mains.

Most of the existing wastewater flows are generated in the northern housing areas and downtown industrial area, located north of Midway Road. Sewage from this area is collected into one of two main sewer lines located along Midway Road before converging north of Kalaeloa Airport into a 30-inch gravity pipe which then conveys flows beneath the airport runways into the main wastewater pump station (WWPS BP-071) near the southern shore line. WWPS BP-071 conveys sewer flows through an existing force main (FM) located along Coral Sea Road and subsequently discharges into the City’s sewer system at SMH #653822 on FDR Avenue across from the Honouliuli Waste Water Treatment Plant (HWWTP). Wastewater is treated at this facility and is either disposed of through the Barbers Point Ocean Outfall or conveyed to the BWS Water Reclamation Facility, located adjacent to the HWWTP, for further treatment and reuse.

Proposed Sewer System – The Kalaeloa sewer system will require minimal modifications and upgrades to the existing sewer system to accommodate the anticipated sewage generated from future development of Parcels 1, 2, and 3. A proposed gravity sewer system consisting of manholes and pipes will be provided within the proposed road right of ways to enable connection to the existing sewer system. The sewer system will be designed to meet City and County of Honolulu Sewer Standards.

*Drainage System*

Existing Drainage System – Kalaeloa is affected by the three major watersheds: the Kaloi Gulch watershed, Kapolei Village watershed, and the City of Kapolei watershed. Land development from the early 1990s to the present has impacted these watersheds due to changes to the area landscape, changed runoff flow patterns, and the generation of increased storm water quantities from urban development.

Offsite runoff from the City of Kapolei located above Parcels 1, 2 and 3 flows into the recently completed James Campbell Industrial Park (JCIP) drainage channel. Offsite runoff from the JCIP is not expected to impact Parcels 1, 2, and 3 since the offsite drainage system can carry runoff beyond the design flow.

Runoff within Kalaeloa (Barbers Point) is drained by drywells and excess storm water runoff sheet flows to coral pits located throughout Kalaeloa where it percolates into porous coral subsurface soils. The dry wells, which are classified as injection wells and are permitted through the DOH Drinking Water Branch Underground Injection Control program, do not currently conform to CCH standards (Department of the Navy, 2011).

Proposed Drainage System – The proposed Kalaeloa drainage system will meet CCH stormwater flow capacity requirements. However, it will not follow the CCH standards for storm drainage details but will be addressed with the planned development of a unique storm drainage system for Parcels 1, 2, and 3. This system will provide for roadway runoff to percolate into a high capacity paver where the stormwater will be filtered using filter fabric and choker rock, and stored in drainage runoff storage chambers. The stormwater held in the storage chambers would eventually percolate into the ground. The system would be maintained by a future association of the property and/or business owners.

Runoff from Parcels 1, 2, and 3, and excess runoff beyond the design storm will overflow into a stormwater drainage system where the flows will be directed to discharge into retention basins.

*5.14.2.2 Potential Impacts and Proposed Mitigation*

Above and below ground utilities and pipelines will be identified during the design of the proposed improvements project. The presence of utilities will be field verified prior to the start of the project and if required, will be removed and/or relocated. Any utility relocations and/or modifications will be coordinated with the affected utility company to minimize disruption of water, power, wastewater, telecommunications and other services.

Residents and area businesses will be notified prior to construction should any temporary disruption of utility service be required, i.e., if the proposed project requires disconnection of a water main, a standby tanker truck will be provided for the provision of water to residents and businesses. Prior to construction, HCDA will require all drawing submittals for the project include detailed BMPs for review and approval by State and CCH agencies as part of the project grading and construction permit process. Erosion control measures may consist of, but are not limited to, hydromulching grass seedling, erecting silt fencing/curtains, berms, and/or other applicable erosion control devices to prevent construction-related soils and silt from mixing with storm water runoff. The project’s compliance with CCH Storm Drainage Standards and Rules Relating to Water Quality will be verified during the review of construction plans. Once construction is complete, utility services will be restored. The proposed project would not result in secondary or cumulative impacts to water or wastewater resources.

### *5.14.3 Solid Waste*

#### *5.14.3.1 Description*

Most residential and general commercial trash from Honolulu is hauled to the Campbell Industrial Park H-POWER (Honolulu Program of Waste Energy Recovery) Plant. This waste-to-energy plant processes over 600,000 tons of waste per year and produces up to 10 percent of O‘ahu’s electricity. Residual ash and non-combustible construction and demolition debris, as well as industry waste is disposed of in a landfill. The two landfills on O‘ahu are the Waimanalo Gulch Sanitary Landfill, administered by the Department of Environmental Services, and the PVT landfill in Nānākuli, administered by the PVT Land Company (CCH Department of Environmental Services, 2005).

#### *5.14.3.2 Potential Impacts and Proposed Mitigation*

The construction of the proposed project is not expected to have long term impacts to solid waste facilities based on the limited scope and scale of work. Short-term impacts are anticipated in the form of construction debris that will be generated requiring disposal. The construction contractor shall be responsible for the disposal of construction debris at a CCH-approved disposal site.

The proposed project is not anticipated to generate a significant quantity of solid waste during planned construction activities. Solid waste that is generated will be disposed of in accordance with HAR, Chapter 11-58.1, Solid Waste Management Control. No secondary or cumulative impacts to solid waste facilities would occur from the implementation of the proposed project.

### *5.14.4 Police Protection*

#### *5.14.4.1 Description*

The Honolulu Police Department (HPD)’s Kapolei police station is located at 1100 Kamokila Boulevard. The project site is in Patrol District 8, Sector 2. As of May 2012, HPD had 1,933 sworn officers (HPD, n.d.).

#### *5.14.4.2 Potential Impacts and Proposed Mitigation*

The proposed construction of the Hunt Kalaeloa subdivision roadways project would not result in an increase in demand for police protection services. No direct, secondary or cumulative impacts to police protection are anticipated or expected, and no mitigation measures are necessary or recommended.

### *5.14.5 Fire Protection*

#### *5.14.5.1 Description*

Fire prevention, suppression, and protection services for all of O‘ahu is provided by the HFD. The Project Site is located adjacent to the Kapolei Fire Station. In 2013, the HFD employed over 1,100 firefighters (Honolulu Fire Department, n.d.).

#### *5.14.5.2 Potential Impacts and Proposed Mitigation*

The proposed Hunt Kalaeloa subdivision roadways project would not result in an increase in demand for fire protection services. The proposed project roadway improvements will comply with Kalaeloa Community Development Plan and all applicable CCH design standards to meet health and fire safety requirements, including the provision of fire apparatus access roads that meet county requirements and an accessible and reliable water source. The water supply and routing systems for the proposed project are being designed in accordance with all applicable Kalaeloa Community Development Plan and CCH standards. No direct, secondary or cumulative impacts on fire protection are anticipated or expected, and no mitigation measures are necessary or recommended.

### *5.14.6 Health Care and Emergency Services*

#### *5.14.6.1 Description*

The nearest major medical facility is the Queen’s Medical Center West O‘ahu, a 7.2-mile drive from the Site. Emergency medical service is provided by the City and County of Honolulu Emergency Services Department, Emergency Medical Services Division. This facility provides emergency care as well as clinic specialty services, generally excluding General Medicine and Family Practice. The largest hospital on the island is The Queen’s Medical Center on Punchbowl Street, with 505 small care beds and 28 sub-acute beds. Queen’s at Punchbowl is the only Level II trauma center in the Pacific Region and provides emergency, primary, and specialized care. Any trauma patients are transferred to Queen’s, approximately six miles from the project site (The Queen's Medical Center, 2013). In addition, numerous privately operated medical/dental clinics and offices are located in the area to serve the local population.

#### *5.14.6.2 Potential Impacts and Proposed Mitigation*

The proposed roadway improvements to the Hunt Kalaeloa subdivision would not result in an increase in demand for health and emergency services. Post construction and upon completion of the proposed roadways, there would be an increased capacity to more efficiently access the existing medical facilities in the region. No direct, secondary or cumulative impacts on emergency services are anticipated or expected, and no mitigation measures are necessary or recommended.

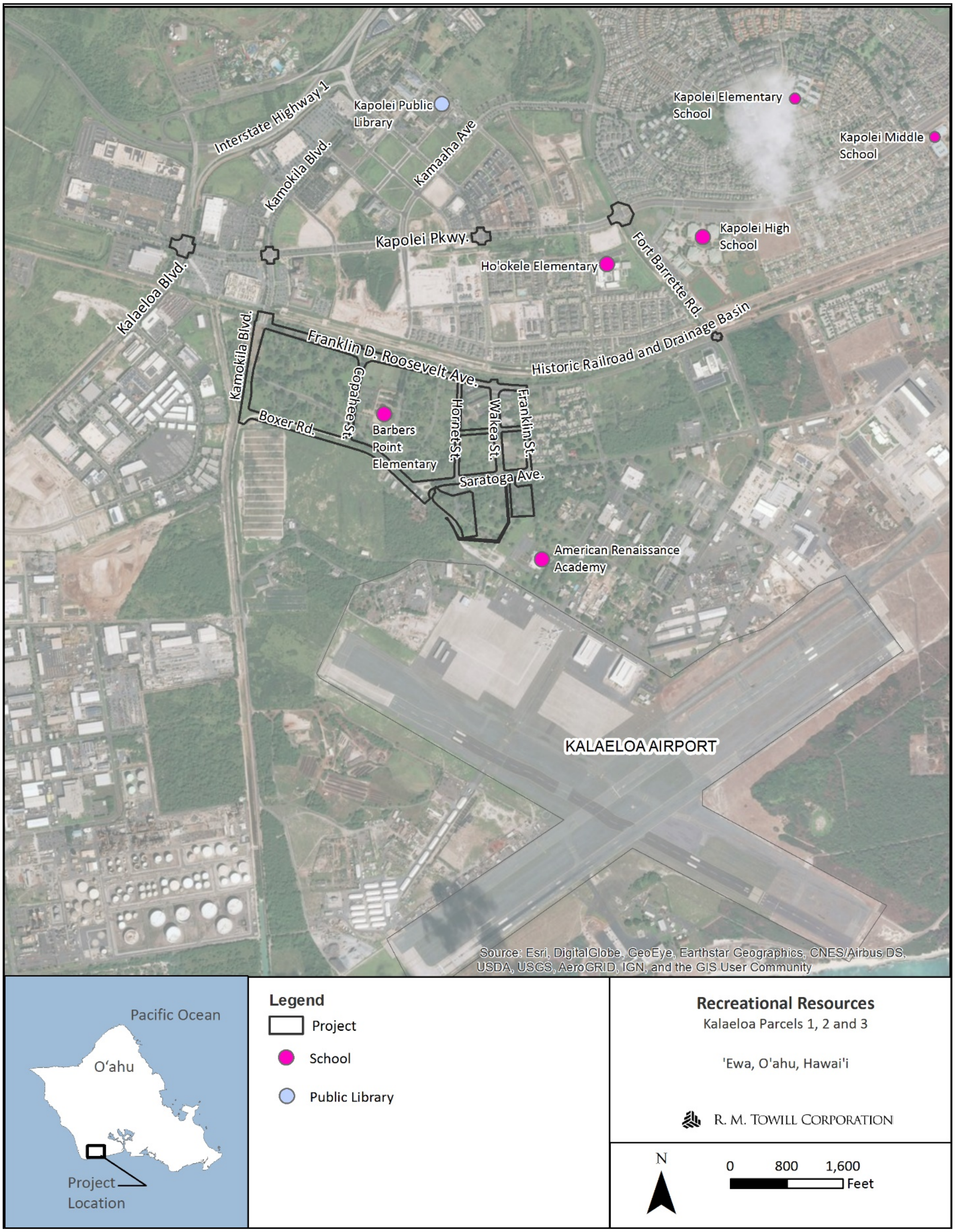
### *5.14.7 Schools and Libraries*

#### *5.14.7.1 Description*

The project site is within the Leeward O‘ahu school district, in the Campbell-Kapolei Complex area. In addition to two high schools, the complex includes 12 elementary schools and three intermediate schools. The Barbers Point Elementary School is located within the project site with 496 students enrolled in the 2012-2013 school year. See **Figure 5-5, Schools and Libraries** for schools and libraries within 2 miles of the project site.

There are two private schools in Kapolei, the American Renaissance Academy and Island Pacific Academy, which enrolled 87 and 483 students, respectively, in 2014-2015 (Hawai‘i Association of Independent Schools, 2016). Kapolei Charter School by Goodwill Hawai‘i serves 49 students throughout grades 9 through 12, and is located 0.3 mile west of the western portion of the project site (Strive HI, 2018).

## Figure 5-5, Schools and Libraries



In addition, higher education institutions in proximity to the project site include the University of Hawai‘i, West O‘ahu, which enrolled 3,128 undergraduate students in 2018 (University of Hawai‘i , West O‘ahu, 2018), and the Hawai‘i Tokai International College, which enrolled 158 undergraduate students in 2016 (Hawai‘i Tokai International College, 2016). Both are located approximately 2.8 miles northeast of the project site.

There are two public libraries in the vicinity, Kapolei north of the project site, and ‘Ewa Beach to the east near the James Campbell High School.

#### *5.14.7.2 Potential Impacts and Proposed Mitigation*

Because the proposed project is to develop the subdivision roadways, the project is not anticipated to impact any schools or libraries.

During construction, the project may result in short-term disruption of vehicle traffic along roadways within the near vicinity or periphery of the project site. However, the project is not anticipated to obstruct or hinder access to nearby educational facilities, including the Barbers Point Elementary School. In the long-term, the realignment of Boxer Road may eliminate one of two driveways into Barbers Point Elementary School. During future planning and design of the project, Hunt will work with the DOE to ensure that an alternative access is provided and that adverse impacts will be avoided.

The proposed project would not increase nor decrease the provision of educational services to the community, and would not directly, secondarily, or cumulatively result in an increase in the area population, which would otherwise generate the need for school services.

## *5.15 Recreational Resources*

### *5.15.1 Description*

Diverse recreational opportunities are available in the surrounding region. The following recreational facilities are within two miles of the project site:

- Barbers Point Beach Park
- Barbers Point Golf Course
- Kapolei Community Park People’s Open Market
- Kapolei High School Farmer’s Market
- Kapolei Community Park
- Kapolei Regional Park
- Kamokila Community Park
- Ko‘olina Beach Park
- Makakilo Neighborhood Park
- Mehana Neighborhood Park
- Nimitz Beach Park/Kalaeloa Beach Park
- Pearl Harbor National Wildlife Refuge
- Pointer Fields
- Pride Fields

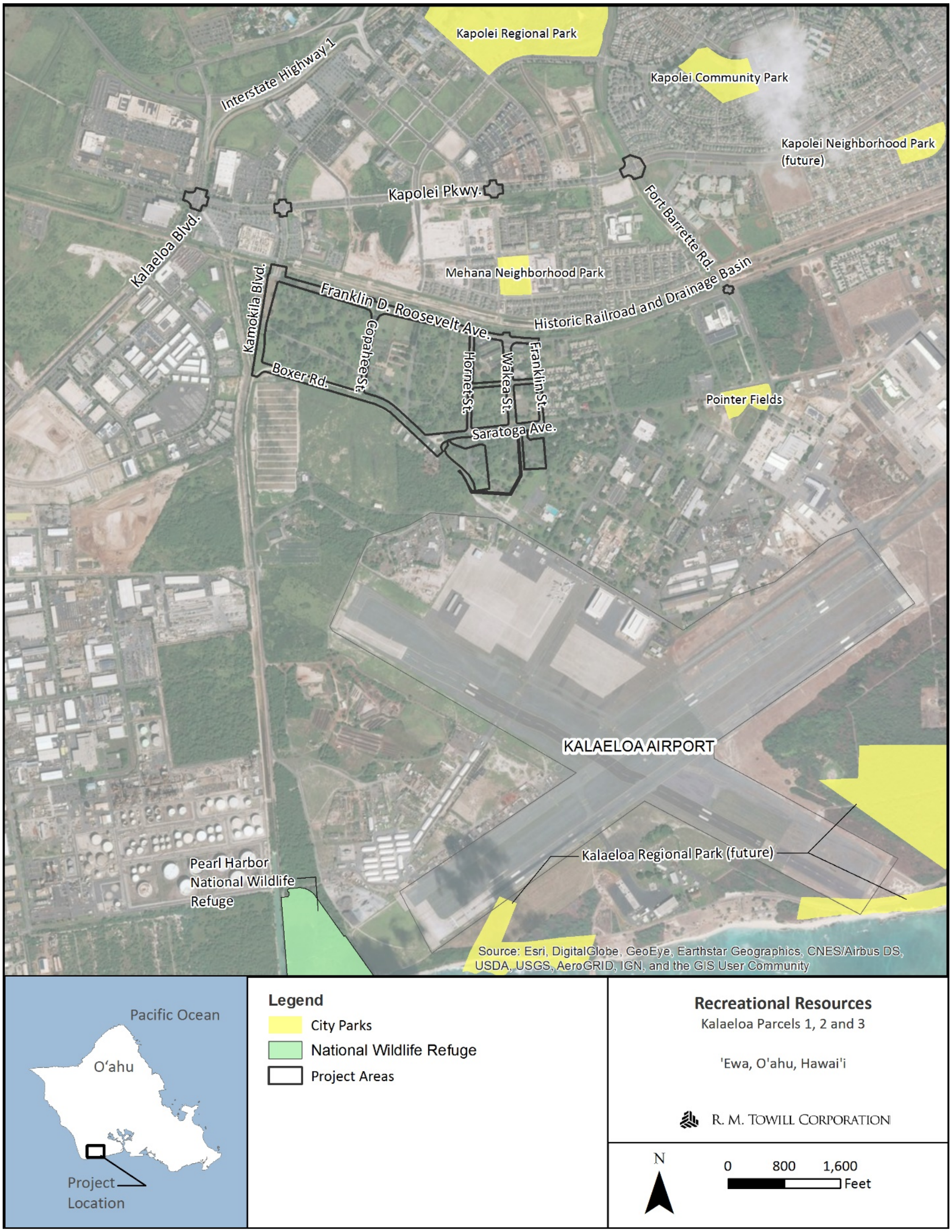
Most recreational resources are available for use by the general public. The parks and baseball fields are owned and managed by the CCH Department of Parks and Recreation (DPR). DPR is currently under a licensing agreement with the U.S. Navy for the Pointer and Pride Fields and the Nimitz Beach Park/Kalaeloa Beach Park, while the CCH owns the other parks listed above. The Pearl Harbor National Wildlife Refuge is owned by the U.S. and allows restricted, escorted public access.

The 2013 ‘Ewa DP envisions a future Kapolei Neighborhood Park approximately 1.1 miles north east and Kalaeloa Regional Park approximately 1.5 miles south and southeast of the project site. The park would anchor the ‘Ewa Open Space and Greenways Network proposed in the ‘Ewa DP. See **Figure 5-6, Recreational Resources**.

### *5.15.2 Potential Impacts and Proposed Mitigation*

During construction, the project may result in short-term disruption of vehicle traffic along roadways within the near vicinity or periphery of the project. However, the project is not anticipated to obstruct or hinder access to nearby recreational facilities.

## Figure 5-6, Recreational Resources



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# *Section 6*
# *Cultural Impact Assessment*

The use of the site for traditional or cultural practices is not expected based on the location of the planned project within a former military installation (BPNAS) that has been transferred to the State of Hawai‘i and proposed for multiple uses including the subject proposed project for the construction of roads. The project area has been previously heavily modified with grading, paving, road and building construction activities. Plants found at the site are primarily introduced, exotic species not normally associated with cultural gathering or use activities. The edges of the paved areas at the site areas are heavily overgrown with weedy species such as lantana, *koa haole*, and various grasses.

The previously paved and otherwise developed condition of the site is also not conducive to the presence of *wahi pana* (storied places) or other sites or activities associated with the gathering of important native species that may include *tī*, flowering Hawaiian plants, or other species bearing fruit.

Based on the above, the potential for adverse direct, secondary, or cumulative effects to traditional or contemporary cultural practices is not anticipated. However, as noted in **Section 5.9.2**, because there is always the potential for the discovery of *‘iwi* or other cultural remains, any inadvertent finds will immediately result in the cessation of work and the immediate reporting of the find to the SHPD at (808) 692-8015 (Main Office, O‘ahu). SHPD will provide further instructions regarding the treatment of the find and the conditions when work may be resumed.

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# *Section 7*
# *Relationship to Land Use Policies, Plans, and Controls*

Federal Government, State of Hawai‘i and City and County of Honolulu policies, plans, and land use controls are established to guide development in a manner that enhances the environment and quality of life. The establishment of policies, plans, and land use controls at all levels of government are further promulgated to help ensure that the long-term social, economic, environmental, and land use needs of the community and region can be met. The proposed project’s relationship to land use policies, plans, and controls for the region and proposed activity are as follows.

## *7.1 State of Hawai‘i*

### *7.1.1 Federal Aviation Administration (FAA) Order 5190.6B*

FAA Order 5190.6B sets forth policies and procedures for the FAA Airport Compliance Program. It provides basic guidance for FAA personnel in interpreting and administering the various continuing commitments airport owners make to the United States as a condition for the grant of federal funds or the conveyance of federal property for airport purposes. The Order discusses the obligations set forth in the standard airport sponsor assurances, addresses the application of the assurances in the operation of public-use airports, and facilitates interpretation of the assurances by FAA personnel. The order’s intent is to ensure compatible land uses near federally obligated airports.

In the state of Hawai‘i, the HDOT-Airports discourages such land uses that may attract hazardous wildlife within five statute miles of airport boundaries, pursuant to FAA Advisory Circular 150/5200-33B. As recommended by HDOT-Airports in their Draft EA comment letter dated January 23, 2019 (File No. DIR 1423 STOP 8.2580), projects within the five-mile airport boundary are advised to read the Technical Assistance Memorandum (TAM) File No. TAM-2016-1 published by the Department of Business, Economic Development and Tourism (DBEDT), Office of Planning (OP) and HDOT-Airports on August 1, 2016 for guidance with development and activities that may require further review and permits.

> <u>Discussion:</u> The project site is approximately 0.6 mile north of the Kalaeloa Airport, and is therefore located within the FAA-designated five-mile radius. The applicant will develop the project following the guidance set forth in TAM File No. TAM-2016-1 and as recommended by HDOT-Airports. The design and landscaping for the drainage improvements would not create conditions to attract wildlife. If wildlife is attracted to the project site, the applicant shall take appropriate measures to ensure proper mitigation of the potential wildlife hazard. Furthermore, the subdivision roadways project does not include the installation of photovoltaic panels or tall equipment; therefore, a glint and glare analysis is not required at this time. Hunt will continue to consult with HDOT-Airports regarding appropriate mitigation measures to ensure that the proposed project and future subdivision may not attract hazardous wildlife, glint/glare hazard, or aerial obstructions.

### *7.1.2 Hawai‘i State Plan*

The Hawai‘i State Plan, adopted in 1978, and promulgated in HRS, Chapter 226, consists of three major parts:

> Part I, describes the overall theme including Hawai‘i’s desired future and quality of life as expressed in goals, objectives, and policies.
>
> Part II, Planning Coordination and Implementation, describing a statewide planning system designed to coordinate and guide all major state and county activities and to implement the goals, objectives, policies, and priority guidelines of the Hawai‘i State Plan.
>
> Part III, Priority Guidelines, which express the pursuit of desirable courses of action in major areas of statewide concern.

The proposed project is consistent with the objectives and policies of the Hawai‘i State Plan. Specifically, the proposed action will increase and diversify the State’s economic base through building and upgrading roadway and drainage facilities necessary to support future residential development of Hunt Kalaeloa. An analysis of the project’s ability to meet the objectives, policies, and priority guidelines of the Hawai'i State Plan are provided in **Table 7-1** below.

**Table 7-1, Hawai‘i State Plan Applicability to the Proposed Project**

| Hawai‘i State Plan Objectives, Policies, and Priority Guidelines | Applicability to the Proposed Project |
|---|---|
| **Objectives and Policies** | |
| §226-5 Objective and policies for population | Not Applicable |
| §226-6 Objectives and policies for the economy--in general | Not Applicable |
| §226-7 Objectives and policies for the economy—agriculture | Not Applicable |
| §226-8 Objective and policies for the economy--visitor industry | **Applicable** |
| §226-9 Objective and policies for the economy--federal expenditures. | Not Applicable |
| §226-10 Objective and policies for the economy--potential growth activities | Not Applicable |
| §226-10.5 Objectives and policies for the economy--information industry | Not Applicable |
| §226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources. | Not Applicable |
| §226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources. | Not Applicable |
| §226-13 Objectives and policies for the physical environment--land, air, and water quality | Not Applicable |
| §226-14 Objective and policies for facility systems--in general | **Applicable** |
| §226-15 Objectives and policies for facility systems--solid and liquid wastes | Not Applicable |
| §226-16 Objective and policies for facility systems--water | Not Applicable |
| §226-17 Objectives and policies for facility systems--transportation | **Applicable** |
| §226-18 Objectives and policies for facility systems--energy | Not Applicable |
| §226-18.5 Objectives and policies for facility systems--telecommunications | Not Applicable |
| §226-19 Objectives and policies for socio-cultural advancement--housing | Not Applicable |
| §226-20 Objectives and policies for socio-cultural advancement--health | Not Applicable |
| §226-21 Objective and policies for socio-cultural advancement--education | Not Applicable |
| §226-22 Objective and policies for socio-cultural advancement--social services | Not Applicable |
| §226-23 Objective and policies for socio-cultural advancement--leisure | Not Applicable |
| §226-24 Objective and policies for socio-cultural advancement--individual rights and personal well-being | Not Applicable |
| §226-25 Objective and policies for socio-cultural advancement--culture | Not Applicable |
| §226-26 Objectives and policies for socio-cultural advancement--public safety | Not Applicable |
| §226-27 Objectives and policies for socio-cultural advancement--government | Not Applicable |
| **Priority Guidelines** | |
| §226-102 Overall Direction | **Applicable** |

| Hawai‘i State Plan Objectives, Policies, and Priority Guidelines | Applicability to the Proposed Project |
|---|---|
| §226-103 Economic priority guidelines | Not Applicable |
| §226-104 Population growth and land resources priority guidelines | Not Applicable |
| §226-105 Crime and criminal justice | Not Applicable |
| §226-106 Affordable housing | Not Applicable |
| §226-107 Quality education | Not Applicable |

The objectives, policies, and priority guidelines of the Hawai'i State Plan directly applicable to the proposed project are discussed in further detail below (emphasis added).

*Section 226-8 Objective and policies for the economy-visitor industry.*

*(b) To achieve the visitor industry objective, it shall be the policy of this State to:*
*(1) Support and assist in the promotion of Hawai‘i’s visitor attractions and facilities; [and,]*
*(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawai‘i’s people.*

Discussion: The proposed project involves the improvement of roadways and drainage associated with the future proposed Hunt Kalaeloa residential development which would be consistent with the State HCDA Kalaeloa CDD plans and guidelines. The improvements will upgrade the existing roadways and provide connectivity for the planned residential development to the H-1 Freeway and provide for direct and safe connection to the future public transit station in Kapolei via Wakea Street.

*Section 226-17 Objectives and policies for facility systems-transportation.*

*(a) Planning for the State’s facility systems with regard to transportation shall be directed towards the achievement of the following objectives:*
*(1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.*
*(2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.*

*(b) To achieve the transportation objectives, it shall be the policy of this State to:*
*(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;*
*(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives;*
*(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties;*
*(6) Encourage transportation systems that serve to accommodate present and future development needs of communities;*
*(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;*
*(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawai‘i's natural environment;*

*(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.*

Discussion: The proposed project will provide needed improvements to the Hunt Kalaeloa subdivision road system for access by vehicles and pedestrians within the Kalaeloa and Kapolei area to encourage the overall objective of statewide economic growth and diversification by providing a facility that will support planned expansion of housing opportunities and services for the growing communities in the ‘Ewa district.

The design and development of this project will address the needs of the community and region through the selection of a site that is consistent with surrounding new and future urban land uses associated with the growing Kalaeloa community as envisioned by the State and Hunt. The project will be developed in accordance with all laws and regulations necessary to ensure against the potential for adverse environmental effects.

*§226-102 Overall Direction*

*The State shall strive to improve the quality of life for Hawai‘i's present and future population through the pursuit of desirable courses of action in seven major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation.*

Discussion: The proposed project will maintain and enhance economic productivity by supporting the effective use of State lands to accommodate future growth in the real estate and public services industries. The project will further benefit the State of Hawai‘i, and resident and visitor populations on O‘ahu by facilitating the efficient transportation of people and goods to, from, and among communities throughout O‘ahu, as a desirable place to live and visit.

#### *7.1.3 State Land Use Law*

The State Land Use Commission classifies all lands in the State of Hawai‘i into one of four land use designations: Urban, Rural, Agricultural and Conservation. According to HRS, Chapter 205, State Land Use Law:

***“Chapter 205, HRS, Districting and classification of lands:”***

*“(a) There shall be four major land use districts in which all lands in the State shall be placed: urban, rural, agricultural and conservation. The land use commission shall group contiguous land areas suitable for inclusion in one of these four major districts. The commission shall set standards for determining the boundaries of each district provided that:”*

*“(1) In the establishment of boundaries of urban districts those lands that are now in urban use and a sufficient reserve area for foreseeable urban growth shall be included;”*

*“In establishing the boundaries of the districts in each county, the commission shall give consideration to the master plan or general plan of the county.”*

> *(b) Urban districts shall include activities or uses as provided by ordinances or regulations of the county within which the urban district is situated.*

Discussion: The proposed action involves the use of land within the Urban and Agriculture State Land Use Districts. The proposed project involving the construction of roadway and drainage improvements, and appurtenances is consistent with these designations. See **Figure 7-1, State Land Use District**.

### *7.1.4 State Functional Plans*

The State Functional Plans provide detail to the Hawaiʻi State Plan and guide State and County actions under specific functional areas. The proposed project is considered applicable to the Transportation Functional Plan.

The applicable objectives and policies of the Transportation Functional Plan are discussed below.

> ***Transportation***
> *Objective I.A: Widening of the transportation system; Policy I.A.1: Increase transportation capacity and modernize transportation infrastructure in accordance with existing master plans.*

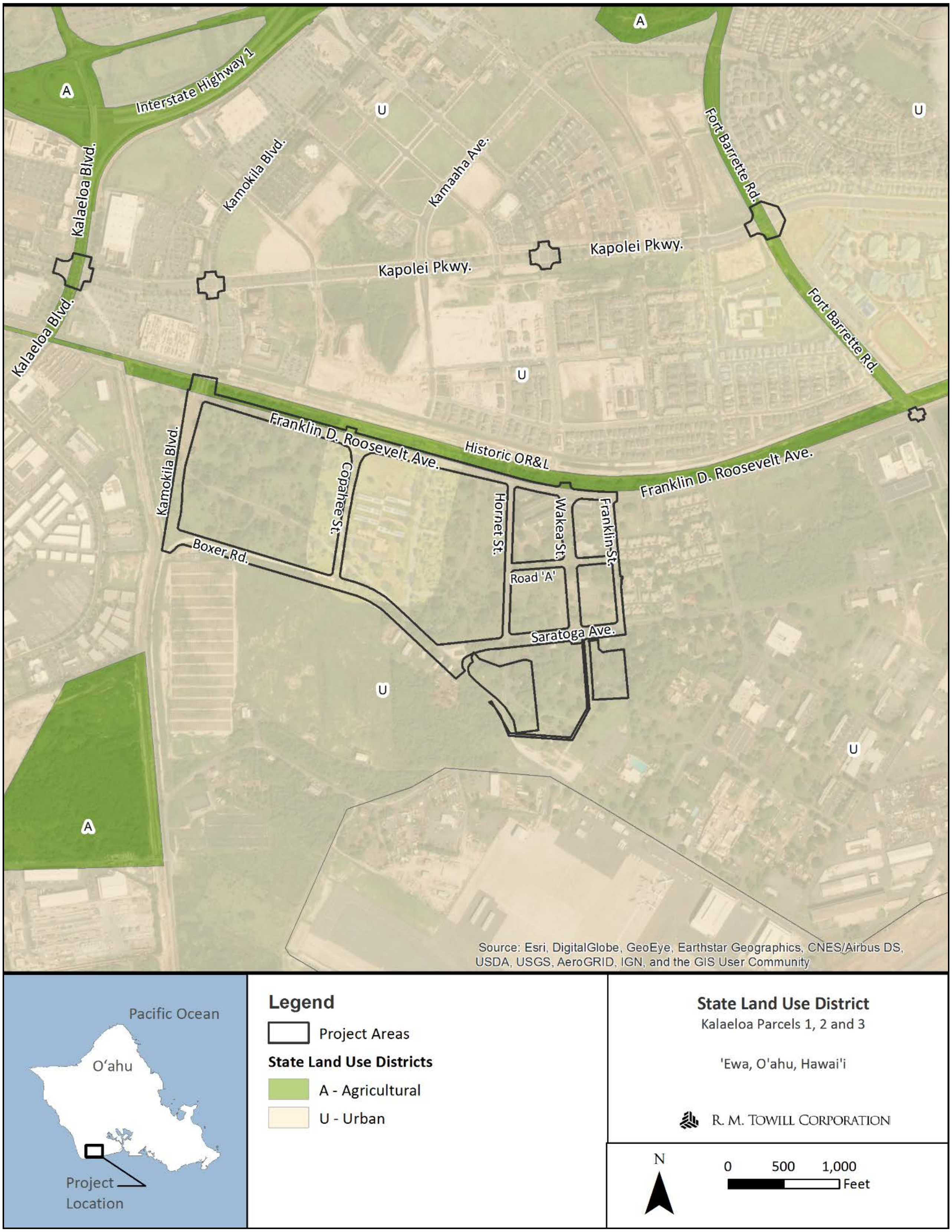
Discussion: The proposed project is designed to provide facility improvements to the existing Hunt Kalaeloa subdivision consisting of road, access, drainage, pedestrian access and related infrastructure systems. This improvement of existing roadway infrastructure will allow for continued long term uses that will support plans for Hunt to develop approximately 39 acres to support the HCDA Master Plan, which envisions a new sustainable community featuring residential development, educational, commercial and recreational activities.

### *7.1.5 Hawaiʻi Statewide Transportation Plan*

The Hawaiʻi Statewide Transportation Plan (HSTP) provides the framework for the planning of Hawaiʻi's transportation system and includes: an extensive public involvement and outreach effort with a broad and diverse range of participants; collaboration with the modal divisions of the DOT and its County partners; and, a detailed research effort to ensure that all technical issues associated with the plan are fully analyzed and considered, and that applicable federal and state regulations are satisfied. The stated purposes of the HSTP are:

- To establish a framework for the development, integrated management, and operation of Hawaiʻi's multi-modal transportation systems, programs, and facilities; and
- To provide a foundation and identify the parameters within which the search for solutions can begin.

## Figure 7-1, State Land Use District



The proposed project is consistent with the stated mission and the following goals of the HSTP:

> *Mission: To provide for the safe, economic, efficient, and convenient movement of people and goods.*
>
> *Goal I: Achieve an integrated multi-modal transportation system that provides mobility and accessibility for people and goods.*
> *Goal II: Ensure the safety and security of the air, land, and water transportation systems.*
> *Goal III: Protect and enhance Hawaiʻi's unique environment & improve the quality of life.*
> *Goal IV: Support Hawaiʻi's economic vitality.*
> *Goal V: Implement a statewide planning process that is comprehensive, cooperative, and continuing.*
>
> Discussion: The Hunt Kalaeloa roadway improvements will both promote the safe and efficient movement of vehicles, bicycles, pedestrians and the HART transit system through the Kalaeloa area and support economic vitality by making more efficient the movement of goods and products requiring transportation to and from the Kalaeloa community. The mauka bound extension of Wakea Street will support the safe movement of vehicles and bicycles to the future transit station in the Kapolei neighborhood adjacent to the Kalaeloa community.

### *7.1.6 Act 54, Session Laws of Hawaiʻi (SLH), Complete Streets*

SLH, Act 54, Complete Streets was signed into law in 2009. The bill calls for context-sensitive solutions to enhance the accessibility and safety for users of multi-modal means of transportation. It calls for use of national industry best practices, including those delineated within reports by the American Planning Association and the National Complete Streets Coalition, when planning, designing, constructing, reconstructing, maintaining or improving public highways, roadways, streets, sidewalks, or anything related to accommodating walking, bicycling, mobility devices, transit and driving. If compliance with SLH, Act 54, becomes unreasonably burdensome to the developer, exceptions to compliance are provided under the Act. These exceptions to compliance include the use of a highway by non-motorized users, a use that is excessively disproportionate to the need or probable future use over the long term, the absence of current or future needs, and/or uses that place any group of multi-modal users at unacceptable risk.

> Discussion: The proposed project is compatible with and advances the priorities set forth in SLH, Act 54, Complete Streets. Existing roadways on the project site are dilapidated and have not been repaired since closure of the BPNAS in 1999. The proposed improvements to roadways would be designed to CCH standards, and therefore provide for bike lanes and incorporate Complete Streets design principles per Honolulu City Council Ordinance 12-15 (2012), fostering greater safety of pedestrians and bicyclists. Complete Streets principles incorporated into the typical roadway sections, as illustrated in **Figures 3-1, 3-2, and 3-3**, include bike lanes, planter strips, and sidewalks to create a pedestrian-friendly environment. The proposed roadways would be ultimately dedicated to the CCH per the 2001 and 2016 MOUs. The proposed action is a context-sensitive incorporation of Complete Streets because it would serve to address the long-term, safe, and accessible alternative transportation needs of Kalaeloa residents, and would not significantly alter the character of the landscape.

### *7.1.7 HCDA Kalaeloa Master Plan*

The Kalaeloa Master Plan was prepared under the direction and guidance of the HCDA. The HCDA was established under the State Legislature in 1976 to supplement traditional community renewal methods by promoting and coordinating public and private sector community development. HCDA plans for and revitalizes urban areas in the State that have been identified by the Legislature to be in need of timely redevelopment. Its legislative mandate empowers HCDA with comprehensive planning, regulation, and development responsibilities.

Act 184 of the 2002 Hawaiʻi State Legislature transferred redevelopment responsibility for Kalaeloa CDD from the BPNAS Redevelopment Commission to the HCDA. HCDA published the Kalaeloa Master Plan in March 2006. The plan serves as an amendment to the Kalaeloa Community Redevelopment Plan, prepared as part of the U.S. Navy BRAC process. Act 184 of the 2002 Hawaiʻi State Legislature also redefined the boundaries of the Kalaeloa CDD to include the entirety of the former BPNAS so that the Kalaeloa CDD now includes the lands retained by the U.S. Navy, excess lands conveyed to other federal agencies, and the surplus lands designated for disposal. The Kalaeloa Master Plan now serves as the principal policy and planning document for HCDA's use in coordinating planning within the Kalaeloa CDD with federal, state, and county government agencies, developers, private landowners, and the community.

HCDA conducted a concentrated planning effort involving review of various planning reference documents, preparation of various environmental analysis reports, and extensive stakeholder and community outreach in preparation of its final plan. Chapter 3 of the plan describes the conceptual framework for developing the land use plan through an overview of the opportunities at Kalaeloa, including addressing regional traffic congestion. Chapter 4 describes the preferred land uses, while Chapter 5 summarizes the issues surrounding the successful implementation of the master plan.

> Discussion: The master plan recommends improvements to the road network within and adjacent to Kalaeloa as an opportunity to enhance regional connectivity. The plan supports ongoing roadway improvements in the Kalaeloa CDD and regional transportation plans, and in addition proposes the following improvements that would be undertaken as a part of the proposed project: 1) enhance vehicular circulation and connectivity with Fort Barrette Road and connections from Kalaeloa to the H-1 Freeway, and 2) extension of Kamokila Boulevard from the City of Kapolei into Kalaeloa. Vehicular circulation and connectivity would be improved through the installation of traffic signals and lane restriping where Fort Barrette Road intersects with FDR Avenue and Kapolei Parkway. Additionally, the plan involves the extension of Kamokila Boulevard from FDR Avenue to Boxer Road.
>
> The master plan also proposes that bicycle trails and mass transit be integrated in roadway projects, and that a pedestrian-friendly environment be fostered. The proposed project would include bike lanes and sidewalks in accordance with HCDA rules set forth in HAR, Chapter 15-215-24, and with Complete Streets principles. See **Sections 7.1.6 and 7.1.9** for further discussion. Additionally, all roads would be designed to CCH standards, and will be ultimately conveyed to the CCH upon completion, as is outlined in the plan and in accordance with the MOUs signed in 2001 and 2016.

The proposed project is intended to support development of Hunt’s Parcels 1, 2, and 3, which are identified as areas for moderate and high intensity mixed uses in Figure 4-1 of the Kalaeloa Master Plan. The proposed project would allow Hunt to lay the foundation of its residential mixed use development, which is also envisioned in the HCDA’s plan for the Kalaeloa CDD.

#### *7.1.8 HCDA Kalaeloa Master Plan – Draft Infrastructure Master Plan Updates (2010)*

The 2006 Kalaeloa Master Plan noted that infrastructure master plan updates (IMPU) would need to be prepared and submitted to the CCH or local utility service provider for approval. The 2010 Draft IMPU, prepared by Fehr & Peers, is intended for submittal to the CCH for approval. HCDA is currently updating the 2010 Draft IMPU. Once approved, the draft IMPU would replace the Kalaeloa Master Plan Chapter 5.2, Infrastructure and Appendix B, Engineering and Infrastructure.

The Draft IMPU notes that existing roadways within the Kalaeloa CDD generally do not conform to CCH standards; therefore, all roadways to be dedicated to the CCH would need to be constructed to a CCH-approved road standard because ownership of all roads is intended to be transferred to the CCH. Fehr & Peers conducted traffic counts, recommended roadway sections, and determined road type, as shown in **Figure 7-2, Draft – Kalaeloa Roadway Concept**. The 2010 Draft IMPU designates special features for each road, including bicycle lanes for Kamokila Boulevard, Wakea Street, Boxer Road, Saratoga Avenue and parking lanes for Copahee Avenue. According to the draft roadway concept, Kamokila Boulevard is extending from FDR Avenue to West Perimeter Road, and Hornet Street is proposed to be exchanged for the Wakea Street Extension.

Discussion: The proposed improvements on FDR Avenue, Kamokila Boulevard, Copahee Street, Boxer Road, and Saratoga Avenue are consistent with the vision set forth in the 2010 Draft IMPU. However, the proposed project will not eliminate Hornet Street or extend Wakea Street, as proposed in the Draft IMPU. As previously stated, HCDA is currently updating the 2010 Draft IMPU. The update would reflect the proposed improvements by Hunt.

#### *7.1.9 HCDA Kalaeloa CDD Rules (HAR, Chapter 15-215)*

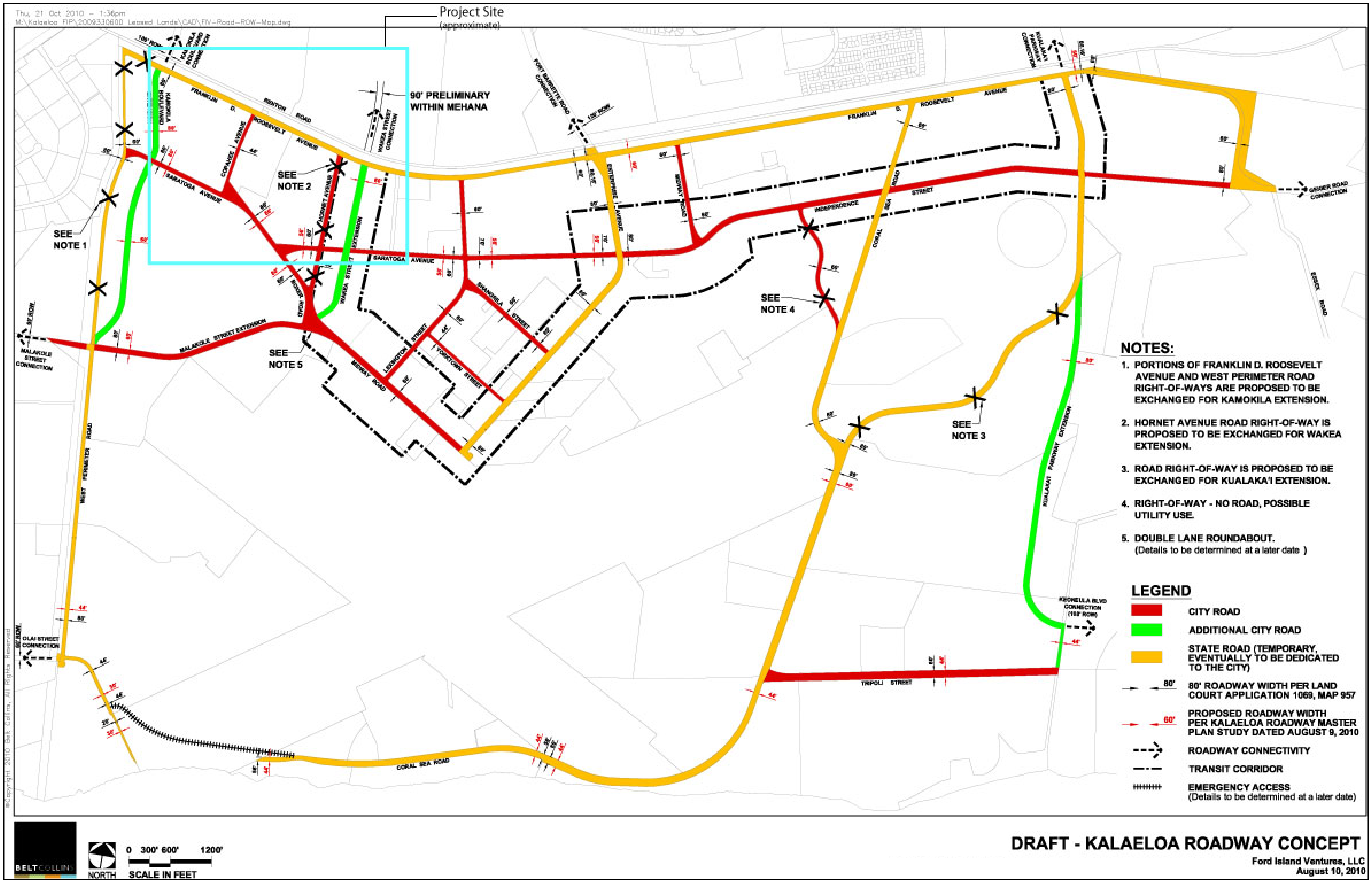
The rules in HAR, Chapter 15-215 are designed to promote and regulate the planned development of the Kalaeloa CDD, consistent with the policies and objectives of the Kalaeloa Master Plan and HRS, Chapter 206E, Hawai‘i Community Development Authority. The rules are intended to protect and promote public health, safety, and general community welfare and protect and preserve places and areas of historical, cultural, architectural, and environmental importance and significance.

According to the rules, §15-215-3, “Applicability”:

*(a) This chapter, together with the KMP shall govern all real property within the Kalaeloa CDD.*

*(b) No building permit shall be approved by the authority for any project within the Kalaeloa CDD unless the project conforms to the provisions of the Kalaeloa Master Plan and this chapter.*

**Figure 7-2, Draft – Kalaeloa Roadway Concept**



*(c) If any provision of the (1) City and County of Honolulu land use ordinance, (2) ‘Ewa Development Plan (Ordinance no. 97-49, as amended by ordinance no. 00-16), or (3) Naval Air Station Barbers Point Community Redevelopment Plan are inconsistent with these rules, then such provisions are hereby declared to be inapplicable to lots within the Kalaeloa CDD and these rules shall govern.*

*(d) Except as otherwise provided herein, all other rules, laws, and ordinances shall continue to remain applicable to the lots within the Kalaeloa CDD.*

*(e) The Kalaeloa sustainability guidelines should be utilized to promote sustainability and energy efficiency.*

Lands within the Kalaeloa CDD are organized into six “Transect Zones” that “reflect the physical form and character of an area, according to the density and intensity of its land use and urbanism” (§15-215-8, Definition of Terms). The project site is designated within the T3 General Urban Zone and T4 Urban Center Zone transect zones. According to §15-215- 23, Transect zones, T3 zones are characterized by mixed use projects, and streets are intended to have curbs, sidewalks, and landscaping that define medium-sized, pedestrian-friendly blocks. The T4 zone is characterized by a mix of retail, office, residential, and civic buildings, and its streets are characterized by pedestrian-friendly streets which are tree-lined with sidewalks.

The Kalaeloa CDD Rules also stipulate that thoroughfares conform to the standards set forth in §15-215-24, Thoroughfare plan. The rules read as follows:

*(b) Thoroughfare plan standards:*

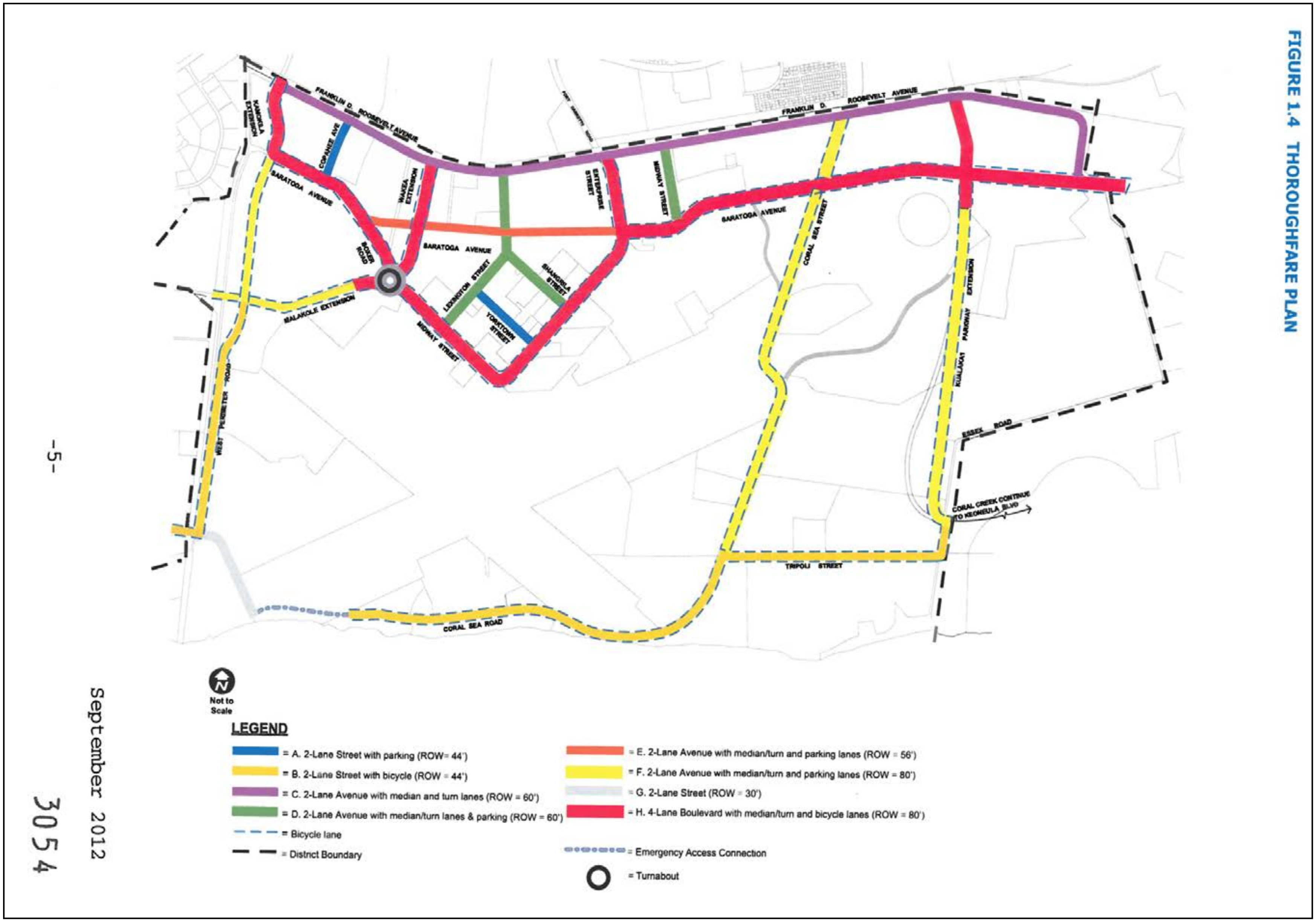
*(1) Thoroughfares shall have street trees planted along their lengths within the public frontage area as provided in Figure 1.5 (street tree chart), dated September 2012, made a part of this chapter, and attached at the end of this chapter; and,*

*(2) Design conflicts between vehicular and pedestrian movement for new thoroughfares in the T3 general urban, T4 urban center and T5 urban center high intensity zones, shall generally be decided in favor of the pedestrian, unless there is overriding public interest which dictates that the conflict be resolved in favor of vehicular movement.*

The Kalaeloa CDD Rules provide design guidance for thoroughfares, as illustrated in **Figure 7-3, Kalaeloa CDD Rules Thoroughfare Plan (Figure 1.4), Figure 7-4, Kalaeloa CDD Rules Thoroughfare Plan (Figure 1.4A),** and **Figure 7-5, Kalaeloa CDD Rules Thoroughfare Plan (Figure 1.4B)**.

Discussion: The proposed project involving the provision of drainage, access roadway, and pedestrian improvements to support the future Hunt residential community within the HCDA Kalaeloa CDD will be developed in compliance with these rules. Specifically, FDR Avenue, Kamokila Boulevard, and Wakea Street will include a median and bike lanes in each direction. The ultimate condition of Saratoga Avenue and Boxer Road will also include a median and bike lanes in each direction. Additionally, Copahee Avenue will include parking lanes in both directions, and thus conform to the Kalaeloa CDD Rules. All roadways would have minimum 5-foot wide sidewalks on each side to conform to the rules. See **Figures 3-1, 3-2,** and **3-3** for proposed typical roadway sections.

**Figure 7-3, Kalaeloa CDD Rules Thoroughfare Plan**



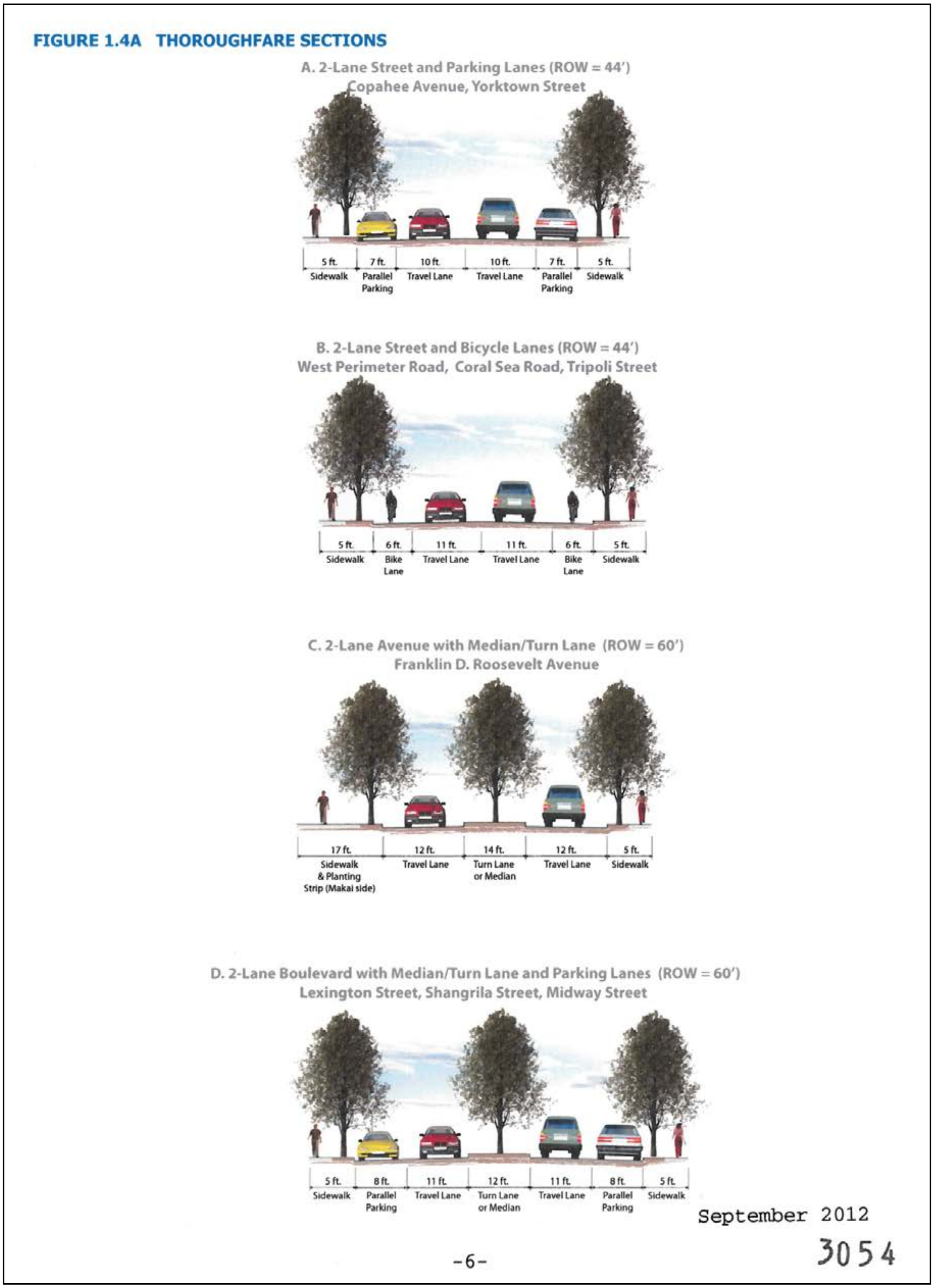
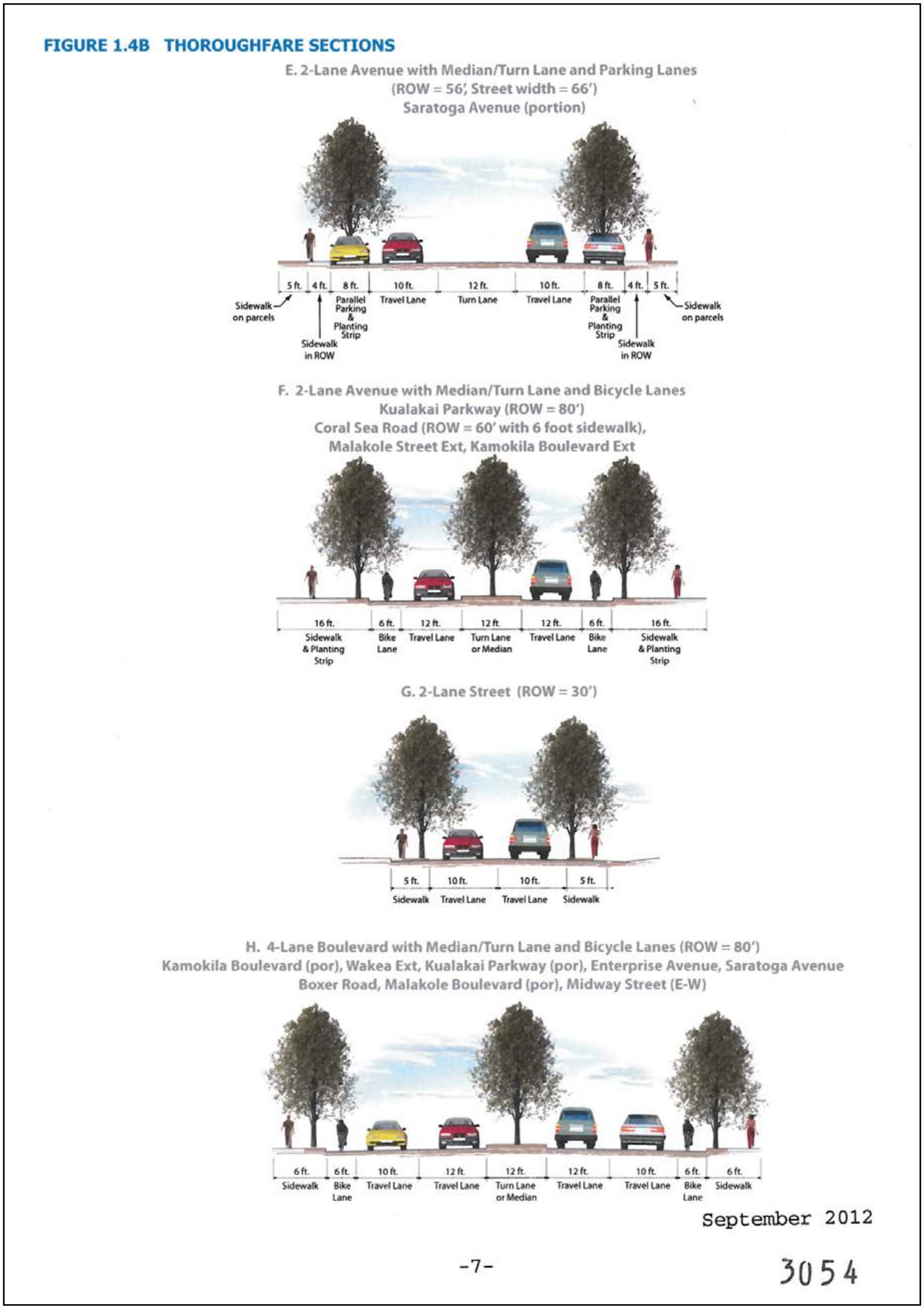



**Figure 7-4, Kalaeloa CDD Rules Thoroughfare Plan (Figure 1.4A)**

**Figure 7-5, Kalaeloa CDD Rules Thoroughfare Plan (Figure 1.4B)**



#### *7.1.10 Kalaeloa Reserved Housing Rules (Hawaiʻi Administrative Rules, Chapter 15-216)*

The Kalaeloa Reserved Housing Rules provides for the establishment of an increased supply of housing for low or moderate-income residents within the Kalaeloa CDD as a condition of new residential construction or redevelopment.

> Discussion: The rules governing the reservation of housing, although not strictly applicable to the proposed project involving the development of surface transportation infrastructure, would be applicable to the subsequent construction of housing envisioned in the Hunt Kalaeloa development (see **Section 7.1.7**).

#### *7.1.11 Hunt Kalaeloa Strategic Implementation Plan*

The Hunt Kalaeloa Strategic Implementation Plan, prepared by AECOM in June 2013, summarizes key development strategies over a 20-year period for the 538 acres of landholdings in Kalaeloa controlled by Hunt. By 2035, Hunt's plan for its holdings in Kalaeloa is projected to contribute toward the overall region's job and housing balance by creating more than 7,000 direct and indirect jobs, and more than 1,000 construction jobs and 4,000 homes. The 4,000 residences will be a mix of multifamily and single-family homes that will range from affordable to moderately price, for sale and as rentals. The plan outlines the approach Hunt intends to take in fostering community development and intended outcomes.

In addition to adopting the concepts set forth in the ʻEwa DP (DPP, 2013), Kalaeloa Master Plan (HCDA, 2006), and the Kalaeloa CDD District Rules/HAR, Chapter 15-215 (HCDA, 2012), the plan adopts the following six planning principles to guide the design and physical form of projects at Hunt's Kalaeloa properties:

- Principle 1: Create a Walkable Community
- Principle 2: Build a Strong Community Identity
- Principle 3: Celebrate and Connect to Cultural and Environmental Assets
- Principle 4: Strengthen Gateways and Edges
- Principle 5: Create and Economic Engine for the Area and its Residents
- Principle 6: Restore and Upgrade Infrastructure

> Discussion: The proposed project to construct and improve roadways and install associated utilities within the project site would fulfill the planning principles set forth in the Hunt Kalaeloa Strategic Implementation Plan, particularly Principle 6.Hunt will continue to work closely with HCDA, HDOT, and CCH, and will dedicate the roads to CCH upon completion of the project. All roads will be designed to conform to HCDA and DPP subdivision design standards, and would incorporate complete streets principles in order to support the walkable, sustainable community envisioned by Hunt. Proposed work on FDR and Saratoga Avenues will fulfill Principle 4 of the plan, which identifies the two roadways as the gateways into the community. The project represents a significant private investment that would benefit the wider community. When constructed, the project would allow Hunt to proceed with development of Parcels 1, 2, and 3.

### *7.1.12 Hunt Kalaeloa Plan*

Hunt controls 538 acres of land in Kalaeloa. The *Hunt Kalaeloa Plan* draft prepared in January 2017 provides a vision for Kalaeloa for the westernmost holdings; Parcels l, 2 and 3 (G70, 2017). These lands which are makai of Kapolei's retail core and adjacent to Barbers Point Elementary School, are the ideal setting for a new residential community. Kalaeloa is a viable option for residences in West Oʻahu with a growing job creation center, and has the potential.to be both a gathering place and a destination. Kalaeloa's history as the former BPNAS will be integrated into the conversion of the former military base to a more vibrant, mixed-use community.

The future development of Hunt Kalaeloa will comprise a mosaic of several different neighborhoods and provide a diverse range of lifestyle choices and character. Characteristics of the community will feature connectivity to the future Leeward Bikeway that links the resorts and public beaches to the neighborhoods, organized sports for children and adults at community sports fields, neighborhood recreation centers, and schools that are part of the community programming that focuses on health and wellness opportunities for Kalaeloa residents.

> Discussion: A strong connection to the ʻEwa shoreline (makai), and to the unique landscape and open spaces of the area geology and environment will be made. The community character will be enhanced with connectivity to a future planned regional bikeway that will link the resorts and public beaches to the neighborhoods.

### *7.1.13 Special Management Area (SMA)*

The CCH has designated the shoreline and certain inland areas of the island of Oʻahu as being within the SMA. SMA areas are designated sensitive environments and protected in accordance with the State's Coastal Zone Management policies, as set forth in HRS, Chapter 205A, Coastal Zone Management. See **Figure 7-6, Special Management Area**.

> Discussion: The project site is located approximately 1.3 miles north of the coastline fronting the former BPNAS which places it outside of the SMA. Therefore, no impacts to the SMA are expected.

### *7.1.14 Coastal Zone Management Act (CZMA)*

All land and water use activities in the state must comply with HRS, Chapter 205A, Hawaiʻi Coastal Zone Law. The State of Hawaiʻi designates the Coastal Zone Management Program (CZMP) to manage the intent, purpose and provisions of HRS, Chapter 205(A)-2, as amended, for the areas from the shoreline to the seaward limit of the State's jurisdiction, and any other area which a lead agency may designate for the purpose of administering the CZMP.

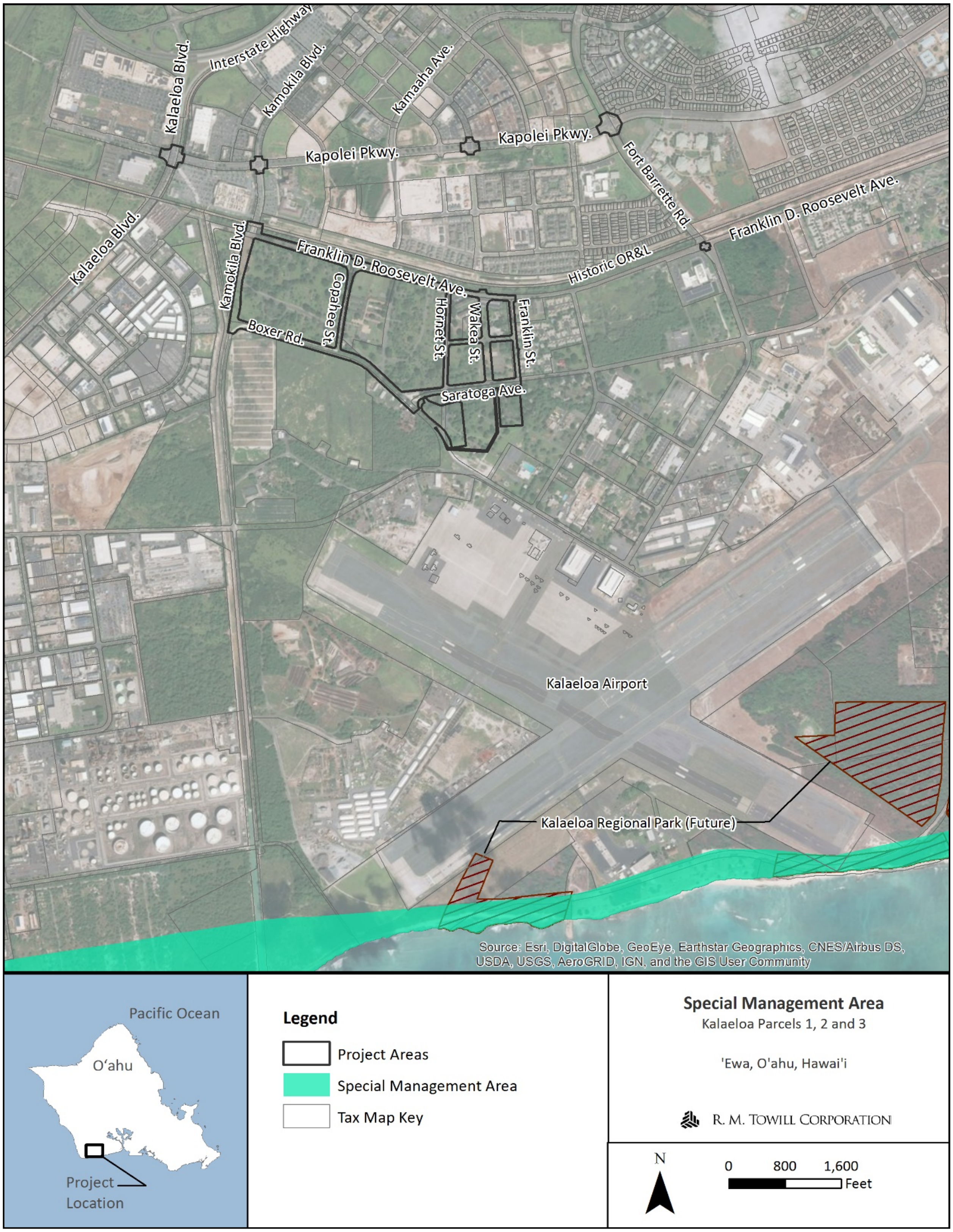
The following is an assessment of the project with respect to the CZMP objectives and policies set forth in Section 205(A)-2.

***1. Recreational resources***

*Objective: Provide coastal recreational opportunities accessible to the public.*

*Policies: A) Improve coordination and funding of coastal recreational planning and management; and*
*B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*

## Figure 7-6, Special Management Area



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

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

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

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

*(v) Ensuring public recreational 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;*

*(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;*

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

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

Discussion: As indicated in **Section 7.1.13** the proposed project is located approximately 1.3 miles mauka of the coastline fronting the former BPNAS. The proposed safety and access improvements proposed by the Hunt Kalaeloa subdivision roads would have no effect on existing access to and from public recreational areas including Kalaeloa Regional Park.

Existing recreational uses currently occur within the immediate area surrounding Kalaeloa and ‘Ewa Beach, and the proposed project is not expected to adversely affect the continuation of these uses.

***2. Historic resources***

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

*Policies: (A) Identify and analyze significant archaeological resources;*

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

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

Discussion: There are no archaeological or cultural resources known to be present within the immediate project site. However, in accordance with HRS, Chapter 6E, and the requirements of the SHPD, should any historic resources, including human skeletal and significant cultural remains be identified during the construction of the proposed project, the following shall be implemented:

1. Work will cease in the immediate vicinity of the find;
2. The find will be protected from any additional disturbance by the contractor; and,
3. SHPD will be contacted immediately at (808) 692-8015 (Main Office, O‘ahu) for further instructions including the conditions under which work activities may resume.

***3. Scenic and open space resources***

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

*Policies: (A) Identify valued scenic resources in the coastal zone management area;*

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

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

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

Discussion: The potential for adverse visual impacts is anticipated to be minimal. The proposed project will involve the improvement of road facilities associated with use of the Hunt Kalaeloa subdivision and the existing neighboring Kapolei, ‘Ewa Villages and Kalaeloa Airport. There will be the use of construction equipment and personnel, which are not expected to constitute an adverse effect to the surrounding viewplane. Public access will continue along Kamokila Boulevard, FDR Avenue, and Wakea Street; access to limited areas may be temporarily restricted from public access to maintain safety during the construction period. These activities will be only for a short period of time and will not result in any adverse permanent changes.

***4. Coastal ecosystems***

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

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

*(B) Improve the technical basis for natural resource management;*

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

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

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

Discussion: Coastal ecosystems will not be affected by the project. No use of the coastal ecosystem will be required. During construction, BMPs will be employed to prevent potential pollutant (sediment) discharges into storm water runoff. These measures will be in place and functional before project activities begin and will be maintained throughout the construction period. When completed, the use of permanent storm water and erosion controls is expected to help improve upon current conditions.

***5. Economic uses***

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

*Policies: (A) Concentrate coastal dependent development in appropriate areas;*

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

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

*(i) Use of presently designated locations is not feasible;*

*(ii) Adverse environmental effects are minimized; and*

*(iii) The development is important to the State's economy.*

Discussion: The proposed project will provide needed improvement of existing roads and infrastructure systems within roadways that serve as the primary thoroughfares for a future Hunt subdivision. The proposed project is considered an investment in Hunt Kalaeloa that will provide environmental benefits in the form of reduced discharges of storm water associated sediments in runoff and the improvement of roadway conditions from reduced ponding and sheetflows of storm water across the site.

In the short term, construction expenditures will have an overall beneficial impact on the local construction industry, and construction activities will benefit the community indirectly through the creation of jobs. In the long term, there will be safe and efficient roadway conditions in the Hunt Kalaeloa subdivision and the surrounding community, which is consistent with policies regarding economic uses.

***6. Coastal hazards***

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

*Policies: (A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;*

*(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;*

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

*(D) Prevent coastal flooding from inland projects.*

Discussion: The proposed project has been evaluated for potential impacts associated with natural hazards including flooding, erosion, and nonpoint source pollution hazards. Natural hazards such as hurricanes, flooding, and tsunami are unavoidable for all coastal areas. Accordingly, all structures proposed for this project will be built, at a minimum, according to equivalent standards for the area's flood zone. To mitigate from hurricanes, the project will ensure that improvements are designed to present building codes which offer some protection from damage.

Hunt will continue to coordinate with the CCH Civil Defense agency to implement and maintain established procedures in the event of a flood or tsunami. It is noted that no habitable structures are proposed that would constitute an unreasonable risk to life or property. Given the requirement for the proposed project to be located within proximity of the shoreline, the proposed use is considered reasonable and is not anticipated to have a significant impact on flood conditions.

***7. Managing development***

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

*Policies: (A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*

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

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

Discussion: The proposed project conforms to all State of Hawaiʻi regulations. A comprehensive list of permits that may be required is provided in **Section 8**. While the proposed project site is within the coastal zone, no coastal resources will be adversely affected.

***8. Public participation;***

*Objective: Stimulate public awareness, education, and participation in coastal management.*

*Policies: (A) Promote public involvement in coastal zone management processes;*

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

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

Discussion: The provision for public participation will be provided through the environmental review process as required in HRS, Chapter 343. Public comments were received during the public comment period associated with the filing of the Draft EA. In addition, should any environmental permit applications be filed for the project, all permits will be subject to governmental agency and public review as required under law.

***9. Beach protection;***

*Objective:  Protect beaches for public use and recreation.*

*Policies: (A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;*

*(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*

*(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.*

Discussion: The proposed project does not involve nor require the direct use of beaches. Shoreline resources are not present in the subject area as the project site is about 1.3 miles mauka of the shoreline.

***10. Marine resources***

*Objective:  Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*

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

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

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

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

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

Discussion: The proposed project does not involve the use or development of marine and coastal resources.

## *7.2 City and County of Honolulu*

### *7.2.1 General Plan*

The O‘ahu General Plan is the policy document for the long-range development of the island of O‘ahu. Adopted in 1977 and amended in 2002, the plan sets forth the long-range objectives and policies for the general welfare of the island over a 20-year time horizon. Combined with the regional development plans, the General Plan provides direction and framework to guide the programs and activities of the CCH.

The relevant goals, objectives, policies and implementing actions, along with a discussion of project conformance, are discussed below.

The proposed project is considered consistent with the following provisions of the GP:

*Section V. Transportation and Utilities.*

*Objective A: To create a multimodal transportation system which moves people and goods safely, efficiently, and at a reasonable cost and minimizes fossil fuel consumption and greenhouse gas emissions; serves all users, including limited income, elderly and disabled populations; and is integrated with existing and planned development.*

*Policy 1: Develop a comprehensive, well-connected and integrated ground-transportation system that enables safe, comfortable and convenient travel for all users, including motorists, pedestrians, bicyclists, and public transportation users of all ages and abilities.*

*Policy 2: Provide multimodal transportation services to people living within the ‘Ewa, Central O‘ahu, and Pearl City-Hawai‘i Kai corridors primarily through a mass transit system including exclusive right-of-way rail transit and feeder-bus components as well as through the existing highway system.*

*Policy 4: Work with the State to ensure adequate and safe access for communities served by O‘ahu's coastal highway system.*

*Policy 6: Support the development of transportation plans, programs, and facilities that are based on Complete Streets features. Maintain and improve roads, bicycle and pedestrian facilities in existing communities to eliminate unsafe conditions.*

*Policy 7: Design street networks to incorporate greater roadway and pathway connectivity.*

*Policy 8: Make transportation services safe and accessible to people with limited mobility: the young, elderly, disabled and those with limited incomes.*

*Policy 9: Consider environmental, social, cultural, and climate change and natural hazard impacts, as well as construction and operating costs, as important factors in planning transportation system improvements.*

*Policy 10: Reduce traffic congestion and maximize the efficient use of transportation resources by pursuing transportation demand management strategies such as carpooling, telecommuting, flexible work schedules, and incentives to use alternative travel modes.*

Discussion: The proposed project represents Hunt’s capital investment in the long term improvement of a critical part of O‘ahu’s transportation infrastructure, facilitating the safe and efficient movement of vehicle and pedestrian traffic in and through Kalaeloa to support the needs of existing and future residents in a new and growing community. The proposed pedestrian and bicycle accessways will improve circulation and safety for pedestrians, bicyclists and drivers transiting along the improved access roads.

### *7.2.2 ‘Ewa Development Plan*

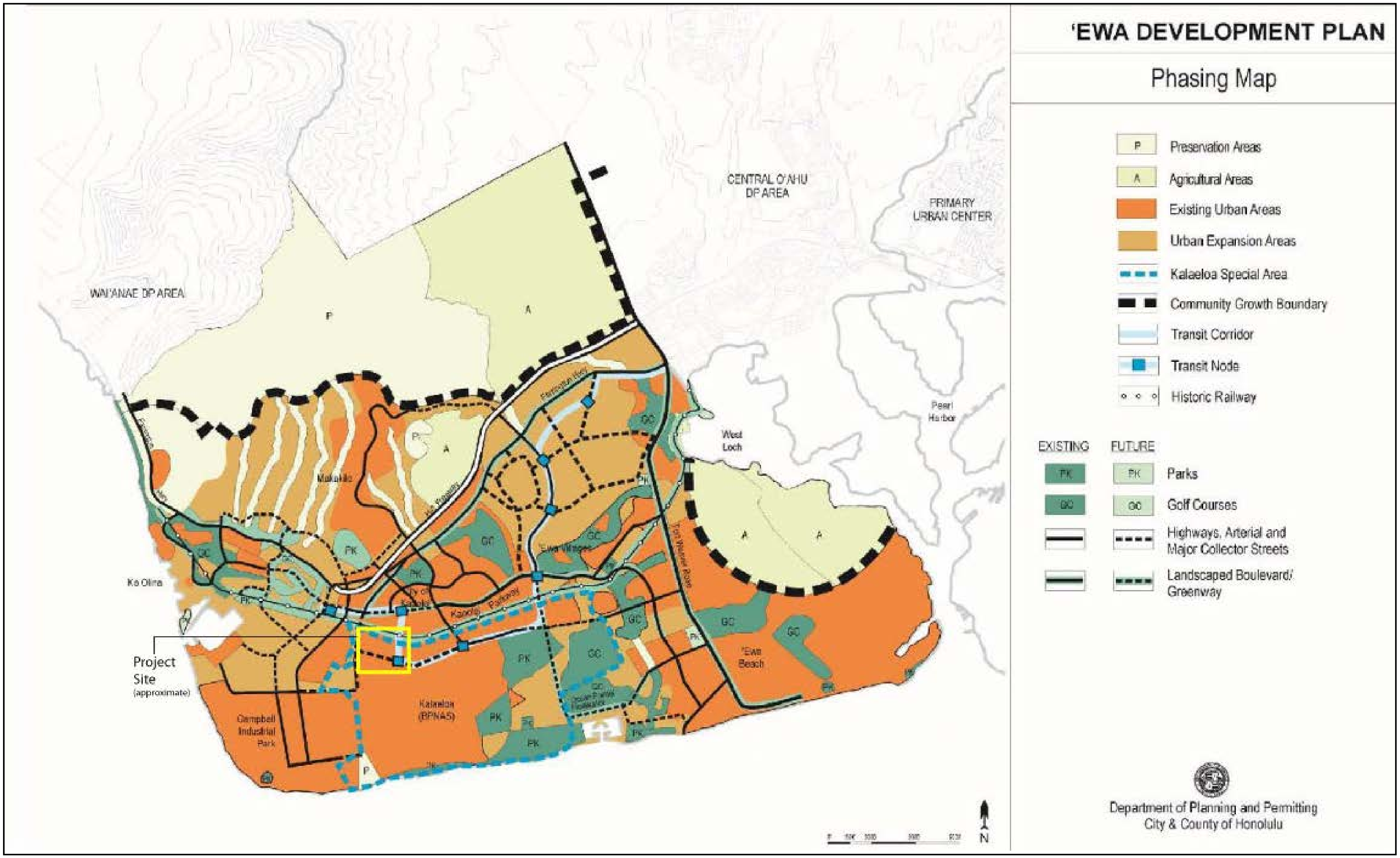
Supporting the General Plan are eight sustainable communities’ plans (SCPs) and development plans (DPs) for various regions of O‘ahu intended to help guide public policy, investment and decision-making on a 25- year planning horizon. Each plan explains the role of the particular region in O‘ahu’s overall development pattern; the vision statement for the area; land use policies, principles and guidelines; public facilities and infrastructure policies and principles; implementation strategies; and maps of Open Space, Land Use and Public Utilities.

The proposed project is located within the ‘Ewa DP area. The ‘Ewa DP, revised and adopted by the Honolulu City Council in 2013, sets forth a vision and implementation plan for a Secondary Urban Center in ‘Ewa, with Kapolei at its heart. The DP vision statement notes that development of adequate infrastructure is essential to meet the needs of new and existing development. Future population and economic growth on O‘ahu are to be directed to the ‘Ewa planning region and the Primary Urban Center. DPP estimates that the population in the ‘Ewa region is projected to grow from 101,397 in 2010 to 164,500 by 2035. As such, the DP serves as a policy guide for the actions and decisions that will support that growth.

The DP designates the project site as within a Special Area within the ‘Ewa for which planning is under the State of Hawai‘i’s HCDA, and planning and development must be consistent with the planning principles and guidelines in the DP. See **Figure 7-7, ‘Ewa DP Phasing Plan**. The DP suggests that the Kalaeloa Master Plan (HCDA, 2006) be submitted for acceptance by the Honolulu City Council as the Special Area Plan for Kalaeloa. The DP envisions master planned communities in Kalaeloa as redeveloped to support pedestrian and bike use within the community and transit use for trips both within and outside the community. An extension of the Rail system is also envisioned to extend through Kalaeloa ending near the intersection of Kapolei Parkway and the planned extension of Hānu‘a Street.

The DP further envisions open space anchored by the future Kalaeloa Regional Park located approximately 1.3 miles south of the project limits at Saratoga Avenue. In the vicinity of the project area, the historic OR&L railroad corridor alignment runs parallel to FDR Avenue, and is identified as a significant historic resource in the ‘Ewa DP, which includes guidelines for its protection and preservation, including a minimum 50-foot setback on either side of the OR&L ROW.

**Figure 7-7, ʻEwa DP Phasing Plan**



The following general policies and guidelines envisioned for Kalaeloa as outlined in the ‘Ewa DP are applicable to the project:

*3.13.1 General Policies*

- *Use Kalaeloa’s redevelopment as an opportunity to integrate the circulation system and land use pattern of the ‘Ewa Plain.*
- *Integrate the road network within Kalaeloa with the regional circulation system for all of ‘Ewa to provide additional ways for residents and workers to cross ‘Ewa from east to west and north to south.*

*3.13.2 Guidelines*

*Circulation System and Transportation System Facilities*

- *Design the circulation system to include major roadways connecting the City of Kapolei to the shoreline recreation center and Ocean Pointe/Hoakalei*
- *Upgrade the road system to allow bus stop facilities to be provided at the airport, military housing area, and shoreline recreation area.*

Discussion: The proposed roadway improvements and extension of Kamokila Boulevard meets the DP’s expressed goal of integrating the road network within Kalaeloa CDD with the regional circulation system. The proposed roadways would support Hunt’s future subdivision, which would be designed to foster a pedestrian- and bike-friendly environment where use of the future East Kapolei rail station would be encouraged. The project incorporates Complete Streets design features, included bike lanes. Furthermore, the project would facilitate future regional connection to the shoreline recreation center and the [area of the proposed] ‘Ewa Marina future Kalaeloa Regional Park. Preliminary plans for the proposed improvements to FDR Avenue would be outside of the designated 50-foot setback on either side of the OR&L ROW.

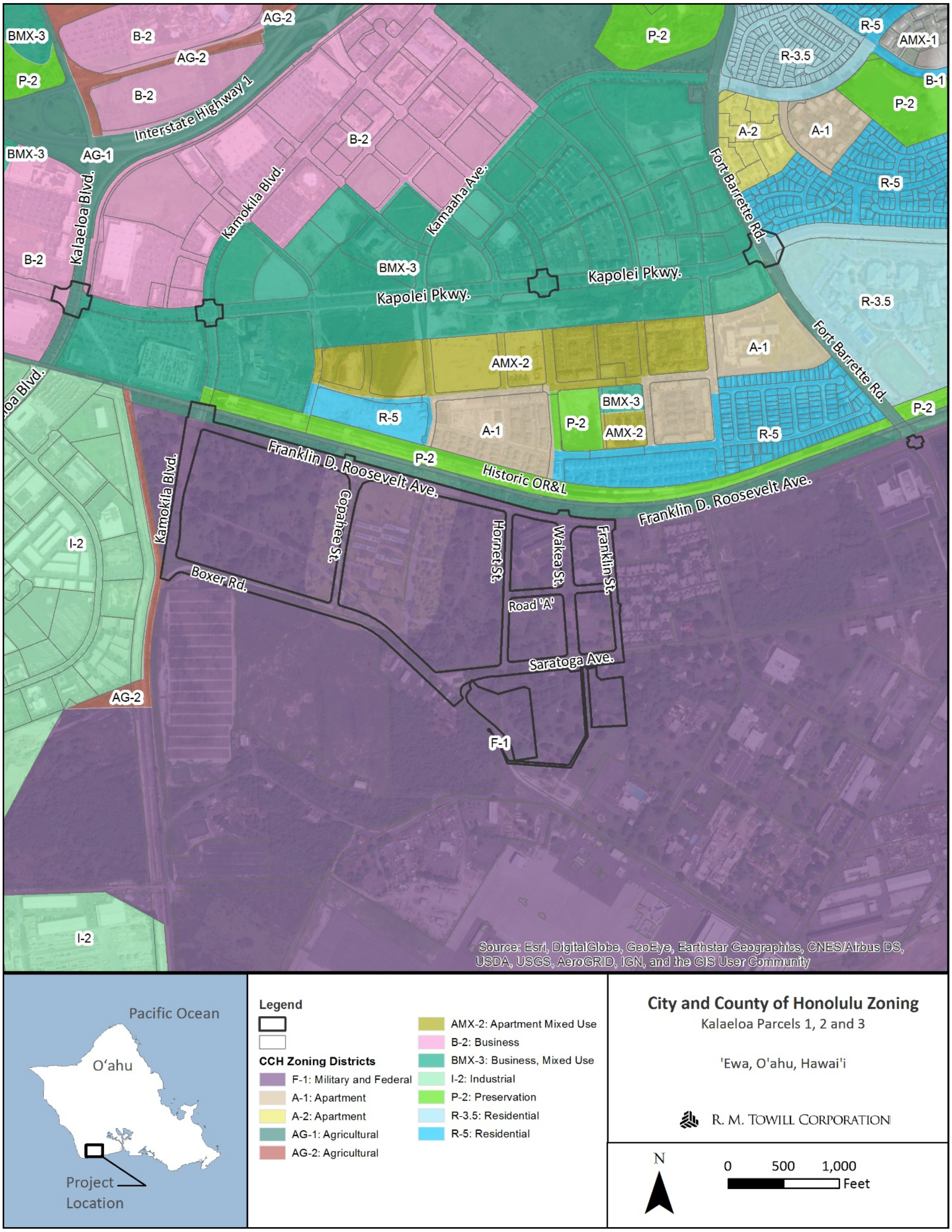
### *7.2.3 City and County of Honolulu Land Use Ordinance*

The Land Use Ordinance (LUO) (Revised Ordinances of Hawai‘i (ROH, Chapter 21-3) implements the goals and objectives of the O‘ahu General Plan and the ‘Ewa DP All lands within the CCH are zoned into specified districts. According to DPP, the project site is located within the F-1 military and federal preservation district where all military and federal uses and structures shall be permitted (ROH, Chapter 21-3.40-1 (b)). See **Figure 7-8, City and County of Honolulu Zoning**.

The purpose for creating the F-1 military and federal preservation district is to identify areas in military or federal government use and to permit the full range of military or federal government activities.

Discussion: This project is consistent with the LUO as having been designated (former) military land. As discussed in **Section 7.1.7, the Kalaeloa Community Master Plan,** adopted by the HCDA in 2005, serves as the vision and provides standards for the adaptive reuse of the former BPNAS following the U. S. Navy’s reassignment of the BPNAS to the State of Hawai‘i pursuant to the Defense Base Closure and Realignment Act of 1990, as amended.

## Figure 7-8, City and County of Honolulu Zoning



In addition, HCDA Kalaeloa CDD Rules set forth in HAR, Chapter 15-215 and Kalaeloa Reserved Housing Rules set forth in HAR, Chapter 15-216 would provide regulatory guidance for the review and development of drainage, access roadway, pedestrian improvements and appropriate housing to support the future Hunt residential community, as discussed in **Sections 7.1.9** and **7.1.10**.

### *7.2.4 O‘ahu Regional Transportation Plan (ORTP) 2040 (2016)*

The O‘ahu Regional Transportation Plan (ORTP) is a policy document that is designed to guide the development of transportation on the island of O‘ahu through the year 2040 (OMPO, 2016). The plan was approved by the O‘ahu Metropolitan Planning Organization (OMPO). OMPO is responsible for coordinating transportation planning on the island of O‘ahu. The organization was designated by the Governor of the State of Hawai‘i in 2015 per the Federal Surface Transportation Assistance Act of 1973, CFR, Chapter 23 Part 450, Planning Assistance and Standards.

The vision statement of the ORTP proposes that O‘ahu “should be a place where we will have efficient, well-maintained, safe, secure, convenient, appropriate, and economical choices in getting from place to place.” The ORTP includes a vision and goals, identifies projects, and provides an implementation program for mid- and long-range investment of the available transportation funds across O‘ahu in a fair and equitable manner (ORTP, 2011). Any proposed federal funded project must be included in the ORTP.

Any future transportation improvement for O‘ahu that receives federal transportation funds must be consistent with the ORTP in order to be eligible for these funds. These requirements are mandated by the U.S. Department of Transportation as a means of verifying the eligibility of metropolitan areas for federal funds earmarked for surface transportation systems.

The ORTP is updated every five years to ensure that transportation decisions are based on current information and community priorities. As part of each update, future population and employment are projected and corresponding changes in travel patterns, revenue, and construction costs are forecast to test and validate new directions for transportation development on O‘ahu.

The island-wide transportation plan for O‘ahu is defined by five overarching goals addressing the following themes: Transportation Facilities, Transportation Operations and Services, Freight Movement and Economic Vitality, Natural Environment, Human Environment and Quality of Life, Land Use and Transportation Integration, Infrastructure Condition, and Reduce Project Delivery Delay (ORTP, 2016).

The Kamokila Boulevard extension from FDR Avenue to Saratoga Avenue as a four-lane roadway is listed in the ORTP 2040 as a long-range (2030 to 2040), developer-funded modernization project.

Discussion: The proposed project includes the construction of roadway projects that would be consistent with ORTP 2040, specifically the extension of Kamokila Boulevard from FDR Avenue to Saratoga Ave. The project would further fulfill the ORTP 2040 goal of constructing well-maintained, safe transportation facilities where existing roads are dilapidated. The roads would serve the residents of Hunt’s future subdivision development.

### *7.2.5 Oʻahu Bike Plan*

In 1994, the City Council and Mayor adopted Ordinance 94-39 (ROH, Section 2 The Mayor and Executive Agencies, Article 12 Department of Transportation Services, 2-12.1 Power, Duties, and Functions) which directed that a bikeway system master plan for urban Honolulu be prepared and updated every five years. This resulted in the publication of the Honolulu Bicycle Master Plan (1999), which was the first significant effort by the CCH in making Honolulu more bike-friendly.

The plan was then broadened in scope to include the entire island, and thus renamed the Oʻahu Bike Plan (2012). The Plan guides the CCH Department of Transportation Service's island-wide bikeway planning. There are currently 132 miles of existing on- and off-road Oʻahu bikeway facilities, and the Plan calls for an additional 559 miles of bikeway to be built over the next 20 to 30 years.

The Vision Statement of the Oʻahu Bike Plan, which first articulated in the 1999 Honolulu Bicycle Master Plan, is as follows:

> *"Oʻahu is a bicycle-friendly community where bicycling is a safe, viable, and popular travel choice for residents and visitors of all ages."*

The goals of the Oʻahu Bike Plan are articulated as the following:

1. *To increase the mode share of bicycle trips.*
2. *To enhance cooperation between roadway users.*
3. *To encourage and promote bicycling as a safe, convenient, and pleasurable means of travel.*
4. *To be recognized by the League of American Bicyclists as a Bicycle-Friendly Community (CCH, 2012a).*

As noted by DTS in its comment letter dated January 30, 2019 regarding the proposed project, bike paths or lanes are designated on FDR Avenue, Saratoga Avenue, and Wakea Street and are considered Priority 2 projects in the 2012 Oʻahu Bike Plan (Table 6). See **Figure 7-9, Oʻahu Bikeway Network ʻEwa and Waiʻanae**.

> Discussion: The proposed project is consistent with the proposed bike paths identified within the Oʻahu Bike Plan. The proposed roadway sections would include bike lanes traveling in each direction on Saratoga Avenue and Wakea Street. The ultimate condition of FDR Avenue would also be designed to incorporate bike lanes. The project would overall provide safe bike paths for the future residents of the subdivision to utilize, thus fulfilling the Plan's goal to encourage more people to utilize bicycles for recreation or commuting and increasing the overall mode share of bicycle trips.

**Figure 7-9, O‘ahu Bikeway Network ‘Ewa and Wai‘anae**

# *Section 8*
# *Permits and Approvals That May Be Required*

## *8.1 Federal*

FAA Order 5190.6B

## *8.2 State of Hawai‘i*

Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) under Hawai‘i Revised Statutes (HRS), Chapter 343

Section 402, CWA, NPDES Notice of Intent Form C, Permit Application for Discharges of Storm Water Associated with Construction Activity (CWB, DOH)

Construction plan review by HCDA

## *8.2 City and County of Honolulu*

Construction Plan Review, DPP

Traffic Management Plan, DPP

Grading Permit, DPP

Street Usage Permit, DTS

ADA review by DCAB

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# *Section 9*
# *Agencies, Organizations, and Individuals to be Consulted for the Environmental Assessment*

The following agencies, organizations, and individuals will be contacted during the HRS, Chapter 343, environmental review process to disclose the environmental conditions of the site, the proposed undertaking, and the potential impacts and mitigation measures that will be applied to ensure against adverse impacts.

## *9.1 Federal Government*

USACE, Honolulu District
USFWS

## *9.2 State of Hawai‘i*

- DLNR:
  - Land Division
  - SHPD
- Department of Education (DOE):
  - Barbers Point Elementary
  - Facilities Development Branch, Planning Section
  - Hawai‘i State Library, Hawai‘i Document Center
  - Hawai‘i State Library, Ewa Beach Public Library and Kapolei Public Library
- DOH:
  - CWB
- DBEDT:
  - OP, CZMP
- HDOT:
  - Director, HDOT
  - Statewide Transportation Planning Office, HDOT
- Office of Hawaiian Affairs

## *9.3 City and County of Honolulu*

BWS
DDC
Department of Environmental Services
DFM

DPP
DTS
HFD
HPD
HART
Makakilo/Kapolei/Honokai Hale Neighborhood Board No. 34

## 9.4 Elected Officials, Organizations and Individuals

State Senator Mike Gabbard, 19th Senatorial District
State Representative Stacelynn Eli, 43rd Representative District
Honolulu County Councilmember Kymberly Marcos Pine, District 1
Eagle River Investors – Hawaiʻi LLC
Hawaiian Electric Company
Hawaiian Telcom
*Honolulu Star-Advertiser*
Hawaiʻi Gas
Kalaeloa Ventures LLC
Kapolei Infrastructure LLC
Spectrum (Formerly Oceanic Time Warner)
Wakea Garden Apartments
Outdoor Circle

## 9.5 Consultation

### 9.5.1 Community Consultation

The project was coordinated with HCDA early in the planning process, and included meetings, phone calls, and overall coordination of the project. The proposed improvements to the roadway system also involved discussion with CCH and HDOT commencing in 2014. At the request of Councilmember Kymberly Marcos Pine, quarterly meetings were held with the HCDA, HDOT, the CCH DPP, DTS, and DFM to discuss the status of the roadways in Kalaeloa and a potential MOU between HCDA, HDOT, and the CCH agencies. State Senator Mike Gabbard and former State Representative Andria Tupola were also present at some meetings, as was a representative of Hunt. Stakeholder meetings were held on the following dates:

- August 20, 2014
- December 5, 2014
- March 6, 2015
- June 4, 2015
- September 3, 2015

Presentations regarding the MOU and Kalaeloa Roadways were given to the community and questions, input, and feedback were solicited at the following meetings:

- Joint HCDA Kalaeloa Stakeholders Meeting – June 18, 2015
- Makakilo/Kapolei/Honokai Hale Neighborhood Board No. 34 Transportation Committee – June 30, 2015
- HCDA Regular Meeting – July 8, 2015

On July 25, 2016, a second MOU was executed between HCDA, HDOT, and CCH reaffirming the intent of the 2001 MOU between the former BPNAS Redevelopment Commission, HDOT, and CCH which transferred ownership of various roadways in Kalaeloa CDD to HDOT and CCH. The 2001 MOU also stipulated that once roadways transferred to HDOT were improved to CCH standards, the roadways would be dedicated to CCH. The 2016 MOU further called for the transfer of ownership of a portion of FDR Avenue and West Perimeter Road from HDOT to HCDA in order to initiate a demonstration project to improve those roads. The roads have not yet been conveyed from HDOT to HCDA as of March 2019. Coordination between HCDA, HDOT, CCH, and Hunt regarding the road conveyances and overall roadway design is ongoing.

Hunt continues to meet regularly with HCDA and the community regarding the subject EA, Subdivision process, and the HCDA Development Permit for the residential and commercial project components. Additionally, Hunt has re-initiated consultation with the public to discuss the project at the following meetings:

- Kalaeloa Advisory Teams’ Combined Meeting (Kalaeloa Community Network, Kalaeloa Public Safety, Kalaeloa Heritage and Legacy Foundation, and the Kalaeloa Advisory Team), Thursday, February 14, 2019
- Makakilo/Kapolei/Honokai Hale Neighborhood Board No. 34, February 27, 2019

Hunt will continue to keep all stakeholders, as well as the area businesses, emergency personnel (fire, ambulance and police), OTS (TheBus and TheHandi-Van), etc., apprised of the details of the proposed project and the impacts that the project may have on the adjoining local street area network.

*9.5.2 Comments Received During the  Draft EA Public Review Periods*

A Draft EA for the subject project was published in the December 23, 2018 edition of *The Environmental Notice* published by OEQC. A copy of the Draft EA was sent to the public and private agencies, organizations, and individuals identified above for review and input. A list of comment letters received during the 30-day public review and comment period ending on January 22, 2019 is provided in **Table 9-1**, below. All comment letters received were provided with a written response for inclusion and use in the preparation of the reissued Draft EA. It should be noted that a copy of the Draft EA was also sent to DPR, who requested to be removed from further consultation lists. A second Draft EA was published in the February 8, 2020 issue of the Environmental Notice for a 30-day public review period, and consulted agencies and organizations were notified of the availability of the document for review via written correspondence.  For a full record of the comment and response letters prepared for both Draft EAs, see **Appendix F**.

**Table 9-1, Comment Letters Received During the First and Second Draft EA Public Comment Periods**

| No. | Agency/Organization | Dates of Letters | Reissued Draft EA Section |
|---|---|---|---|
| 1 | HPD | 2/24/2020 | 10.1 |
| 2 | DAGS | 1/24/2019, 2/27/2020 | -- |
| 3 | HFD | 1/16/2019, 3/2/2020 | 3.1, 5.14.2, 5.14.2.1, 5.14.5, 5.14.5.2, |
| 4 | DOH CAB | 3/3/2020 | 5.11.2 |
| 5 | USFWS | 3/6/2020 | 5.8 |
| 6 | DLNR | 1/29/2019, 3/6/2020 | 5.4.1 |
| 7 | DOE | 1/15/2019, 3/6/2020 | 5.10, 5.14.1, 5.14.7, 9.5.1, 10.1 |
| 8 | DBEDT, OP | 1/14/2019, 3/7/2020 | 1.0, 2.3, 3.4, 5.2, 5.3, 5.5, 5.7, 5.8.2.2, 5.9, 7.1.13, 8.0, 10.3 |
| 9 | HDOT | 1/23/2019, 3/9/2020 | 2.3, Figure 3-4, 5.14.1, 7.1.1, 7.1.8, 9.5.1 |
| 10 | Outdoor Circle | 3/9/2020 | 5.8.1.1 |
| 11 | BWS | 2/19/2019, 3/9/2020 | 5.14.2 |
| 12 | DFM | 1/9/2019, 3/17/20 | 2.1, 5.14.1, 5.14.2 |
| 13 | DPP | 1/30/2019 | 5.14.1, 5.14.2, 7.2.2, 8.0 |
| 14 | DPR | 2/4/2019 | -- |
| 15 | DDC | 2/7/2019 | 5.14.1 |
| 16 | DTS | 1/31/2019 | 3.1, 5.2, 5.3, 5.7, 5.14.1, 7.1.6, 7.2.5 |

# *Section 10*
# *Summary of Effects*

In accordance with the content requirements of HRS, Chapter 343, and the significance criteria in HAR, Chapter 11-200.1-13, an applicant or agency must determine whether an action may have significant impacts on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects, and its short- and long-term effects.

HAR, Section 11-200.1-24 requires discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Short-term and long-term do not necessarily refer to fixed time periods but are viewed relative to environmentally significant consequences of the proposed action. **Sections 10.1 and 10.2** below discuss the extent to which the proposed action involves trade-offs among short-term and long-term gains and losses, as well as the extent to which the proposed action forecloses future options and/or narrows the range of beneficial uses of the environment.

In making the determination of whether an action may have significant impacts on the environment, HAR, Chapter 11-200.1-13 establishes "Significance Criteria" to be applied as a basis for identifying whether significant environmental impacts will occur. An action shall be determined to have a significant impact on the environment if it meets any one of the criteria. The relationship of the proposed action to the criteria are discussed below in **Section 10.3**.

## *10.1 Short Term Effects*

Short-term effects associated with the proposed project will be principally during the construction phase. Noise will be temporarily generated from construction activities and the related mobilization of equipment. Construction equipment is expected to include, but not be limited to, backhoe(s), loader(s), or excavator(s), work trucks, and powered hand tools. All internal combustion powered equipment will be muffled in accordance with standard engine operating practices. Upon the completion of work, noise levels will return to preexisting ambient levels.

Fugitive dust may be generated during construction. The contractor will be required to control fugitive dust through the regular wetting of soils and ground areas susceptible to the generation of dust during work activities. Only enough water to wet the surface of the ground will be used to prevent the generation of runoff.

Protection of water quality will be through the use of mitigative measures including silt fencing/curtains, berms, and other applicable erosion controls to prevent construction storm water related soils and silt from leaving active areas of work. Specifications for the use of these measures will be through the construction plan approval process and National Pollutant Discharge Elimination System (NPDES) permit application that will be filed by the design consultant during the design phase.

As recommended by the Honolulu Police Department (HPD) in its letter dated February 24, 2020: 1) project contractor will provide appropriate safety equipment and notification to area residents as necessary to maintain public safety during the period of construction, and 2) will be advised to take appropriate measures to guard against theft as well as vandalism. Upon completion of work all construction equipment, machinery, and personnel will be demobilized from the job site with no further disturbance to the area. All debris and waste materials will be disposed of at an approved refuse facility. Active work areas will be replanted with vegetation, similar to that found at the existing site.

## *10.2 Long Term, Secondary, and Cumulative Effects*

Potential long-term direct, secondary, and cumulative impacts have been evaluated and are documented for the following resources or issues: land use; land ownership; public health and safety; roadways and traffic; utilities; public facilities and services; topography, geology, and soils; hydrology; natural hazards; climate and air quality; noise; visual resources; marine environment; terrestrial flora and fauna; cultural resources; and socioeconomics. Of the resources and issues evaluated, the following long-term direct, secondary and cumulative impacts are potentially significant.

*Surface Water, Drainage, and Water Quality*

The proposed project would provide needed improvement of existing roads formerly serving military uses of the BPNAS. The area and region are in the process of transformation into a new residential community by Hunt, as envisioned in the HCDA Kalaeloa Community Development Plan. The proposed roadway improvements would also comply with Kalaeloa CDD and CCH design standards to meet safety requirements. The increase in impermeable surface area is expected to be negligible based on the existing urban use surfaces of the surrounding area. An adverse increase in surface runoff is not expected to result in significant adverse impacts. Upon the completion of work, all equipment used on-site will be demobilized and all debris and waste materials disposed of at an approved state or CCH refuse facility.

The proposed project would result in positive long-term and secondary impacts by providing environmental benefits in the form of reduced discharges of storm water associated sediments in runoff, and the improvement of working conditions from the reduced incidence of storm water sheet flow across the site. The project would therefore reduce untreated storm water discharges into nearshore coastal waters. Long-term impacts from the proposed improvements are expected to protect nearshore State marine waters, and provide the conditions necessary to improve public health and safety, and visual aesthetics.

*Socio-Economics*

There would be positive long-term and secondary impacts involving social benefits for residents and visitors from use of an improved roadway system for the growing Kalaeloa community. With or without the proposed action, the urbanization of Kalaeloa and neighboring Kapolei would evolve with anticipated future growth of the State. Long-term gains from development of the proposed project include the more efficient land use of former BPNAS lands that will support continued growth in the ‘Ewa region.

The proposed project will maintain and enhance economic productivity by supporting the effective use of public and private land to accommodate future growth in real estate, service sectors, and the retail industry. The project will further benefit the State of Hawaiʻi, and residents and visitors to Oʻahu, by facilitating the efficient transportation of people and goods to, from, and among southern areas of Oʻahu, to enable the island to continue to be a desirable place to live and visit.

The potential for significant adverse cumulative impacts is not anticipated:

- The proposed project is consistent with the long-range goals, policies and objectives articulated in policy documents for the redevelopment of Kalaeloa. It is also compatible with existing land uses in the area and would comply with applicable land use regulations. As a result, project implementation would not contribute to potentially significant land use compatibility or policy conflicts.
- The proposed project is designed to provide facility improvements to the existing transportation system and allow for the continued long-term use of existing public infrastructure. The project would encourage development of the Hunt Kalaeloa residential component to accommodate future growth in the ʻEwa region. This would benefit accomplishing related aspects of the Kalaeloa Master Plan by encouraging economic growth and continued vitality and sustainability of ʻEwa as the secondary urban center.
- The proposed project would result in positive long-term impacts by providing increased transportation efficiency of vehicles and goods to, from, and among ʻEwa region communities. It would enhance services now provided by improving upon the use of area roadways serving private and public lands. The proposed project would also meet current and future demand for the use of Oʻahu transportation facilities.
- The proposed project is located in an area adequately served by public services including police and fire protection. The project would not significantly affect the existing level of service of either police or fire protection service. The potential (less than significant) construction related impacts associated with the future use of the site would not alter the ability of fire or police protection from providing adequate levels of service and would not place an undue burden on public facilities that would support the project.

## *10.3 Significance Criteria*

In accordance with the provisions set forth in HRS, Chapter 343, and the significance criteria in HAR, Chapter 11-200.1-13, signed into law on August 8, 2019, this Final EA has determined that the project will have no significant adverse impact to air and water quality, existing utilities, noise, archaeological or cultural sites, or wildlife habitat. All anticipated impacts will be temporary and will not adversely impact the environmental quality of the area.

According to the Significance Criteria:

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

The proposed project is not anticipated to adversely impact any natural or cultural resources. The project site is located within a former military area with vestiges of former structures and roads associated with previous military use and development. These include foundations of military buildings, roads in various states of repair, and a few unpaved trails made by off-road vehicles. No significant archaeological or cultural sites are therefore anticipated to be discovered. However, the SHPD will be consulted for further assessment through the review of the ALRFI prepared for the project, and in the unlikely event that any remains or artifacts are encountered, practices as identified in **Section 5.9** of this document would be applicable. Any inadvertent finds will immediately result in the cessation of work and the immediate reporting of the find to the SHPD who will furnish further instructions regarding the treatment of the find and the conditions when work may be resumed.

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

The proposed use of the site will facilitate the long-term restoration and reuse of roads that service the Kalaeloa area and will not curtail existing or planned surrounding land uses.

3. *Conflict with the state’s long-term environmental policies or long-term environmental goals established by law;*

The proposed project is consistent with the environmental policies, goals and guidelines as delineated in HRS, Chapter 344, and as documented in this EA. See also **Sections 7.1, State of Hawai‘i**; and **7.2, City and County of Honolulu**.

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

The proposed project is expected to have little to no effect on the social and economic environment. The planned roadway and related infrastructure improvements will generally serve to meet the level of service needed based on the use of standards and guidelines for future development of transportation infrastructure serving the Kalaeloa community.

The proposed project will not, by itself, stimulate economic growth and welfare, but would accommodate current and future uses associated with the Hunt Kalaeloa subdivision development.

See also **Sections 5.9, Archaeological and Historic Resources**; **5.13, Socio-economic Environment**; and **6, Cultural Impact Assessment**.

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

The proposed project will be developed in accordance with Federal, State, and CCH rules and regulations governing public safety and health. Potential sources of adverse impacts have been identified and appropriate mitigative measures developed. The primary public health concerns are anticipated to involve air, water, noise, and traffic impacts. However, these impacts will be either minimized or brought to negligible levels by the appropriate use of the mitigation measures as described in this document.

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

The proposed project will not, by itself, stimulate unexpected changes in population. It will, however, accommodate current and future vehicular, bicycle, and pedestrian traffic associated with the Kalaeloa area. Inasmuch as the project will facilitate improved access and drainage, such improvements have been earlier considered as part of the HCDA Kalaeloa Master Plan and are expected to result in no adverse effects to population changes or effects to public facilities. See also **Section 5.13, Socioeconomic Environment**.

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

The proposed project will be developed in accordance with the environmental policies of HRS, Chapter 343. The analysis provided in this EA indicates that no substantial environmental degradation is anticipated or expected.

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

The proposed project addresses the need for roadway and related improvements, and represents a commitment by Hunt toward maintaining transportation infrastructure. It is being developed as an ongoing effort to maintain and where required, upgrade the transportation system to meet existing and projected future service demands. The project will not by itself, involve a commitment to larger actions. However, as part of the Kalaeloa Community Development Master Plan, areas surrounding the project site can be expected to be used in the future.

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

There are no threatened or endangered flora or fauna species within or immediately surrounding the project site. No adverse environmental effects to rare, threatened, or endangered species, or habitat are anticipated. See also **Section 5.8, Flora and Fauna**.

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

Any potential for adverse impacts to air, water quality, or noise levels will be addressed by use of appropriate mitigative measures as described in this EA. See also **Sections 5.4, Water Resources and Hydrology**; **5.10, Noise Conditions**; and **5.11, Air Quality**.

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 project is located in an area that is already in use as an access roadway system within existing Kalaeloa. The project itself does not possess any sensitive characteristics that would detract from or adversely impact the surrounding environment. See also **Sections 5.3, Geology and Topography**; **5.4, Water Resources and Hydrology**; **5.6, Wetlands**; and **5.7, Natural Hazards**.

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

The proposed site is not located within any scenic vista or view plane identified in CCH or State Plans. The proposed project is not expected to result in long-term visual impacts in the form of an improved access roadway system, utility and drainage infrastructure, and appurtenances including the addition of traffic signals at specific intersections as described in this EA. The improvements will be noticeable, but will not intrude on existing view planes. In general, the appearance of the project will be similar to the visual impact created by its adjacent urbanized Kapolei and ʻEwa neighbor communities, and will not detract from existing views. Visual impacts associated with construction activities will be temporary and cease with the removal of construction equipment and personnel. See also **Section 5.12, Visual Resources**.

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

Energy that is used will be in the form of fossil fueled internal combustion equipment, machinery, and vehicles, and electricity supplied to the site by either an existing Hawaiian Electric Company power connection or by the use of portable generator(s). The use of these forms of energy is not expected to be greater or significantly greater than that used for the development of similar projects.

**Table 10-1, Hunt Kalaeloa Subdivision Roads Project Impacts Summary**

| Resource Area | Direct Short-term Impacts | Direct Long-term Impacts | Secondary Impacts | Cumulative Impacts | Mitigation and BMPs | EA Section |
|---|---|---|---|---|---|---|
| Climate | Construction activities that require the use of heavy machinery would present a short-term increase in GHGs. | No Adverse Impact. | No Secondary Impact. | Minimal Cumulative Impact – because the direct impact to climate would be only short-term, and would not increase the use of machinery, the project would make no persistent contribution to cumulative impacts (e.g., Act 286, Session Laws of Hawaiʻi 2012). | No Mitigation required. | 5.2 Climate |
| Geology, Topography, and Soil Resources | Ground disturbing activities | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | • Erosion control measures will be employed during construction.<br>• Site restoration to original condition at conclusion of project.<br>• Disposal will be at an approved facility or location in accordance with Federal, State, and City and County of Honolulu regulations.<br>No Mitigation required. | 5.3 Geology and Topography<br>5.5 Soils and Potential for Hazardous Materials |
| Groundwater, Surface Water, Drainage, and Water Quality | Localized and potential temporary increase in turbidity. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | • Construction will be regulated through adherence to NPDES permit conditions.<br>• During construction, work activities will comply with HAR 11-55 Water Pollution Control.<br>• Discharge pollution prevention measures will be employed in all phases of the project.<br>• Following construction all areas of ground disturbance will be stabilized with appropriate materials. | 5.4 Water Resources and Hydrology |
| Natural Hazards | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | No Mitigation required. | 5.7 Natural Hazards |
| Wetlands | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | No Mitigation required. | 5.6 Wetlands |
| Terrestrial Flora | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | No Mitigation required. | 5.8.1 Terrestrial Flora |
| Terrestrial Fauna | Increased lighting during construction of the proposed project. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | • Light fixtures utilized for this project will be designed and installed to reduce glare and fully shield light from migrating and/or nocturnally flying seabirds.<br>• A survey for Pueo ground nesting activity will be undertaken and if discovered, DLNR would be notified prior to construction activity.<br>• Recommendation that no woody vegetation taller than 4.6 m (15 ft) to be removed during June 1 through September 15 to observe the Hawaiian hoary bat nesting season. | 5.8.2 Terrestrial Fauna |

| Resource Area | Direct Short-term Impacts | Direct Long-term Impacts | Secondary Impacts | Cumulative Impacts | Mitigation and BMPs | EA Section | |
|---|---|---|---|---|---|---|---|
| Archaeological Cultural Resources | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | • In the unlikely event cultural deposits and/or human skeletal remains are encountered during ground disturbance, work stopped immediately and SHPD notified of the nature of the discovery.<br>No further mitigation required. | 5.9 | Archaeological and Cultural Resources |
| Noise | Temporary source of noise above ambient levels from construction noise. | No Adverse Impact. | No Secondary Impact. | Minimal Cumulative Impact – because other past, present, and reasonably foreseeable future actions are expected to be consistent with existing development and the direct impact to noise would be only short-term, the project would make no persistent contribution to cumulative impacts. | • Mufflers used on all combustion powered construction vehicles and machinery, and all noise attenuation equipment maintained<br>• Work limited to weekdays during daylight hours between 7:00 am and 6:00 pm. No work scheduled on federal or state holidays.<br>• The contractor to secure a noise permit from the DOH prior to the initiation of construction. | 5.10 | Noise Conditions |
| Air Quality | Temporary and localized emissions from increased fugitive dust and exhaust emissions from construction related equipment, and vehicles. | No Adverse Impact. | No Secondary Impact. | Minimal Cumulative Impact – because the direct impact to air quality would be only short-term, the project would make no persistent contribution to cumulative impacts. | • Construction equipment and vehicles shall be maintained in proper working order to reduce air emissions.<br>• During construction, work activities will comply with HAR, Chapter 11-59 and 11-60.<br>• Dust control plan to include water source, use of soils wetting, use of silt screening.<br>No further mitigation required. | 5.11 | Air Quality |
| Visual Resources | Temporary visual impacts from the presence construction equipment | No Adverse Impact. | No Secondary Impact. | Minimal Cumulative Impact – other past, present, and reasonably foreseeable future actions are expected to be consistent visually with existing development. | • Equipment will be confined to work areas.<br>• All construction related equipment will be removed following the completion of work.<br>No further mitigation required. | 5.12 | Visual Resources |
| Socio-Economic Environment and Demographics | No Adverse Impact. | No Adverse Impact. | Minimal Secondary Impact –reasonably foreseeable future actions are expected to be consistent with existing development. | Minimal Cumulative Impact – other past, present, and reasonably foreseeable future actions are expected to be consistent with the socio-economic environment of the existing development. | No Mitigation required. | 5.13 | Socio-Economic Environment and Demographics |
| Transportation Facilities | Potential for limited, non-substantial short-term effects on transportation due to construction related activities and transit of vehicles to and from the job site. | No Adverse Impact. | Minimal Secondary Impact –reasonably foreseeable future actions are expected to be consistent with existing development. | Minimal Cumulative Impact – other past, present, and reasonably foreseeable future actions are expected to be consistent with the transportation use of the existing development. | No Mitigation required. | 5.14.1 | Roads and Transportation |
| Electrical, Water, and Wastewater | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | No Mitigation required. | 5.14.2 | Utilities |

| Resource Area | Direct Short-term Impacts | Direct Long-term Impacts | Secondary Impacts | Cumulative Impacts | Mitigation and BMPs | EA Section |
|---|---|---|---|---|---|---|
| Solid Waste | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | • Disposal of solid waste will be handled in accordance with applicable Federal, State, and City and County of Honolulu rules and regulations. | 5.14.3 Solid Waste |
| Police, Fire, Health Care and Emergency Services | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | No Mitigation required. | 5.14.4 Police Protection<br>5.14.5 Fire Protection<br>5.14.6 Health Care and Emergency Services |
| Schools and Libraries | No Adverse Impact. | Realignment of Boxer Road may eliminate one of two driveways into Barbers Point Elementary School. | No Secondary Impact. | No Cumulative Impact. | Hunt will work with the DOE to ensure that an alternative access is provided and that adverse impacts will be avoided. | 5.14.7 Schools |
| Recreational Facilities | No Adverse Impact. | No Adverse Impact. | No Secondary Impact. | No Cumulative Impact. | No Mitigation required. | 5.15 Recreational Resources |

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# *Section 11*
# *Summary of Findings and Significance Determination*

In accordance with the provisions set forth in HRS, Chapter 343, and the significance criteria in HAR, Chapter 11-200.1-13, this EA has evaluated and assessed the potential for environmental impacts associated with the proposed project and it is preliminarily determined that a HRS, Chapter 343, EIS will not be required.

The proposed Hunt Kalaeloa Subdivision Roads project is not anticipated to result in significant adverse impacts to geology, soils, hydrology, stream flow, biological resources, air quality, natural hazards, cultural resources, socioeconomics, or land uses. Minimal impacts may consist of minor traffic, noise and air quality disturbances to residents in the immediate surrounding location of the project site, but will completely cease once construction is completed.

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***Appendices for the Final Environmental Assessment***
*Prepared in Accordance with Hawaii Revised Statutes,*
*Chapter 343, and Hawaii Administrative Rules, Title 11, Chapter 200.1*

# *Hunt Kalaeloa Subdivision Roads*

*District of ʻEwa, Island of Oʻahu, Hawaiʻi*


**August 2020**

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*Accepting Agency:*
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*Final Environmental Assessment*
*Prepared in Accordance with Hawaii Revised Statutes,*
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# *Hunt Kalaeloa Subdivision Roads*

*District of ʻEwa, Island of Oʻahu, Hawaiʻi*

## *Appendices*

| | |
|---|---|
| *Appendix A* | *Preliminary Construction Drawings*<br>*R. M. Towill Corporation, 2018* |
| *Appendix B* | *Phase I Environmental Site Assessment*<br>*Element Environmental LLC,*<br>*December 2017* |
| *Appendix C* | *Biological surveys for proposed road improvements at*<br>*Kalaeloa, Kapolei, Oʻahu*<br>*AECOS, Inc., January 2018* |
| *Appendix D* | *Archaeological Literature Review and Field Inspection,*<br>*Cultural Surveys Hawaiʻi, Inc., December 2017* |
| *Appendix E* | *Draft Report: Traffic Impact Analysis Report for the*<br>*Development of Parcels 1, 2, and 3 in Kalaeloa. Fehr & Peers,*<br>*December 29, 2017 + 2019 Memorandum* |
| *Appendix F* | *Early Consultation: Comments Received during the Draft*<br>*Environmental Assessment Comment Periods from December*<br>*28, 2018 to March 9, 2020 and Responses* |

## *Appendix A*

*Preliminary Construction Drawings,*
*R. M. Towill Corporation, 2018*

# DEVELOPMENT OF KALAELOA
# PARCELS 1, 2 AND 3
## BACKBONE ROADWAY IMPROVEMENTS

**HONOULIULI , EWA , OAHU , HAWAII**

TAX MAP KEY : 9-1-013: 002, 003, 004, 010, 026, 128 & 129

CONSTRUCTION PLAN FILE NO. 2018/CP-147

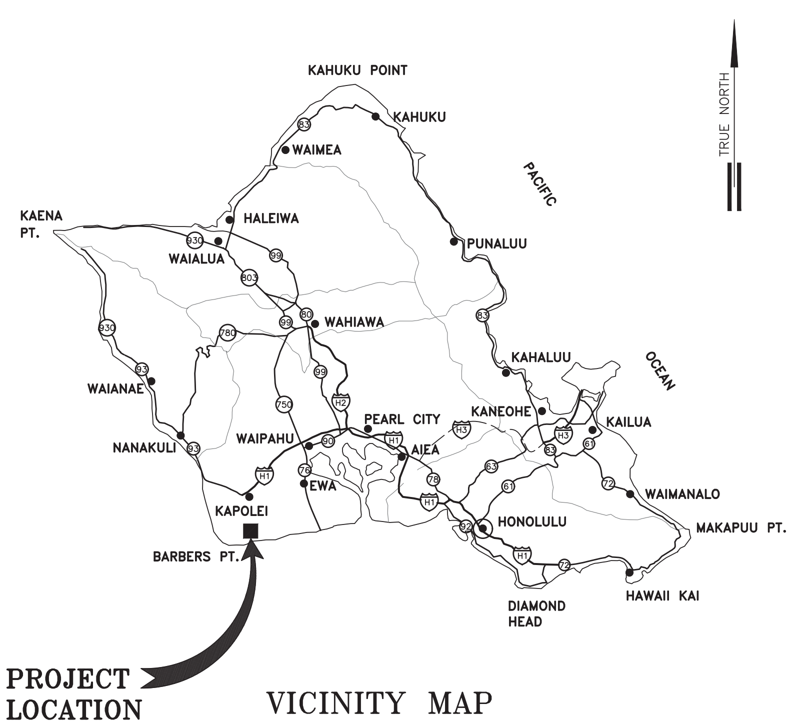
**PREPARED FOR:**

**HUNT COMMUNITIES HAWAII LLC**

737 BISHOP STREET, SUITE 2750
HONOLULU, HAWAII 96813

Prepared by:

R. M. TOWILL CORPORATION
SINCE 1930
Planning • Engineering • Environmental Services • Photogrammetry • Surveying • Construction Management




VICINITY MAP

5 0 5 10
SCALE IN MILES


LOCATION MAP
NOT TO SCALE

**APPROVED :**

DIRECTOR, DEPARTMENT OF PLANNING & PERMITTING
CITY & COUNTY OF HONOLULU

DATE

2018/CP-147 FEBRUARY 2019

DEVELOPMENT OF KALAELOA – PARCELS 1, 2 AND 3 – BACKBONE ROADWAY IMPROVEMENTS

RMTC JOB NO.: 1-22371-0E

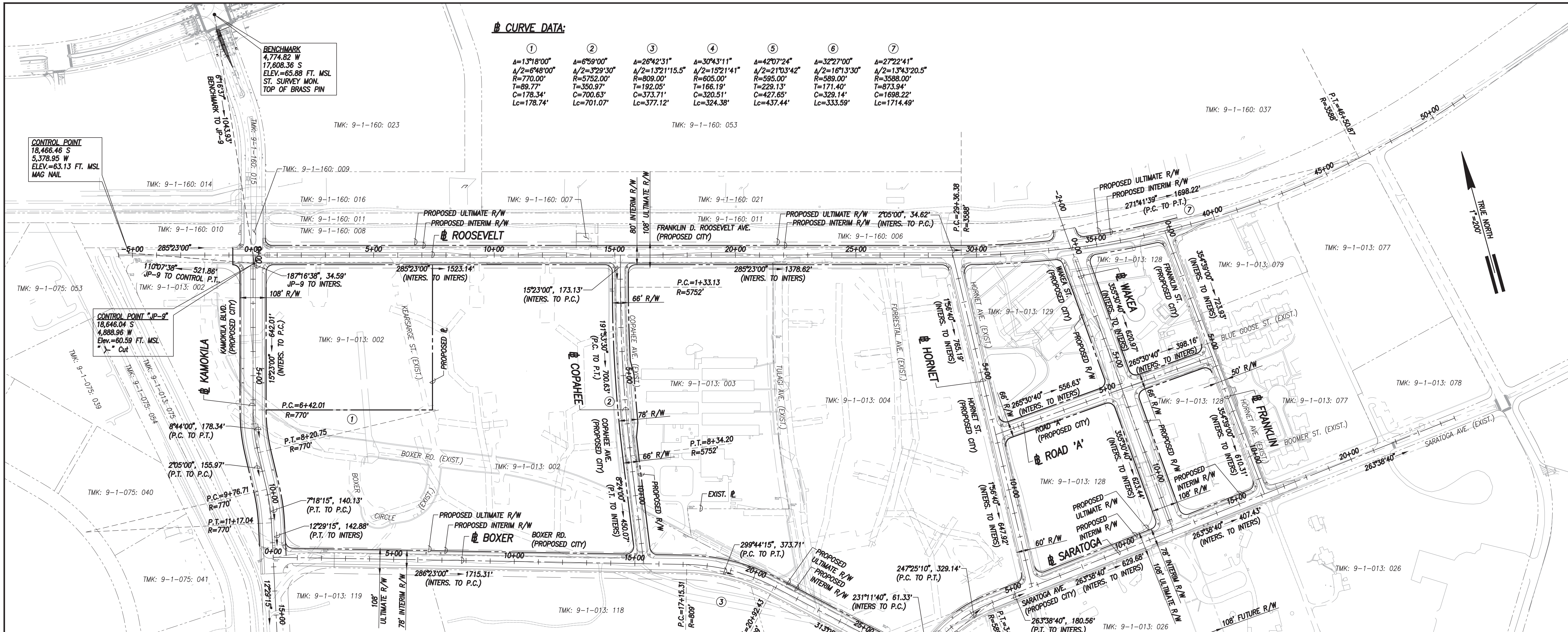
## ℄ CURVE DATA:

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Δ | 13°18'00" | 6°59'00" | 26°42'31" | 30°43'11" | 42°07'24" | 32°27'00" | 27°22'41" |
| Δ/2 | 6°48'00" | 3°29'30" | 13°21'15.5" | 15°21'41" | 21°03'42" | 16°13'30" | 13°43'20.5" |
| R | 770.00' | 5752.00' | 809.00' | 605.00' | 595.00' | 589.00' | 3588.00' |
| T | 89.77' | 350.97' | 192.05' | 166.19' | 229.13' | 171.40' | 873.94' |
| C | 178.34' | 700.63' | 373.71' | 320.51' | 427.65' | 329.14' | 1698.22' |
| Lc | 178.74' | 701.07' | 377.12' | 324.38' | 437.44' | 333.59' | 1714.49' |

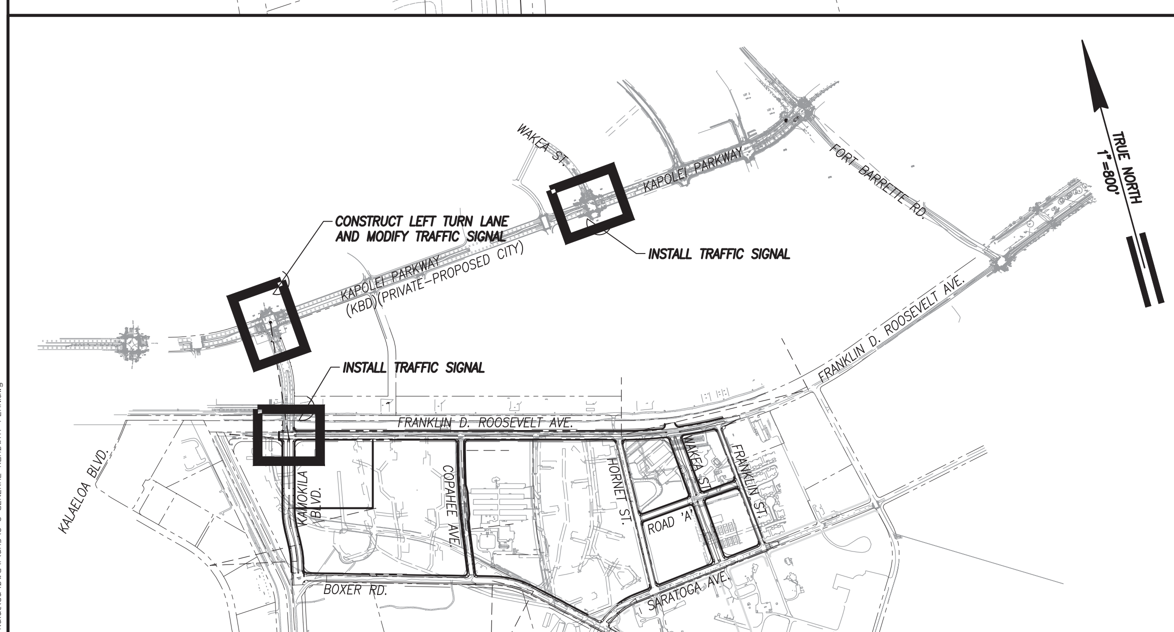
BENCHMARK
4,774.82 W
17,608.36 S
ELEV.=65.88 FT. MSL
ST. SURVEY MON.
TOP OF BRASS PIN

CONTROL POINT
18,466.46 S
5,378.95 W
ELEV.=63.13 FT. MSL
MAG NAIL

CONTROL POINT "JP-9"
18,646.04 S
4,888.96 W
Elev.=60.59 FT. MSL
"Y" Cut




## GENERAL ROADWAY PLAN
SCALE: 1"=200'




## OFFSITE INTERSECTION GENERAL PLAN
SCALE: 1"=800'

GRAPHIC SCALES:
1" = 200': 200' 100' 0 200' 400'
1" = 800': 800' 400' 0 800' 1600'

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

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DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## GENERAL ROAWAY PLAN AND OFFSITE INTERSECTION GENERAL PLAN

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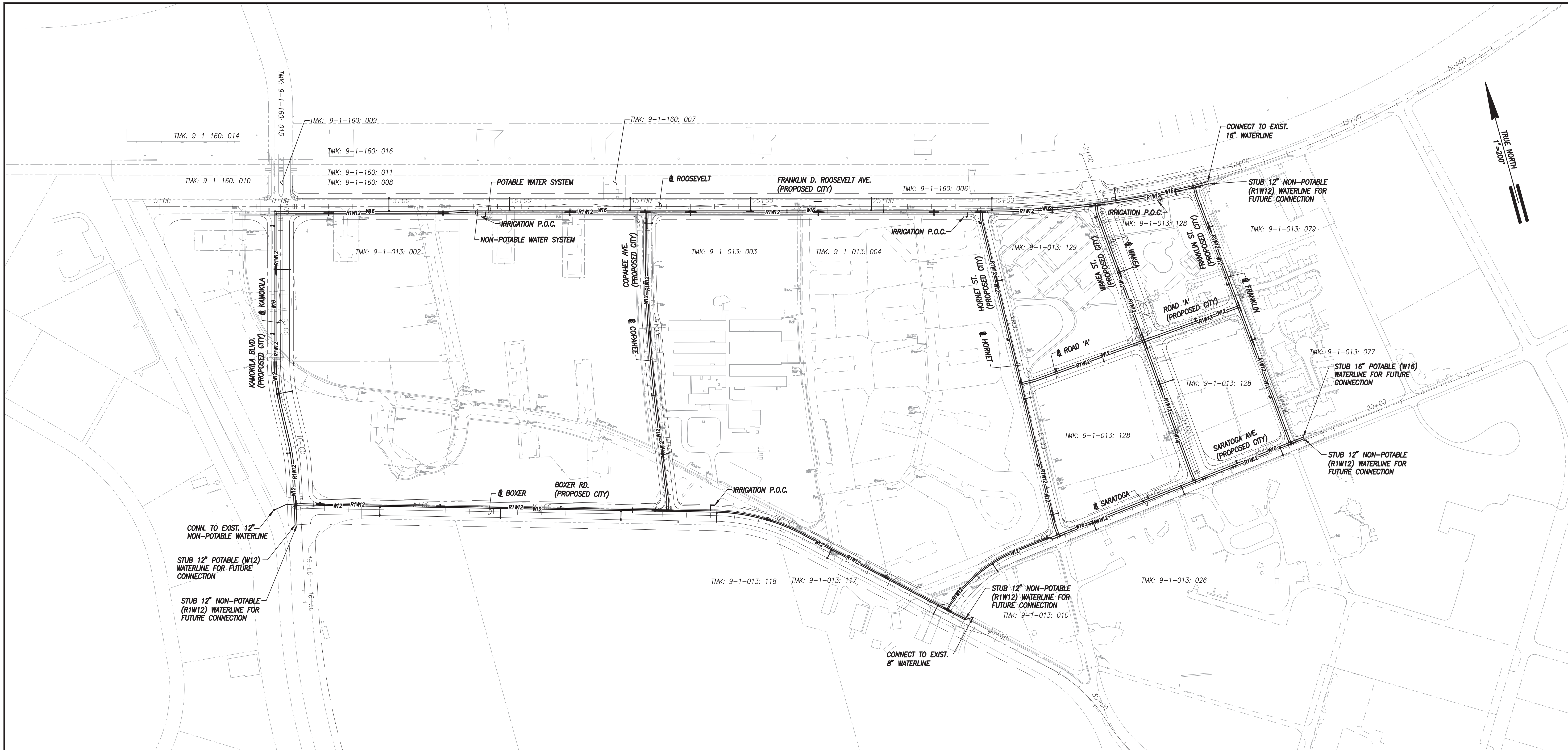
SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE | CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE | POCKET | FOLDER | NO.




## GENERAL WATER SYSTEM PLAN

SCALE: 1"=200'

GRAPHIC SCALE:

1" = 200' — 200' 100' 0 200' 400'

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

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BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

GENERAL WATER SYSTEM PLAN

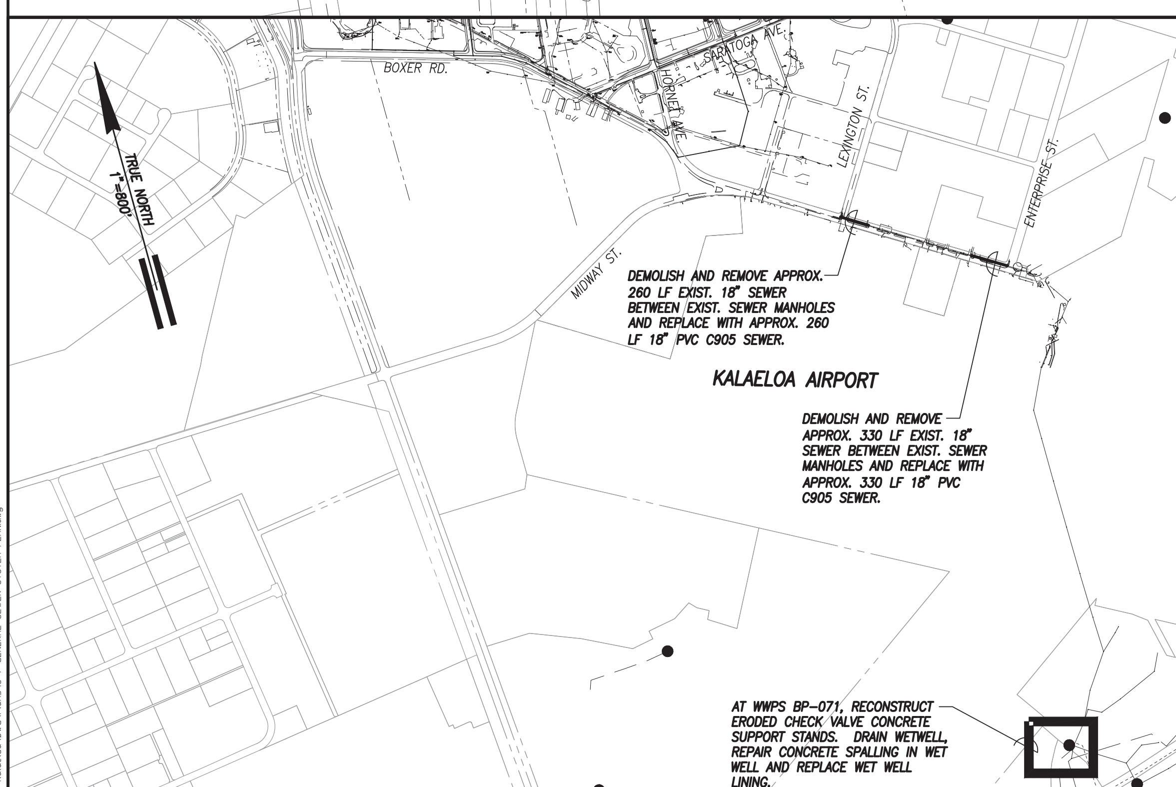
APPROVED BY



| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|


## GENERAL SEWER SYSTEM PLAN

SCALE: 1"=200'




## OFFSITE SEWER PLAN

SCALE: 1"=800'

GRAPHIC SCALES:

1" = 200' — 200' 100' 0 200' 400'

1" = 800' — 800' 400' 0 800' 1600'

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

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SIGNATURE — 04/20 DATE

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

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DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
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TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

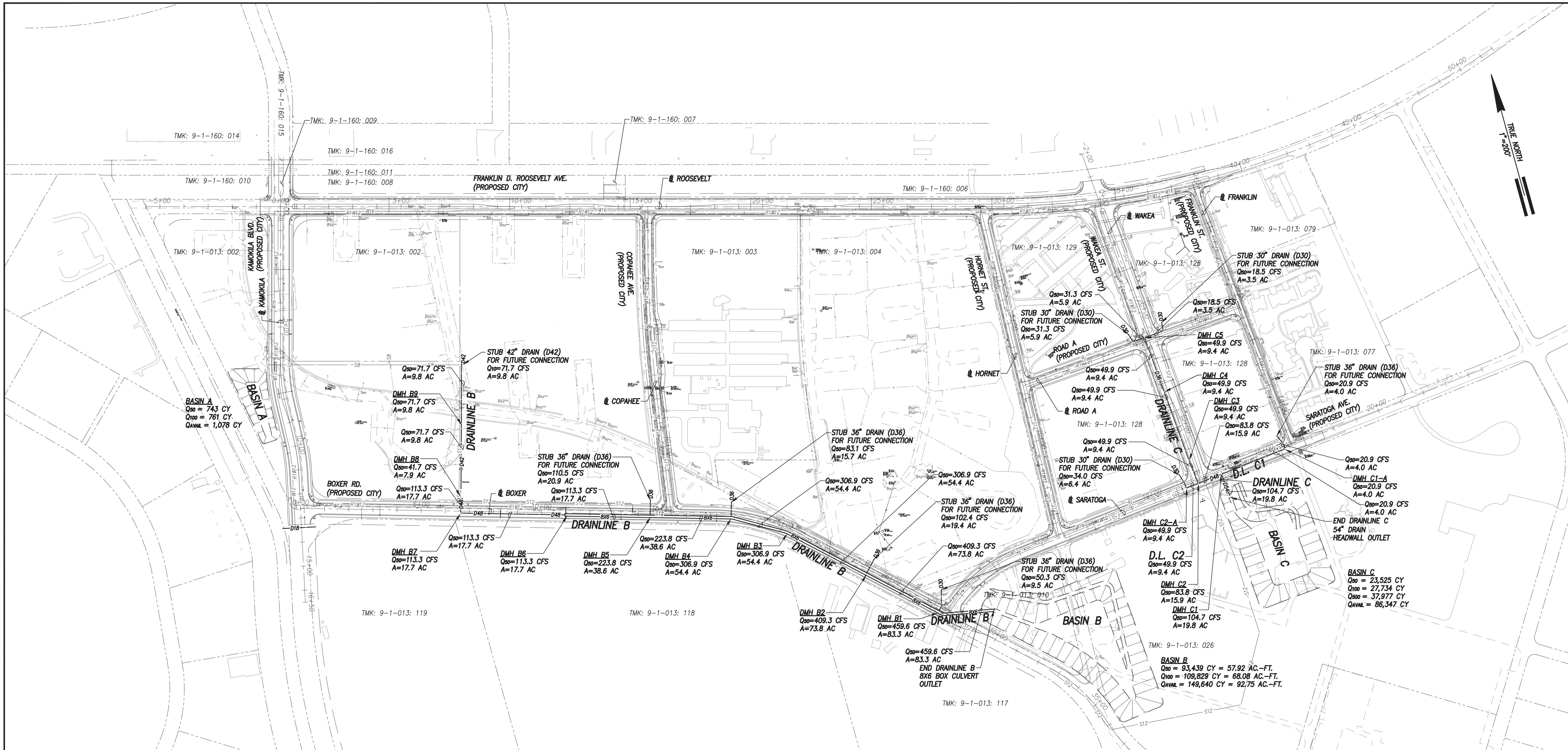
## GENERAL SEWER SYSTEM PLAN

APPROVED BY

Tue, 23 Apr 2019 - 2:14pm K:\civil\2237\ Hunt Kalaeloa\DWG\Plans\C-7 GENERAL SEWER SYSTEM PLAN.dwg



| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




## GENERAL DRAINAGE PLAN

SCALE: 1"=200'

GRAPHIC SCALE:

1" = 200'  200'  100'  0  200'  400'

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

R. M. TOWILL CORPORATION

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DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

GENERAL DRAINAGE PLAN AND OFFSITE INTERSECTION GENERAL PLAN

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SIGNATURE 04/20 DATE

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CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|



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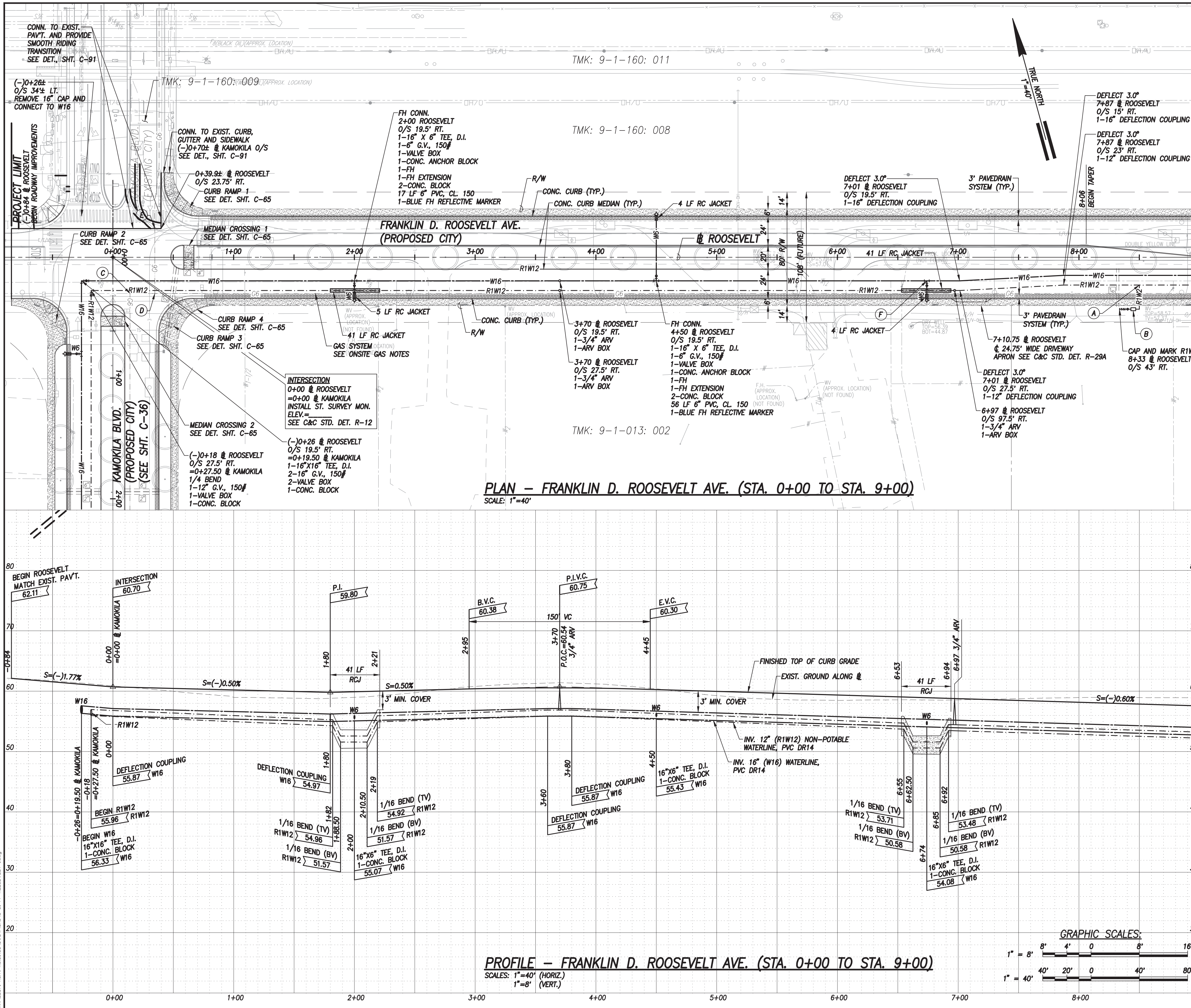



Ⓐ 8+50 ℄ ROOSEVELT
O/S 23' RT.
CONTRACTOR TO INSTALL TYPE D LATERAL, BLIND METER SPLICE LENGTH TO ACCOMODATE A 1-1/2" METER AND ALL APPURTENANCES IN ACCORDANCE WITH BWS STD. DET. L-15.
1-TYPE "III" METER BOX
1-2" G.V.
1-TYPE 'B' METER BOX

Ⓑ INSTALL BWS APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER AFTER THE METER PRIOR TO ANY BRANCHES OR TEES PER BWS STD. DET. V-9

Ⓒ 0+14.20 ℄ ROOSEVELT
O/S 30' RT.
1-6" GAS 1/4 BEND (H)

Ⓓ 0+34.75 ℄ ROOSEVELT
O/S 30' RT.
1-6" X 6" GAS TEE

Ⓔ 0+34.75 ℄ ROOSEVELT
O/S 23.75' RT.
END G6
INV.=XX.XX
1-6" CAP AND MARKER

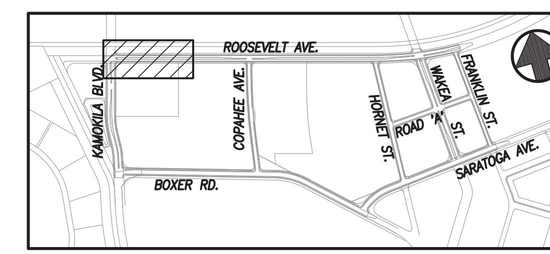
Ⓕ FH CONN.
6+74 ℄ ROOSEVELT
O/S 19.5' RT.
1-16" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
17 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

R. M. TOWILL CORPORATION

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DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## PLAN AND PROFILE - 1
## FRANKLIN D. ROOSEVELT AVENUE
## (STA. 0+00 TO STA. 9+00)

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SIGNATURE 04/20 DATE

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CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE
CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
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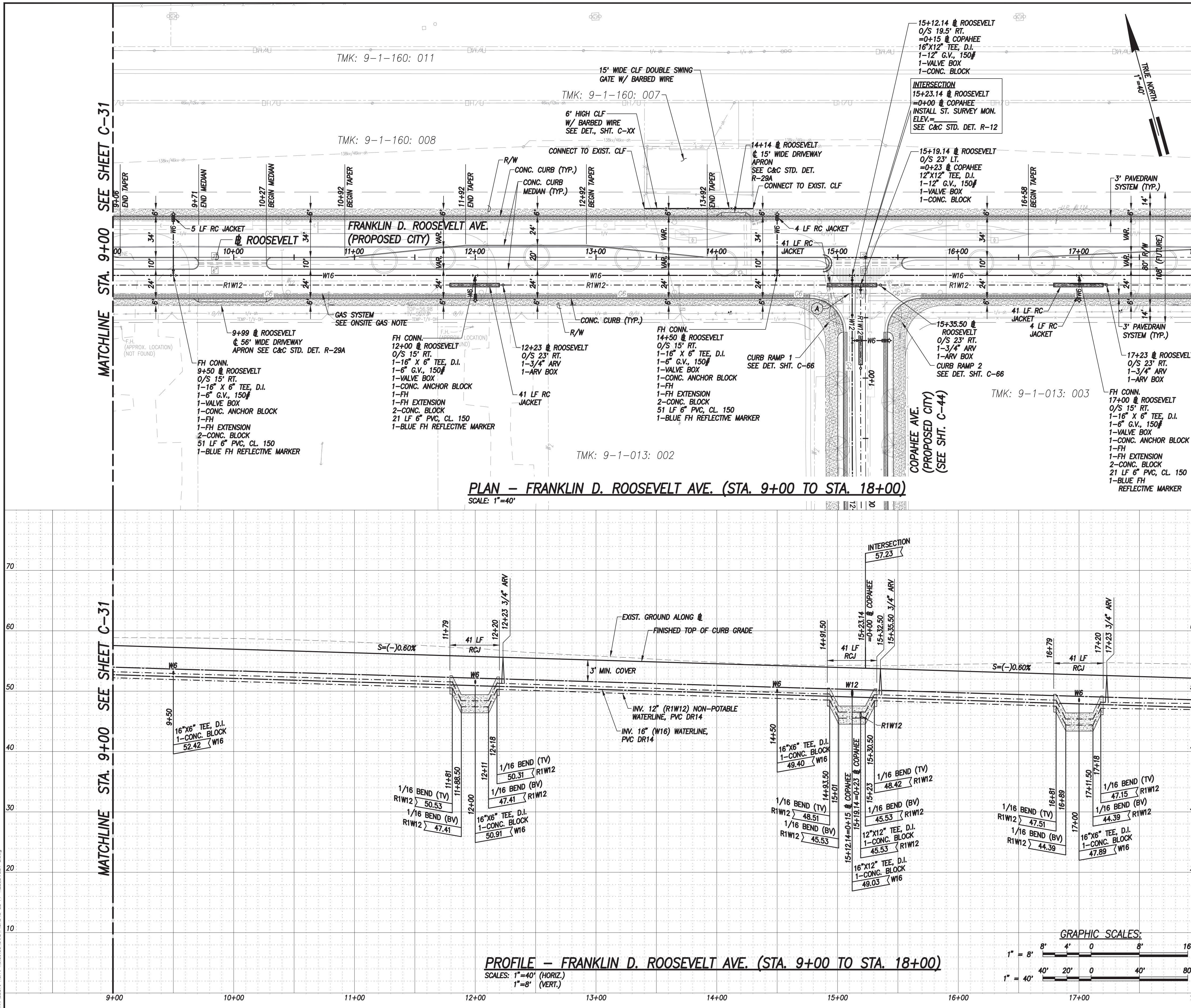


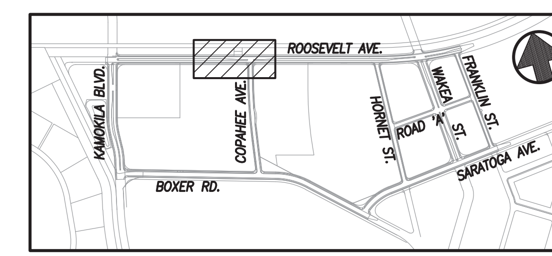

Ⓐ 15+09.84 ℄ ROOSEVELT
O/S 30' RT.
1-6"X4" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | 6" |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

R. M. TOWILL CORPORATION

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DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

**PLAN AND PROFILE – 2**
**FRANKLIN D. ROOSEVELT AVENUE**
**(STA. 9+00 TO STA. 18+00)**

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SIGNATURE 04/20 DATE

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CHIEF, CIVIL ENGINEERING BRANCH, DPP — DATE — CHIEF, TRAFFIC REVIEW BRANCH, DPP — DATE

| FILE | POCKET | FOLDER | NO. |
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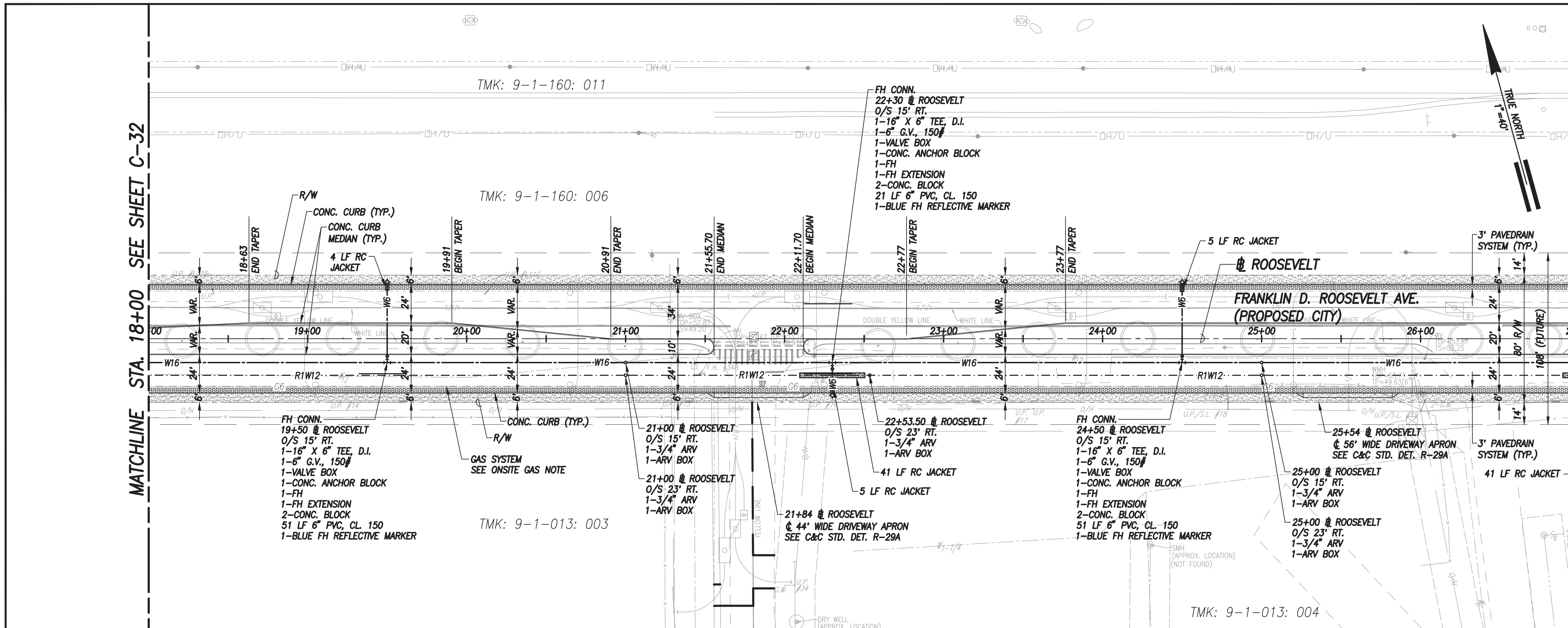
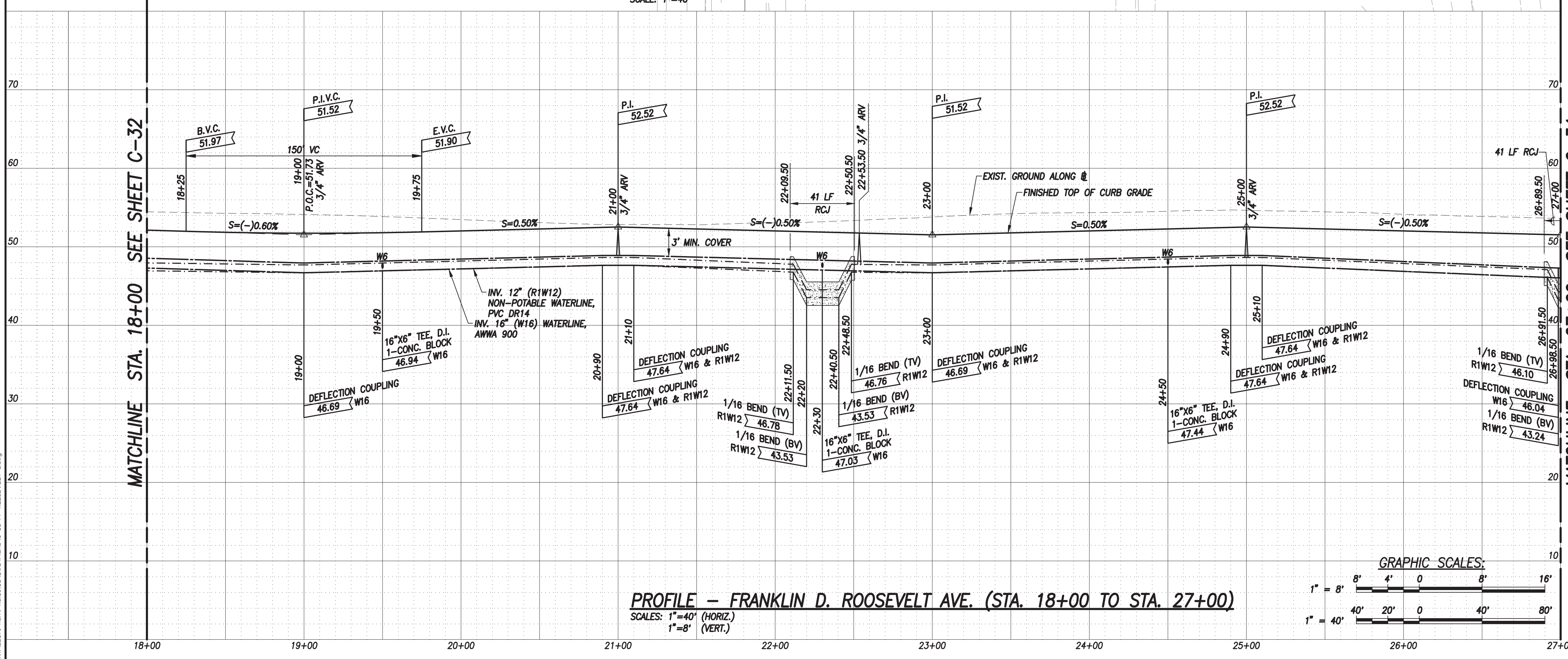



PLAN – FRANKLIN D. ROOSEVELT AVE. (STA. 18+00 TO STA. 27+00)

SCALE: 1"=40'




GRAPHIC SCALES:

1" = 8'

1" = 40'

PROFILE – FRANKLIN D. ROOSEVELT AVE. (STA. 18+00 TO STA. 27+00)

SCALES: 1"=40' (HORIZ.)
1"=8' (VERT.)

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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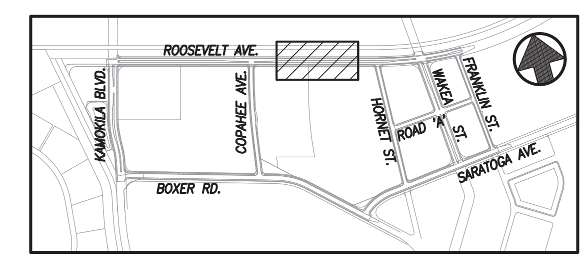
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | W |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

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TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

PLAN AND PROFILE – 3
FRANKLIN D. ROOSEVELT AVENUE
(STA. 18+00 TO STA. 27+00)

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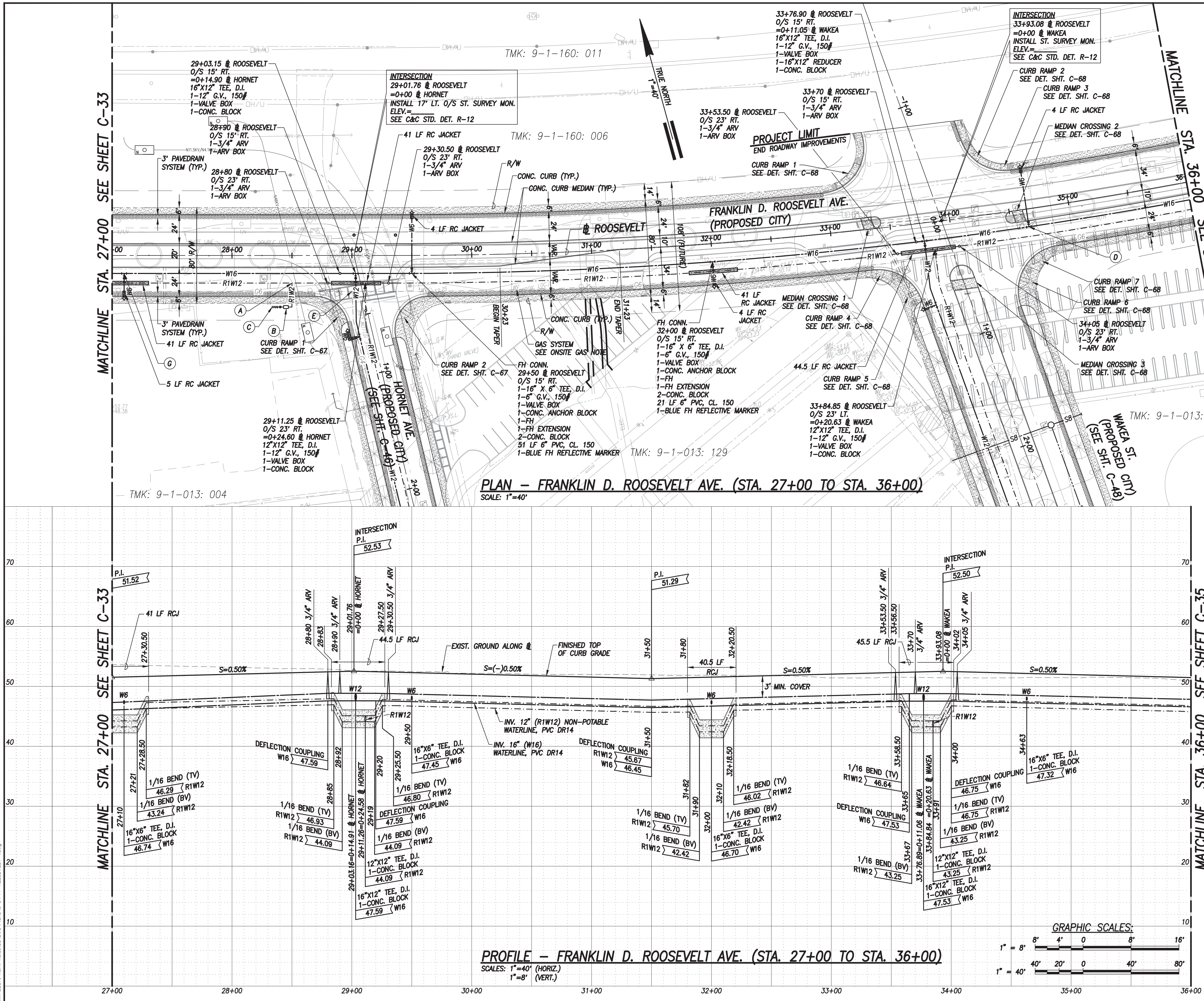
SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE POCKET FOLDER NO.




(A) 28+50 @ ROOSEVELT
O/S 23' RT.
CONTRACTOR TO INSTALL TYPE D LATERAL, BLIND METER SPLICE LENGTH TO ACCOMODATE A 1-1/2" METER AND ALL APPURTENANCES IN ACCORDANCE WITH BWS STD. DET. L-15.
1-TYPE "III" METER BOX
1-2" G.V.
1-TYPE 'B' METER BOX

(B) INSTALL BWS APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER AFTER THE METER PRIOR TO ANY BRANCHES OR TEES PER BWS STD. DET. V-9

(C) CAP AND MARK R1W2
8+33 @ ROOSEVELT
O/S 43' RT.

(D) FH CONN.
34+64.5 @ ROOSEVELT
O/S 15' RT.
1-16" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
51 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

(E) 29+00 @ ROOSEVELT
O/S 30' RT.
1-6"X4" GAS TEE

(F) 33+72 @ ROOSEVELT
O/S 30' RT.
1-6"X4" GAS TEE

(G) FH CONN.
27+10 @ ROOSEVELT
O/S 15' RT.
1-16" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
21 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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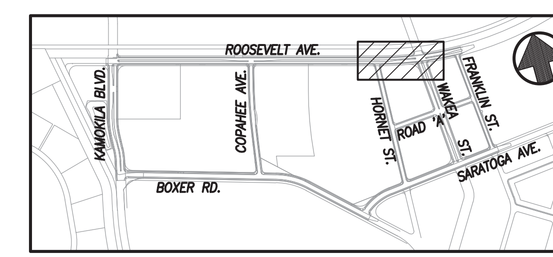
## LEGEND:

- IRRIGATION SLEEVE & SIZE
- GAS SYSTEM & SIZE — GAS6
- EXIST. POTABLE WATER SYSTEM
- NON-POTABLE WATER SYSTEM & SIZE — R1W12
- POTABLE WATER SYSTEM & SIZE — W16
- SEWER SYSTEM & SIZE — S8
- PAVEDRAIN SYSTEM




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION
Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## PLAN AND PROFILE – 4
## FRANKLIN D. ROOSEVELT AVENUE
## (STA. 27+00 TO STA. 36+00)

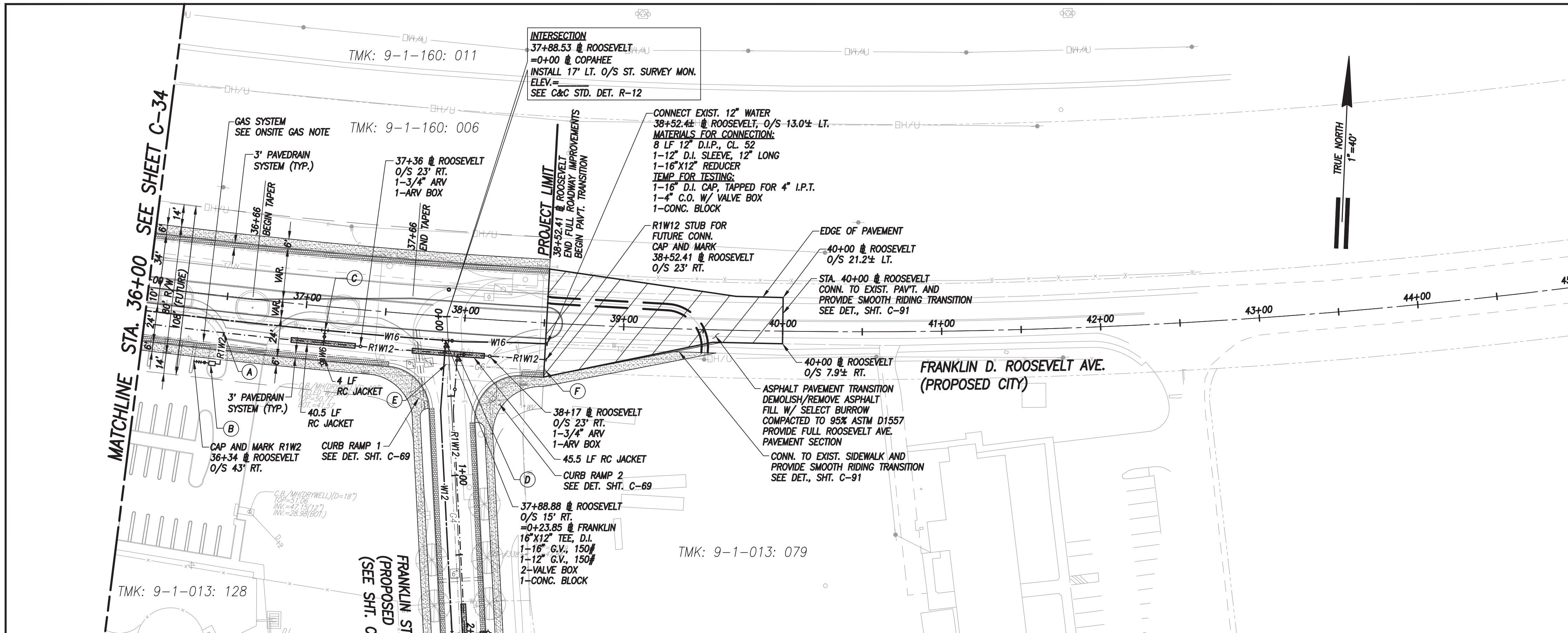
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

04/20
SIGNATURE DATE

APPROVED BY

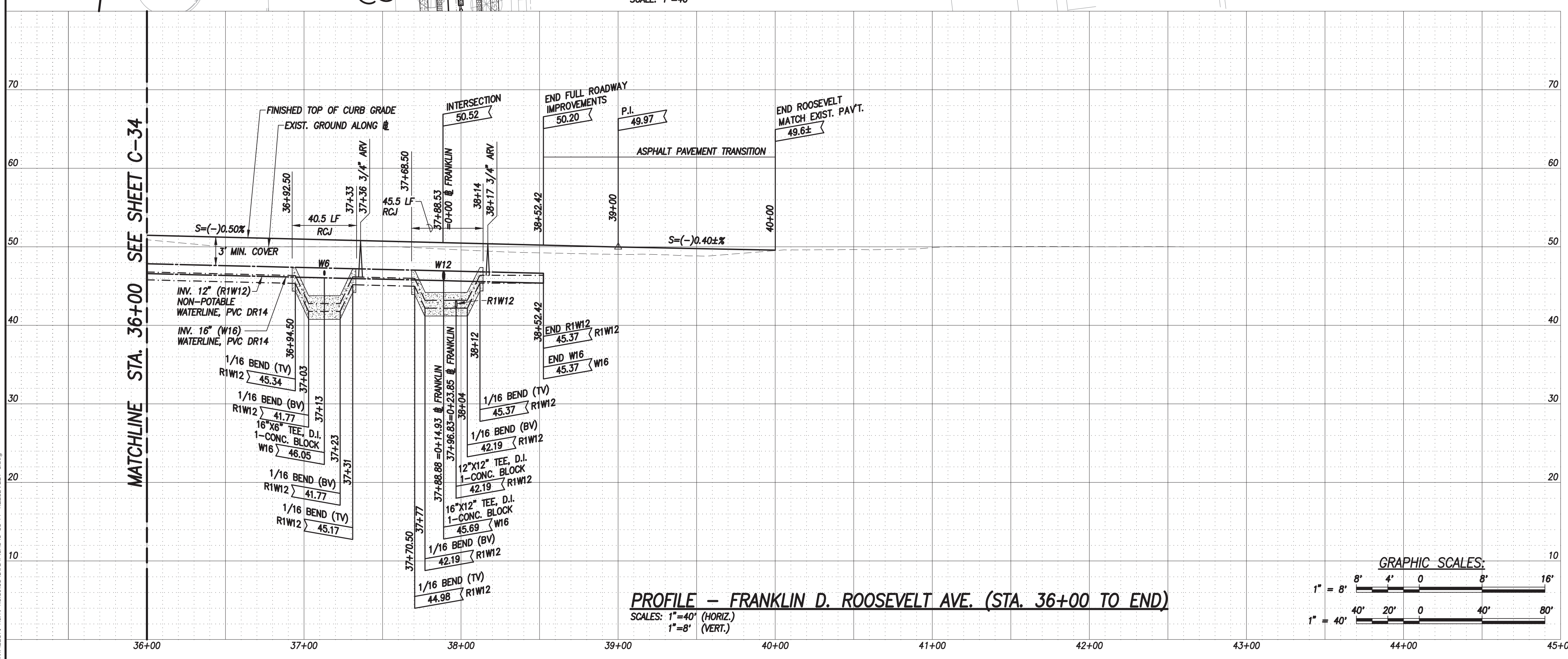
CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE POCKET FOLDER NO.




PLAN – FRANKLIN D. ROOSEVELT AVE. (STA. 36+00 TO END)

SCALE: 1"=40'




PROFILE – FRANKLIN D. ROOSEVELT AVE. (STA. 36+00 TO END)

SCALES: 1"=40' (HORIZ.)
1"=8' (VERT.)

GRAPHIC SCALES:
1" = 8' — 8' 4' 0 8' 16'
1" = 40' — 40' 20' 0 40' 80'

(A) 36+50 ℄ ROOSEVELT
O/S 24' RT.
CONTRACTOR TO INSTALL TYPE D LATERAL, BLIND METER SPLICE LENGTH TO ACCOMODATE A 1-1/2" METER AND ALL APPURTENANCES IN ACCORDANCE WITH BWS STD. DET. L-15.
1-TYPE "III" METER BOX
1-2" G.V.
1-TYPE 'B' METER BOX

(B) INSTALL BWS APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER AFTER THE METER PRIOR TO ANY BRANCHES OR TEES PER BWS STD. DET. V-9

(C) FH CONN.
37+13 ℄ ROOSEVELT
O/S 15' RT.
1-16" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
51 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

(D) 37+96.83 ℄ ROOSEVELT
O/S 23' RT.
=0+14.93 ℄ FRANKLIN
12"X12" TEE, D.I.
2-12" G.V., 150#
2-VALVE BOX
1-CONC. BLOCK

(E) 37+90.35 ℄ ROOSEVELT
O/S 30' RT.
1-6"X4" GAS TEE

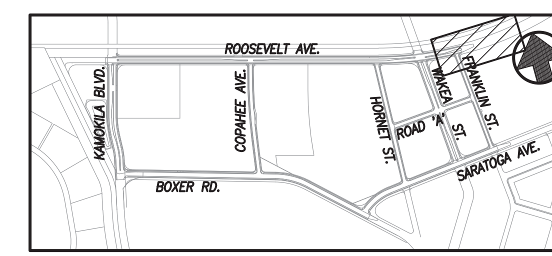
(F) 38+52.40 ℄ ROOSEVELT
O/S 30' RT.
END G6
INV.=XX.XX
1-6" GAS CAP AND MARKER

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | W |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|
| | | | | |

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

### PLAN AND PROFILE – 5
### FRANKLIN D. ROOSEVELT AVENUE
### (STA. 36+00 TO END)

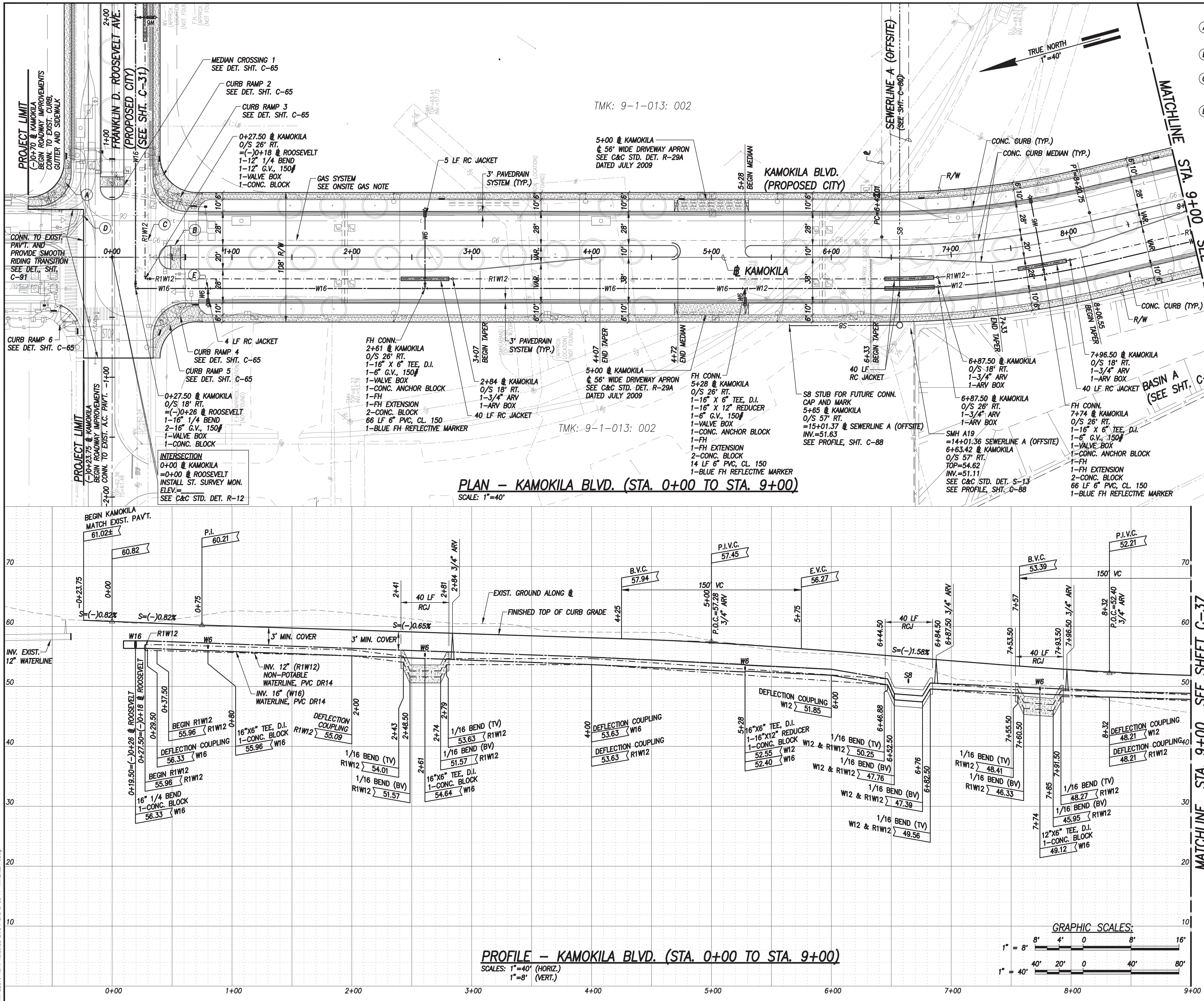
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE POCKET FOLDER NO.




Ⓐ CURB RAMP 1
SEE DET. SHT. C-65

Ⓑ MEDIAN CROSSING 2
SEE DET. SHT. C-65

Ⓒ 0+30 ℄ KAMOKILA
O/S 14.20' LT.
1-6" GAS 1/4 BEND (H)

Ⓓ (–)0+23.75 ℄ KAMOKILA
O/S 34.75' LT.
END G6
INV.=XX.XX
1-6" CAP AND MARKER

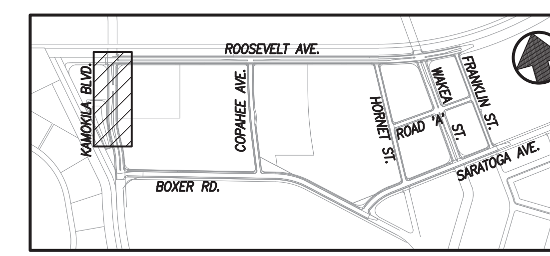
Ⓔ FH CONN.
0+79 ℄ KAMOKILA
O/S 26' RT.
1-16" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
14 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| PAVEDRAIN SYSTEM | |




## KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

### PLAN AND PROFILE – 1
### KAMOKILA BOULEVARD
### (STA. 0+00 TO STA. 9+00)

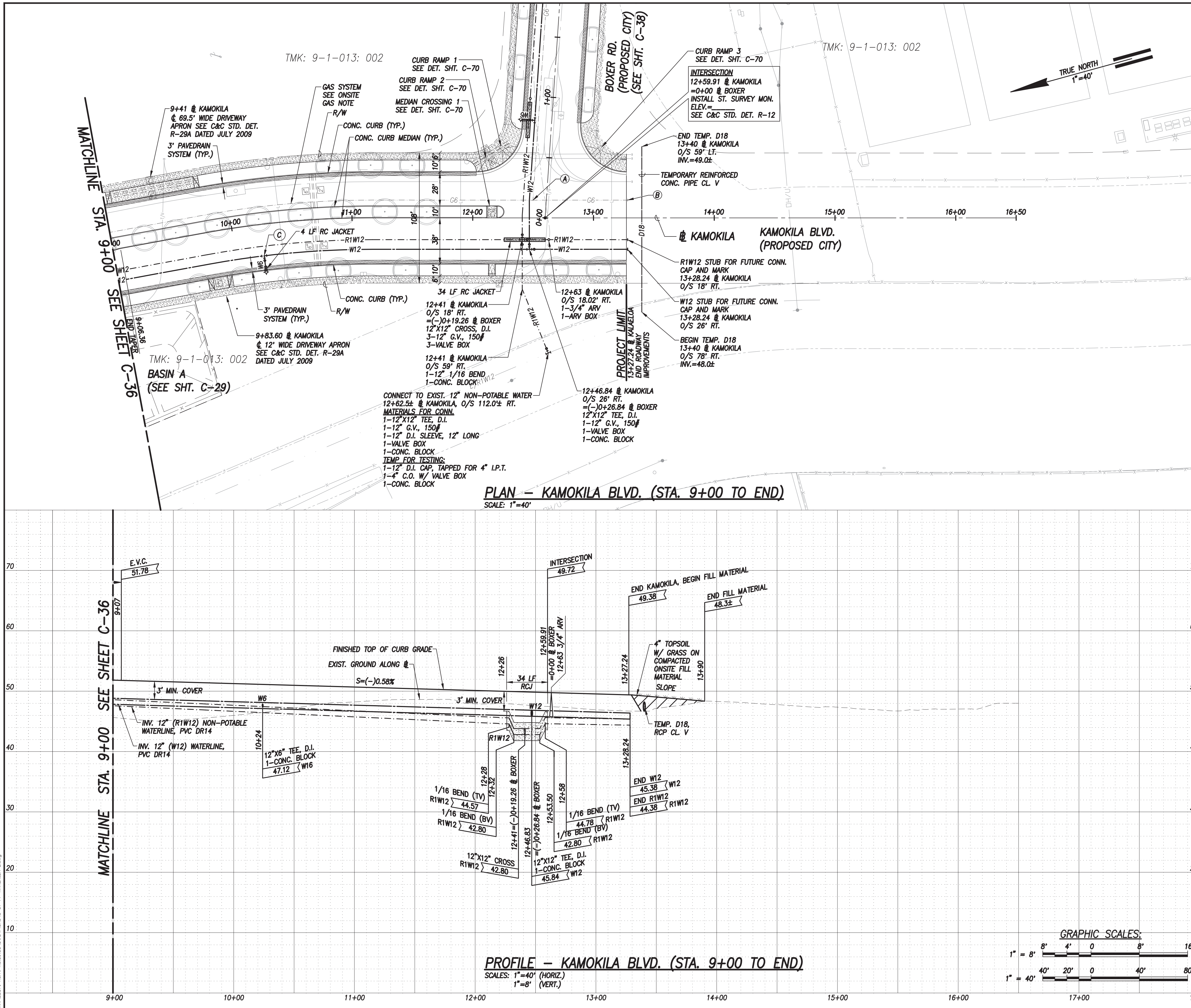
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE
CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




Ⓐ 12+49.84 ℄ KAMOKILA
O/S 14.70' LT.
1-6" X 6" GAS TEE

Ⓑ 13+28.22 ℄ KAMOKILA
O/S 14.70' LT.
END G6
INV.=XX.XX
1-6" CAP AND MARKER

Ⓒ FH CONN.
10+24 ℄ KAMOKILA
O/S 26' RT.
1-16" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
14 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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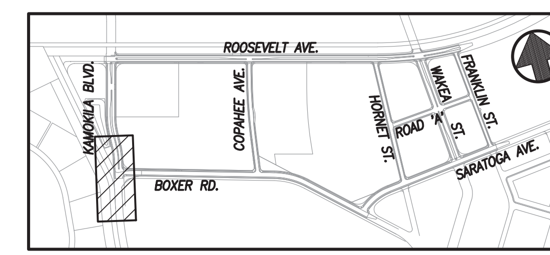
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

# PLAN AND PROFILE – 2
# KAMOKILA BOULEVARD
# (STA. 9+00 TO END)

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

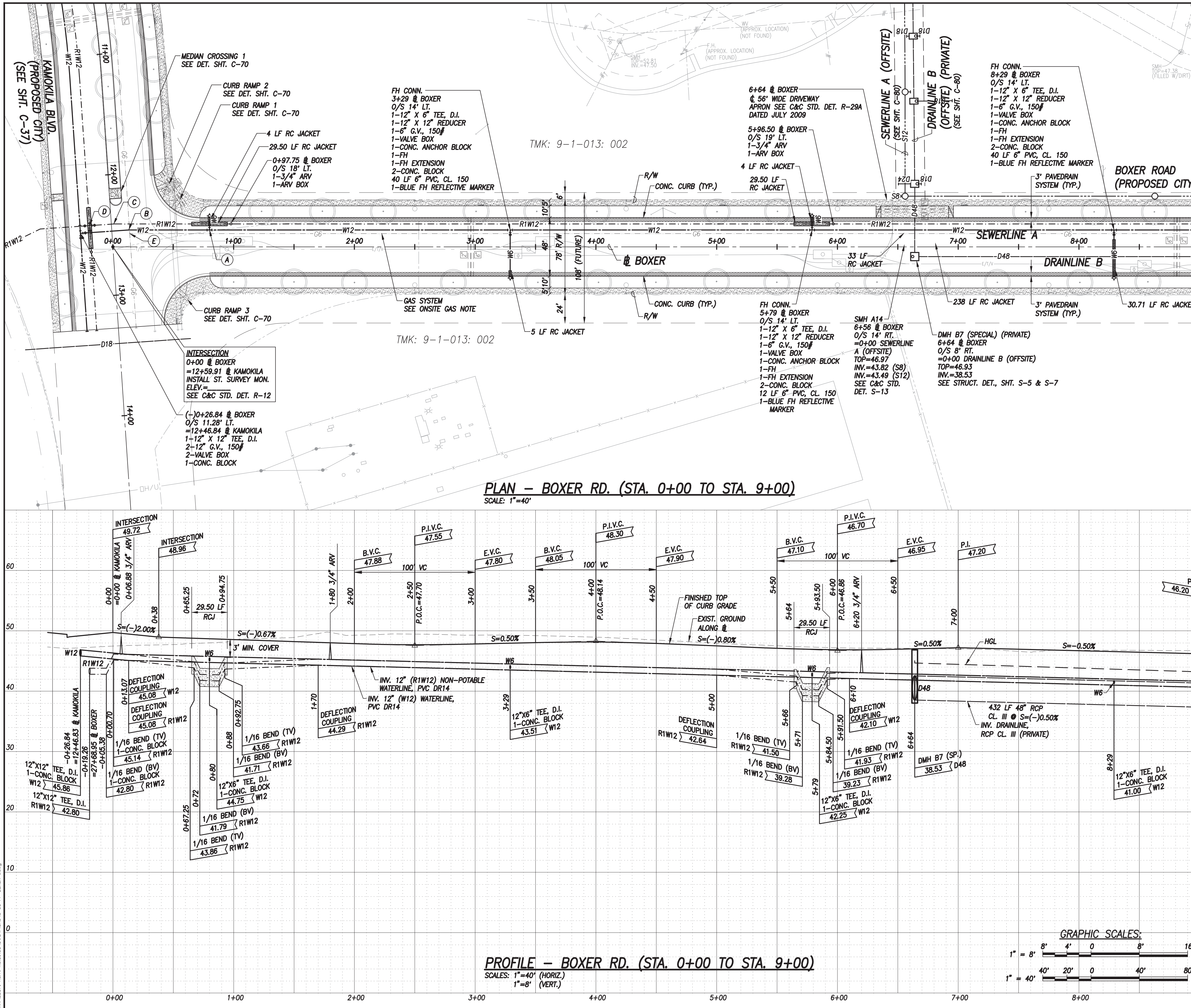
SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE
CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE



| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




Ⓐ FH CONN.
0+80 ℄ BOXER
O/S 14' LT.
1-12" X 6" TEE, D.I.
1-12" X 12" REDUCER
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
12 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

Ⓑ DEFLECT 3.9°
0+13.07 ℄ BOXER
O/S 14' LT.
1-12" DEFLECTION COUPLING

Ⓒ DEFLECT 3.9°
0+00.70 ℄ BOXER
O/S 19' LT.
1-12" DEFLECTION COUPLING

Ⓓ (-)0+19.26 ℄ BOXER
O/S 17.64' LT.
=12+41 ℄ KAMOKILA
1-12" X 12" TEE, D.I.
2-12" G.V., 150#
2-VALVE BOX
1-CONC. BLOCK

Ⓔ 0+14 ℄ BOXER
O/S 11' LT.
1-6" X 6" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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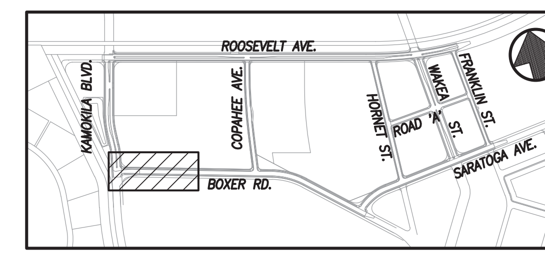
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

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SIGNATURE 04/20 DATE

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

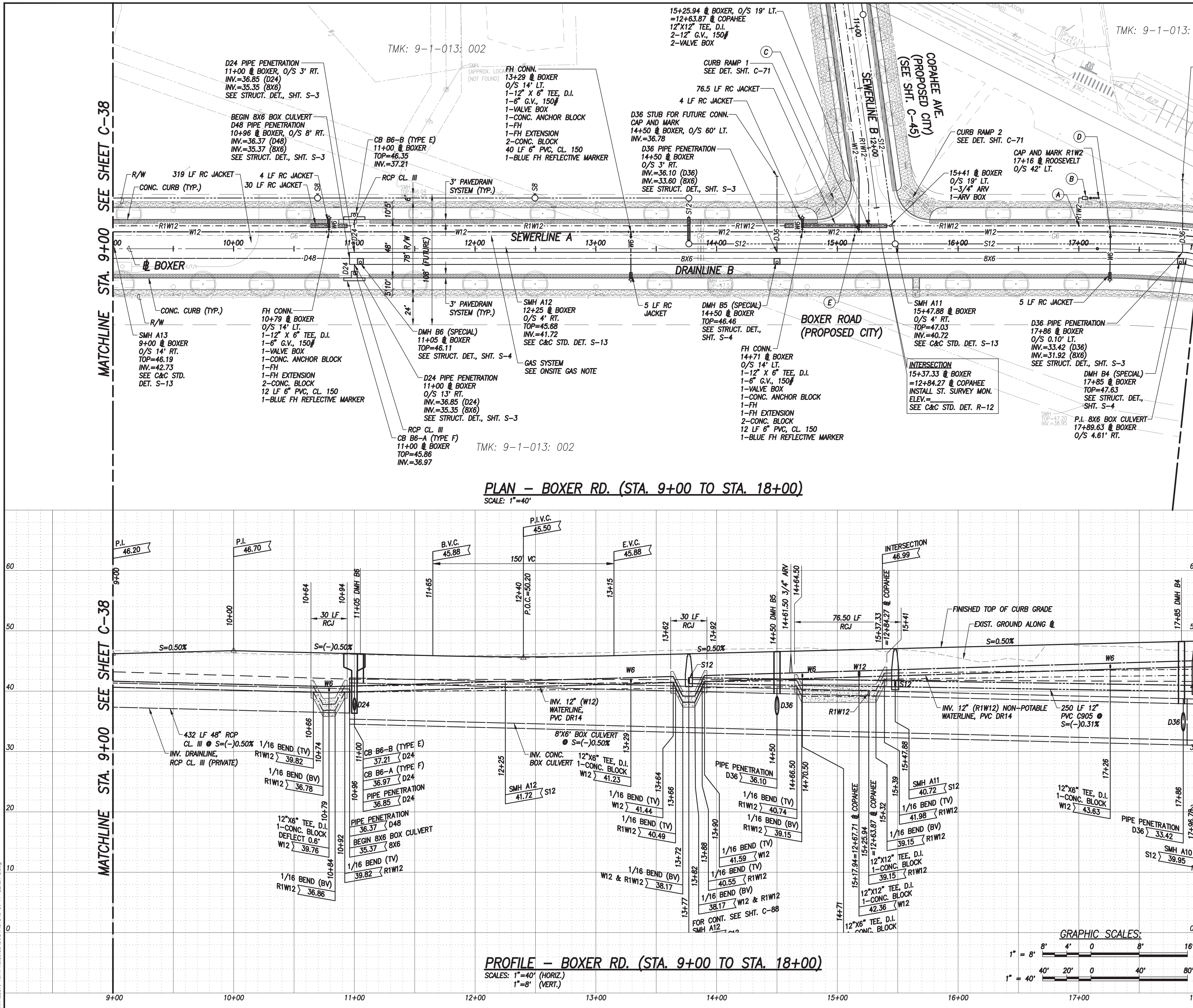
# PLAN AND PROFILE - 1
# BOXER ROAD
# (STA. 0+00 TO STA. 9+00)

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE



| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




A 17+00 @ ROOSEVELT
O/S 19' LT.
CONTRACTOR TO INSTALL TYPE D LATERAL, BLIND METER SPLICE LENGTH TO ACCOMODATE A 1-1/2" METER AND ALL APPURTENANCES IN ACCORDANCE WITH BWS STD. DET. L-15.
1-TYPE "III" METER BOX
1-2" G.V.
1-TYPE 'B' METER BOX

B INSTALL BWS APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER AFTER THE METER PRIOR TO ANY BRANCHES OR TEES PER BWS STD. DET. V-9

C 15+17.94 @ BOXER, O/S 17.27
=12+67.71 @ COPAHEE
12"X12" TEE, D.I.
2-12" G.V., 150#
2-VALVE BOX
1-CONC. BLOCK

D FH CONN.
17+26 @ BOXER, O/S 14' LT.
1-12" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
40 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

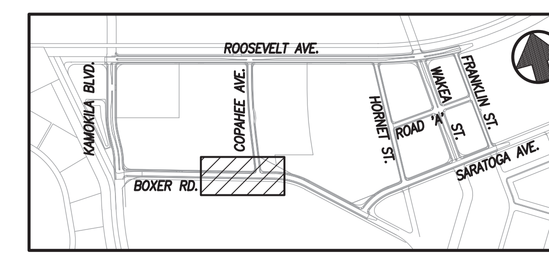
E 12+70.15 @ BOXER
O/S 21.30' RT.
1-6" X 4" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

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SIGNATURE 04/20 DATE

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

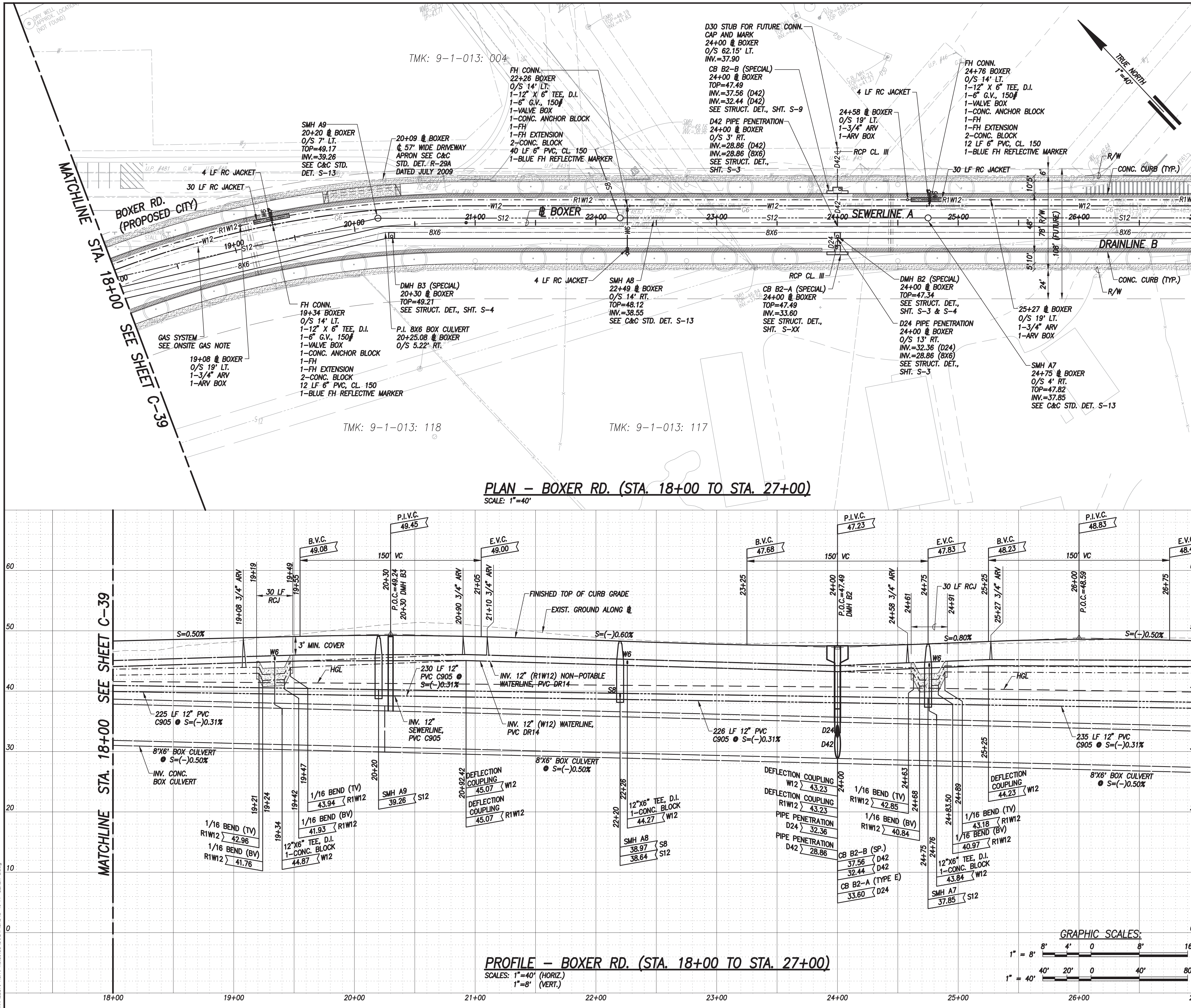
DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

# PLAN AND PROFILE - 2
# BOXER ROAD
# (STA. 9+00 TO STA. 18+00)

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE
CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE POCKET FOLDER NO.




## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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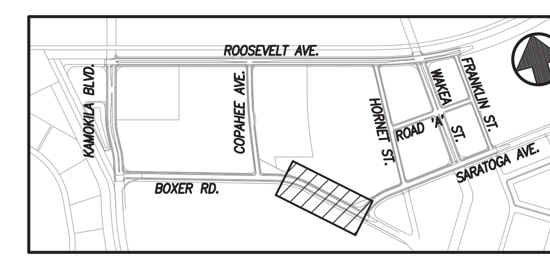
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | W |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




## KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

# PLAN AND PROFILE - 3
# BOXER ROAD
# (STA. 18+00 TO STA. 27+00)

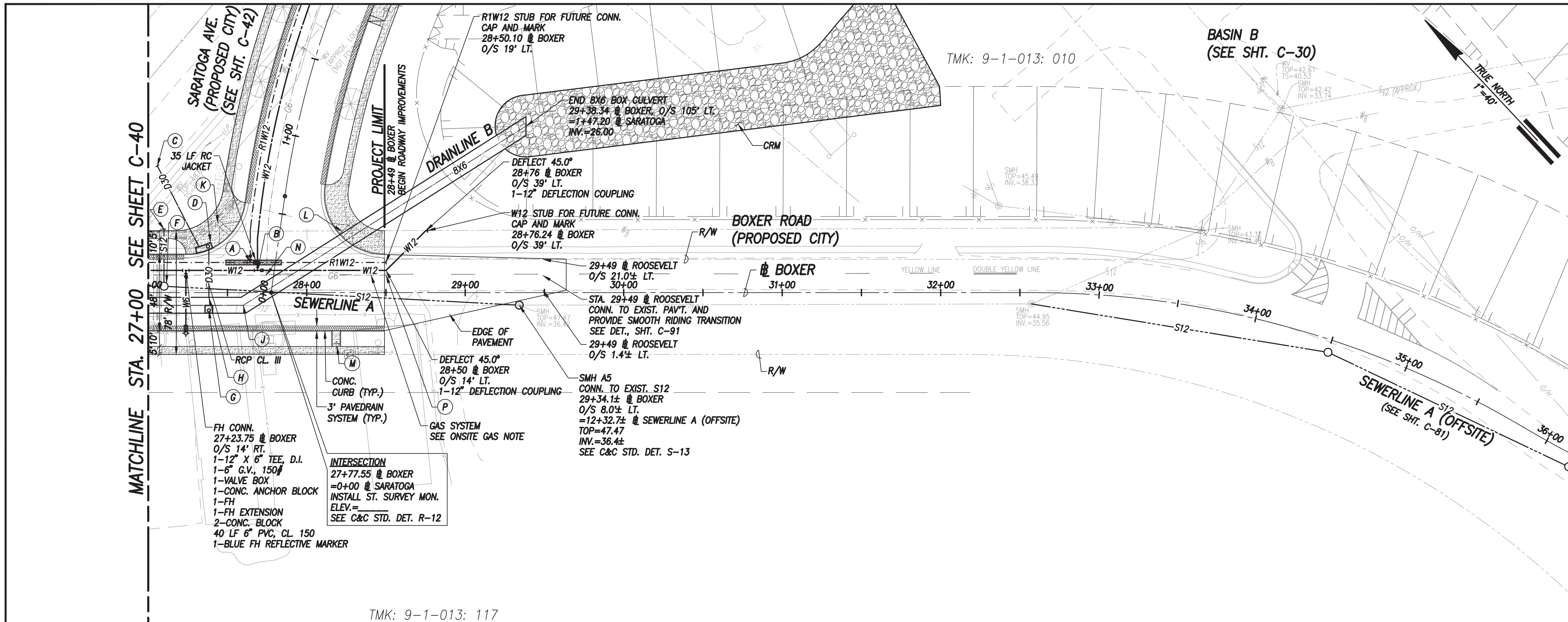
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

04/20
SIGNATURE DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE
CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




A 27+64.42 @ BOXER O/S 19' LT. =0+16.96 @ SARATOGA 12"X12" TEE, D.I. 2-12" G.V., 150# 2-VALVE BOX 1-CONC. BLOCK

B 27+68.95 @ BOXER O/S 14' LT. =0+12.65 @ SARATOGA 12"X12" TEE, D.I. 2-12" G.V., 150# 2-VALVE BOX 1-CONC. BLOCK

C D30 STUB FOR FUTURE CONN. CAP AND MARK 25+05.79 @ BOXER O/S 79.88' RT. INV.=38.81

D CB B1-A (SPECIAL) 27+35.83 @ BOXER O/S 25.97' LT. TOP=41.18 INV.=38.19 (D30) INV.=31.43 (D30) SEE STRUCT. DET., SHT. S-XX

E S8 STUB FOR FUTURE CONN. CAP AND MARK 27+10 @ BOXER O/S 40' LT. TOP=48.27 INV.=36.76

F SMH B2 28+00 @ BOXER O/S 13' LT. TOP=47.72 INV.=36.84 SEE C&C STD. DET. S-13

G DMH B1 (SPECIAL) 27+38.29 @ BOXER TOP=47.98 SEE STRUCT. DET., SHT. S-3 & S-4

H D30 PIPE PENETRATION 27+38.29 @ BOXER O/S 3' RT. INV.=29.67 (D30) INV.=27.17 (8X6) SEE STRUCT. DET., SHT. S-3

J P.I. 8X6 BOX CULVERT 27+60.04 @ BOXER O/S 8' RT.

K CURB RAMP 1 STD. DET. SHT. C-72

L CURB RAMP 2 STD. DET. SHT. C-72

M CURB RAMP 3 STD. DET. SHT. C-72

N 27+74.43 @ BOXER O/S 11' LT. 1-6"X6" GAS TEE

P 28+50 @ BOXER O/S 11' LT. END G6 INV.=XX.XX 1-6" GAS CAP AND MARKER

## PLAN – BOXER RD. (STA. 27+00 TO END)

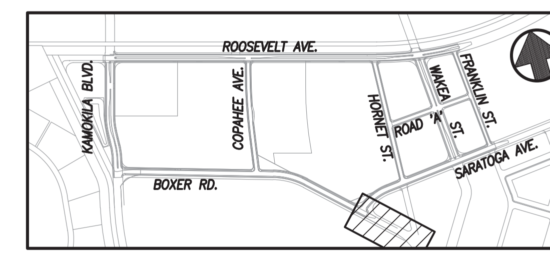
SCALE: 1"=40'

## NOTES:

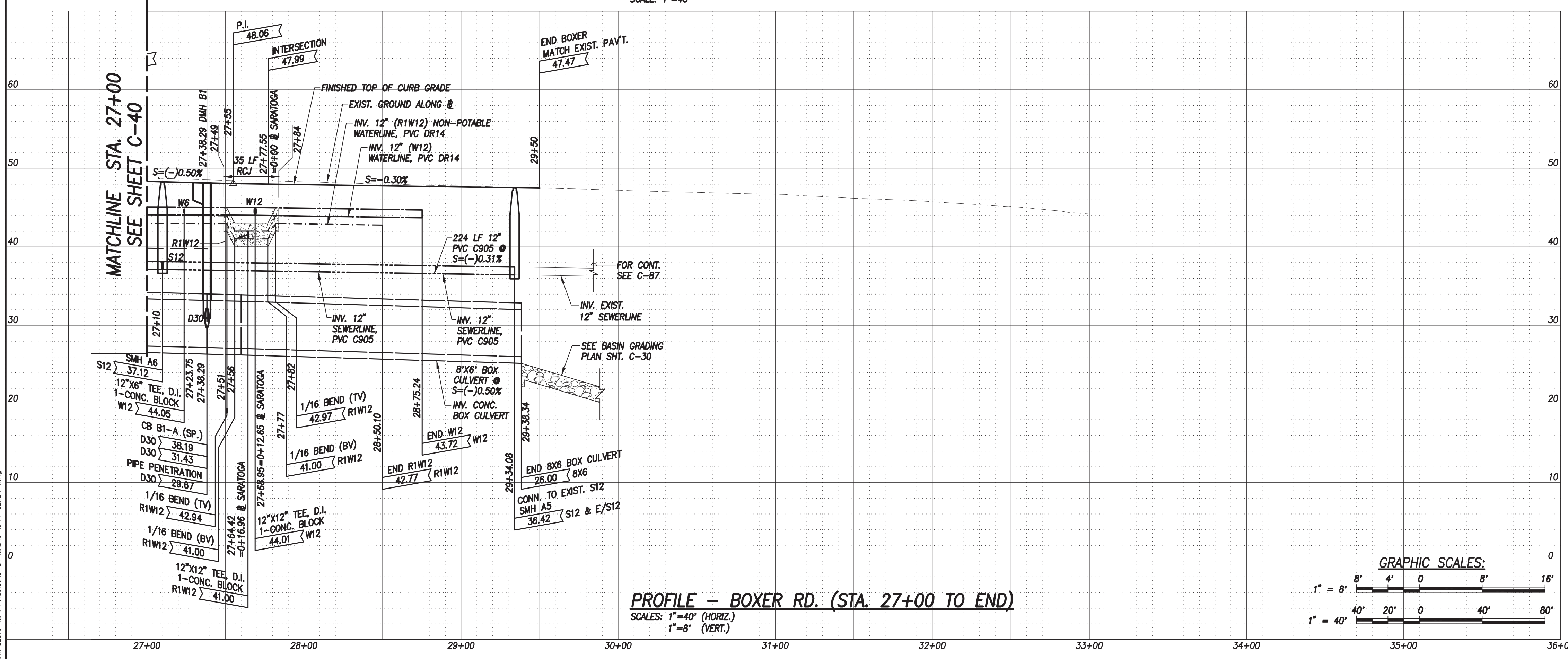
1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




## KEY MAP




## PROFILE – BOXER RD. (STA. 27+00 TO END)

SCALES: 1"=40' (HORIZ.) 1"=8' (VERT.)

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|
| | | | | |

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

R. M. TOWILL CORPORATION

808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

# PLAN AND PROFILE – 4 BOXER ROAD (STA. 27+00 TO END)

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SIGNATURE 04/20 DATE

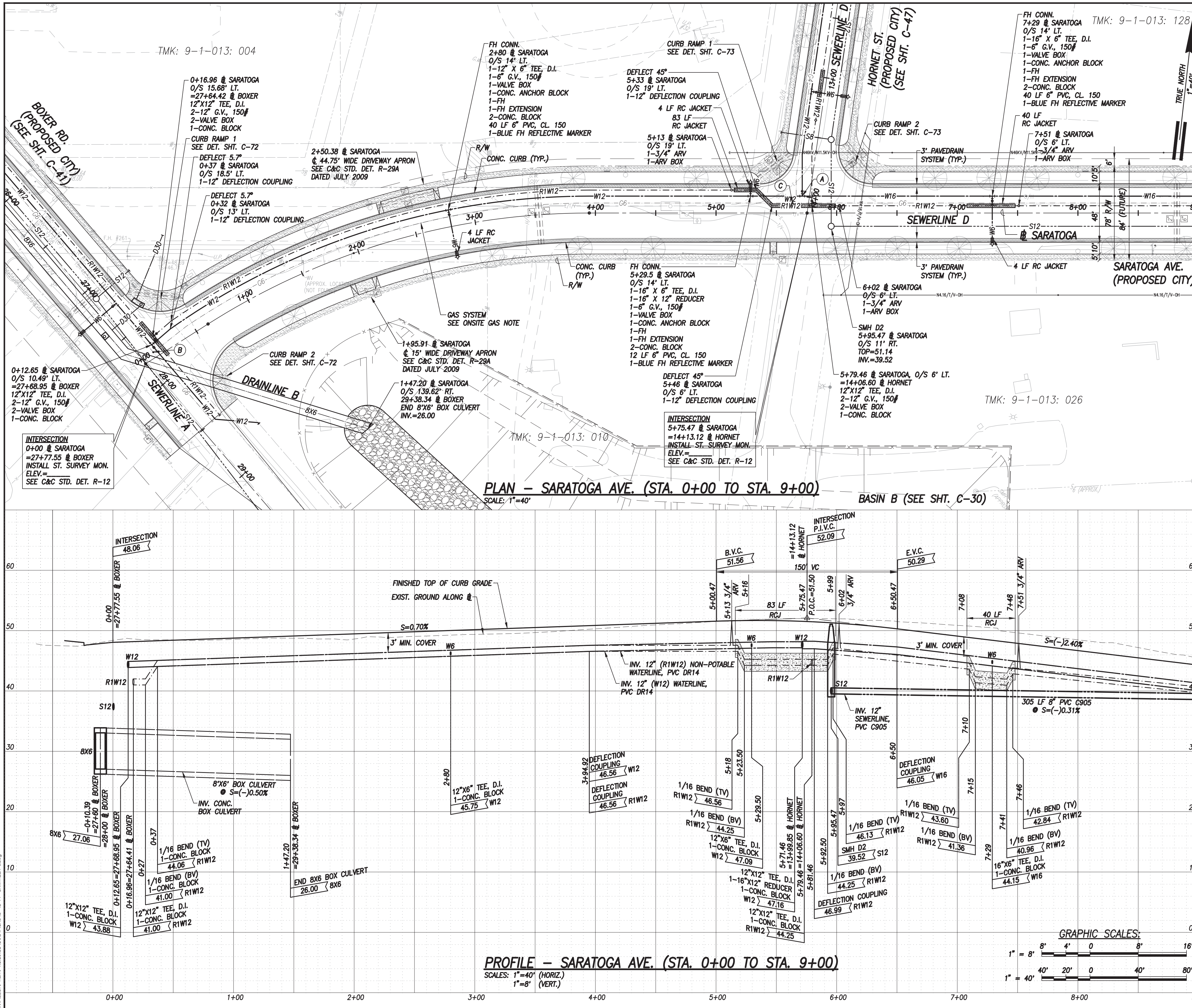
APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE POCKET FOLDER NO.



Tue, 23 Apr 2019 - 2:38pm K:\Civil\2237\ Kurt Kalaeloa\Dwg\Plans\C-41 PP BOXER-4.dwg




(A) 5+71.46 ℄ SARATOGA
O/S 14' LT.
=13+99.85 ℄ HORNET
1–16"X12" TEE, D.I.
1–16"x12" REDUCER
1–16" G.V., 150#
1–12" G.V., 150#
2–VALVE BOX
1–CONC. BLOCK

(B) 0+10.46 ℄ SARATOGA
O/S 4.64' LT.
1–6" X 6" GAS TEE

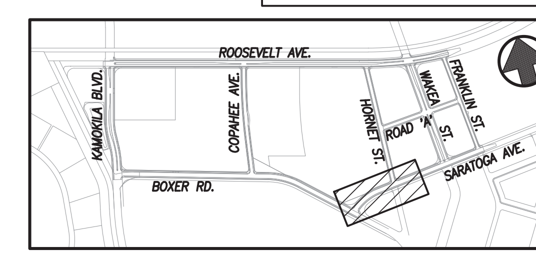
(C) 5+63.29 ℄ SARATOGA
O/S 8.30' LT.
1–6" X 6" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

R. M. TOWILL CORPORATION

808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## PLAN AND PROFILE – 1
## SARATOGA AVENUE
## (STA. 0+00 TO STA. 9+00)

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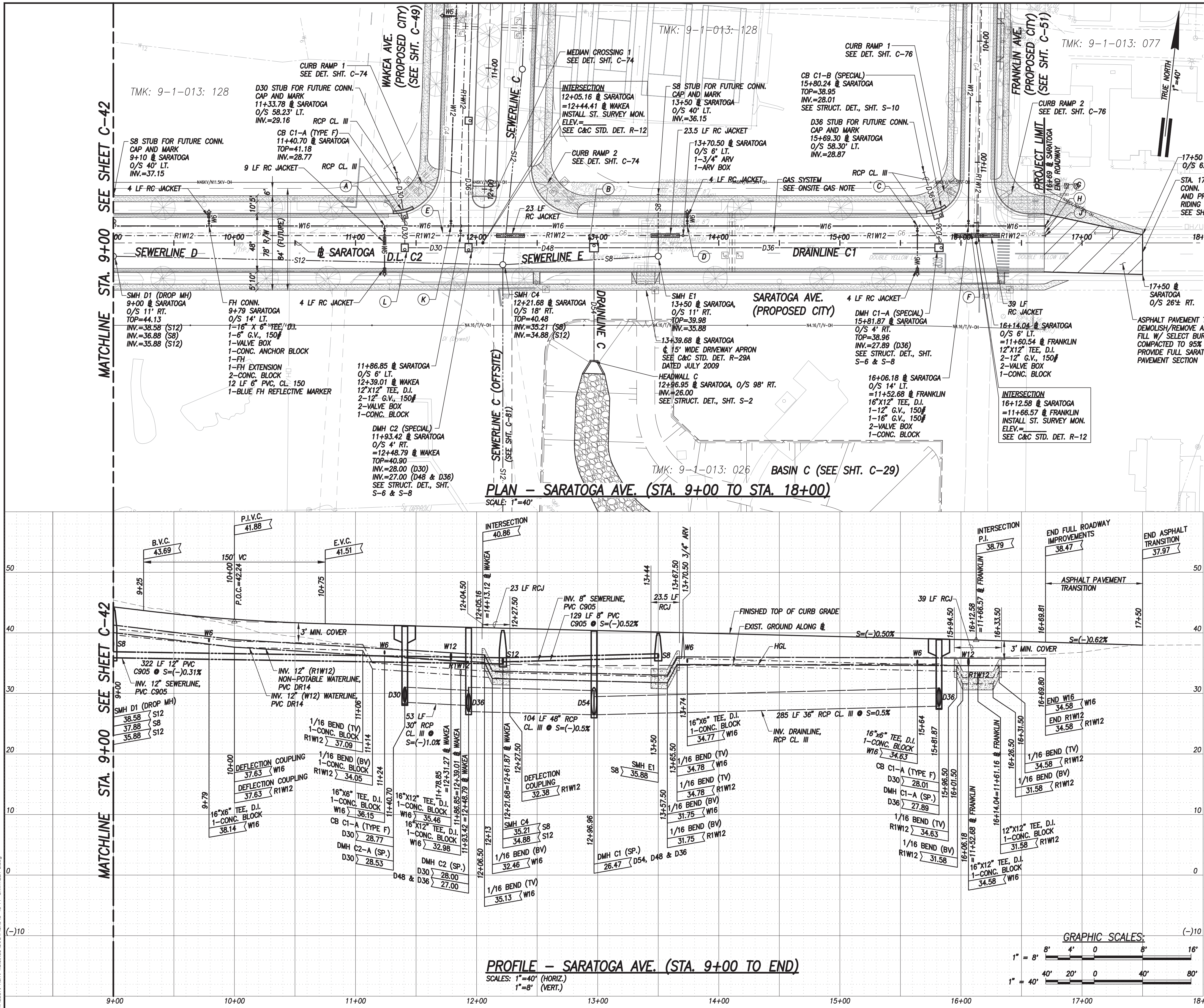
04/20

SIGNATURE DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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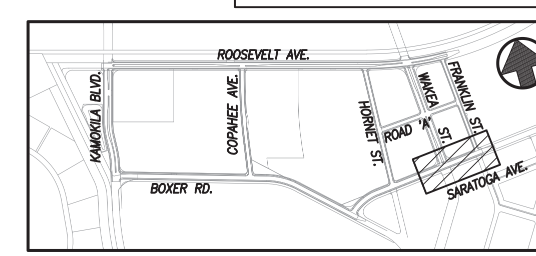
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




## KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## PLAN AND PROFILE – 2
## SARATOGA AVENUE
## (STA. 9+00 TO END)

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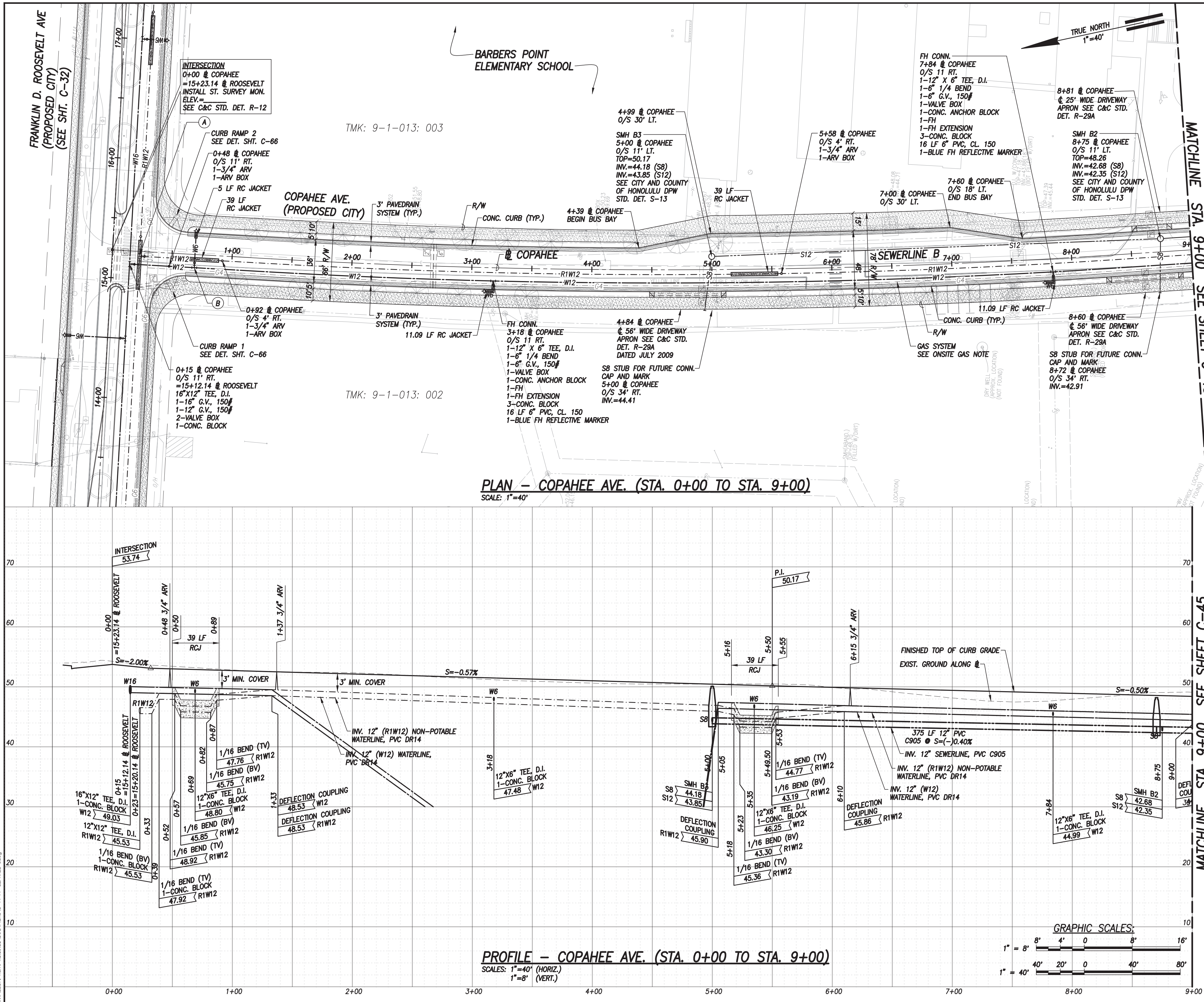
SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE



| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




Ⓐ 0+23 ℄ COPAHEE
O/S 4' RT.
=15+19.14 ℄ ROOSEVELT
12"X12" TEE, D.I.
2-12" G.V., 150#
2-VALVE BOX
1-CONC. BLOCK

Ⓑ FH CONN.
0+69 ℄ COPAHEE
O/S 11' RT.
1-12" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
31 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

Ⓒ 0+30 ℄ COPAHEE
O/S 13.30' RT.
1-6"X4" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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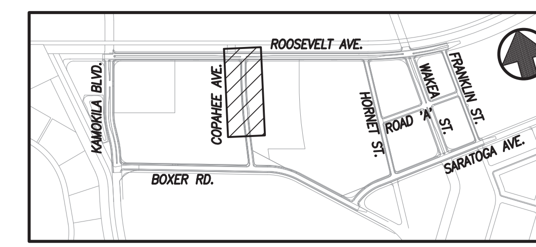
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

APPROVED

DEPARTMENT OF EDUCATION DATE

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

PLAN AND PROFILE - 1
COPAHEE AVENUE
(STA. 0+00 TO STA. 9+00)

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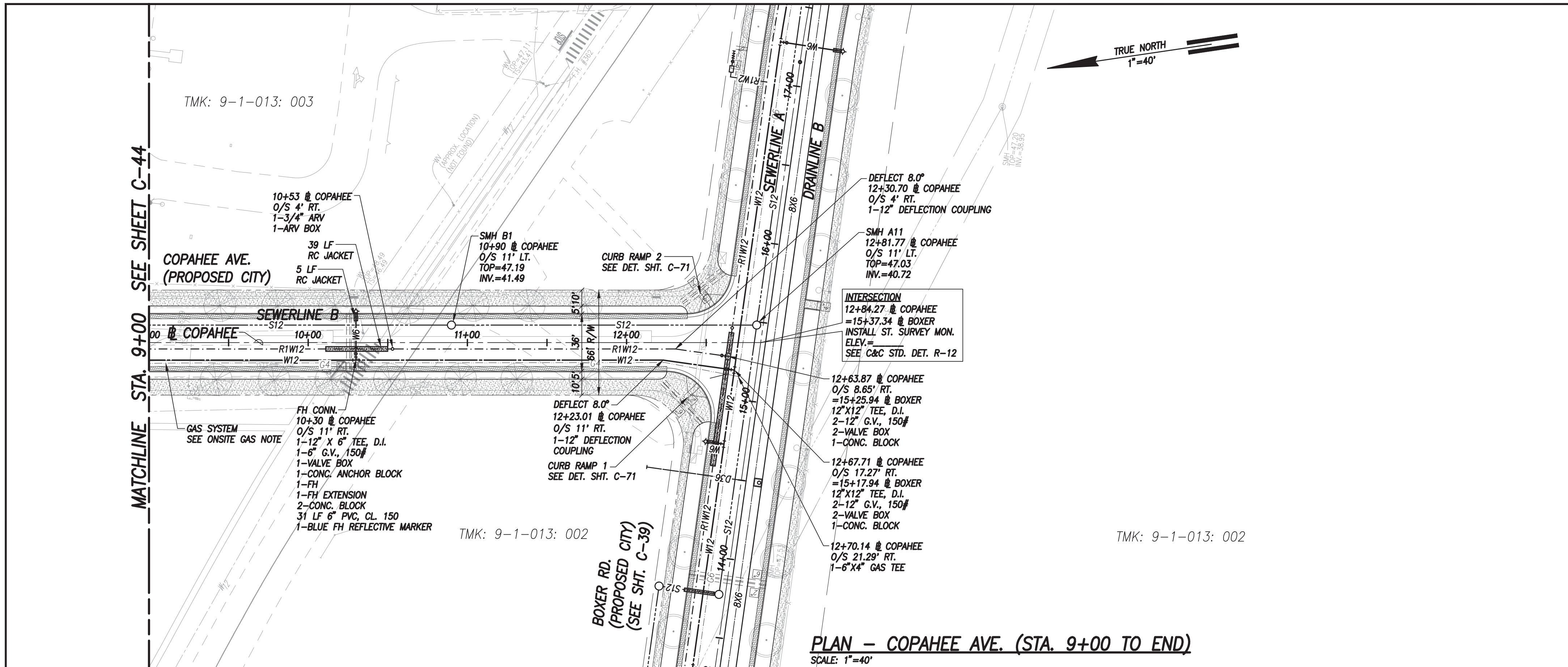
SIGNATURE 04/20 DATE

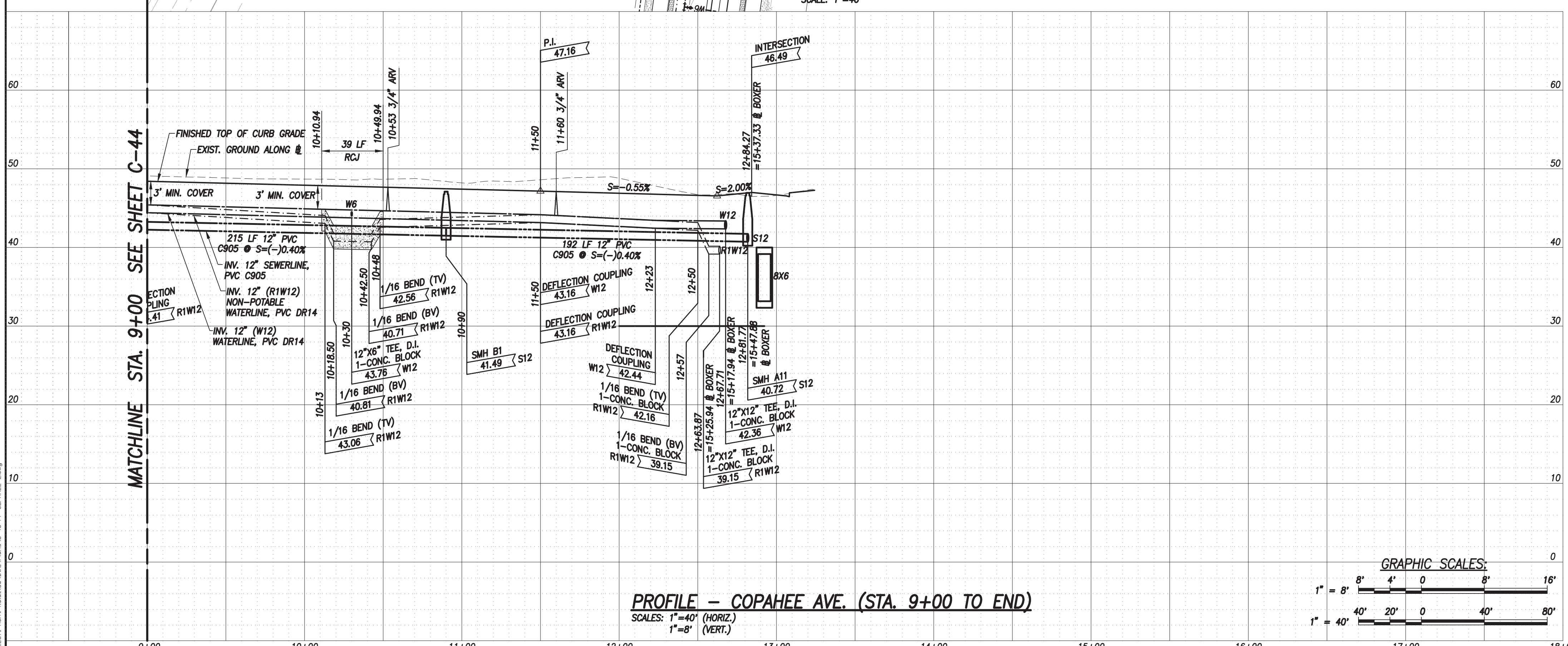
APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE
CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE




## PLAN – COPAHEE AVE. (STA. 9+00 TO END)

SCALE: 1"=40'




## PROFILE – COPAHEE AVE. (STA. 9+00 TO END)

SCALES: 1"=40' (HORIZ.)
1"=8' (VERT.)

GRAPHIC SCALES:
1" = 8'
1" = 40'

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
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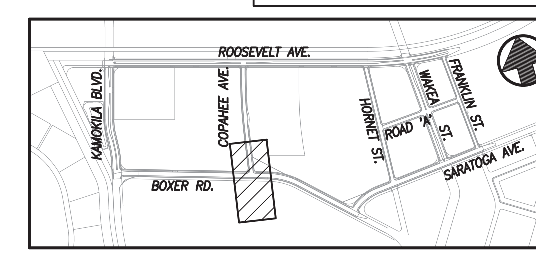
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




## KEY MAP

APPROVED

DEPARTMENT OF EDUCATION — DATE

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

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04/20

SIGNATURE — DATE

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning • Engineering • Environmental Services • Photogrammetry • Surveying • Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

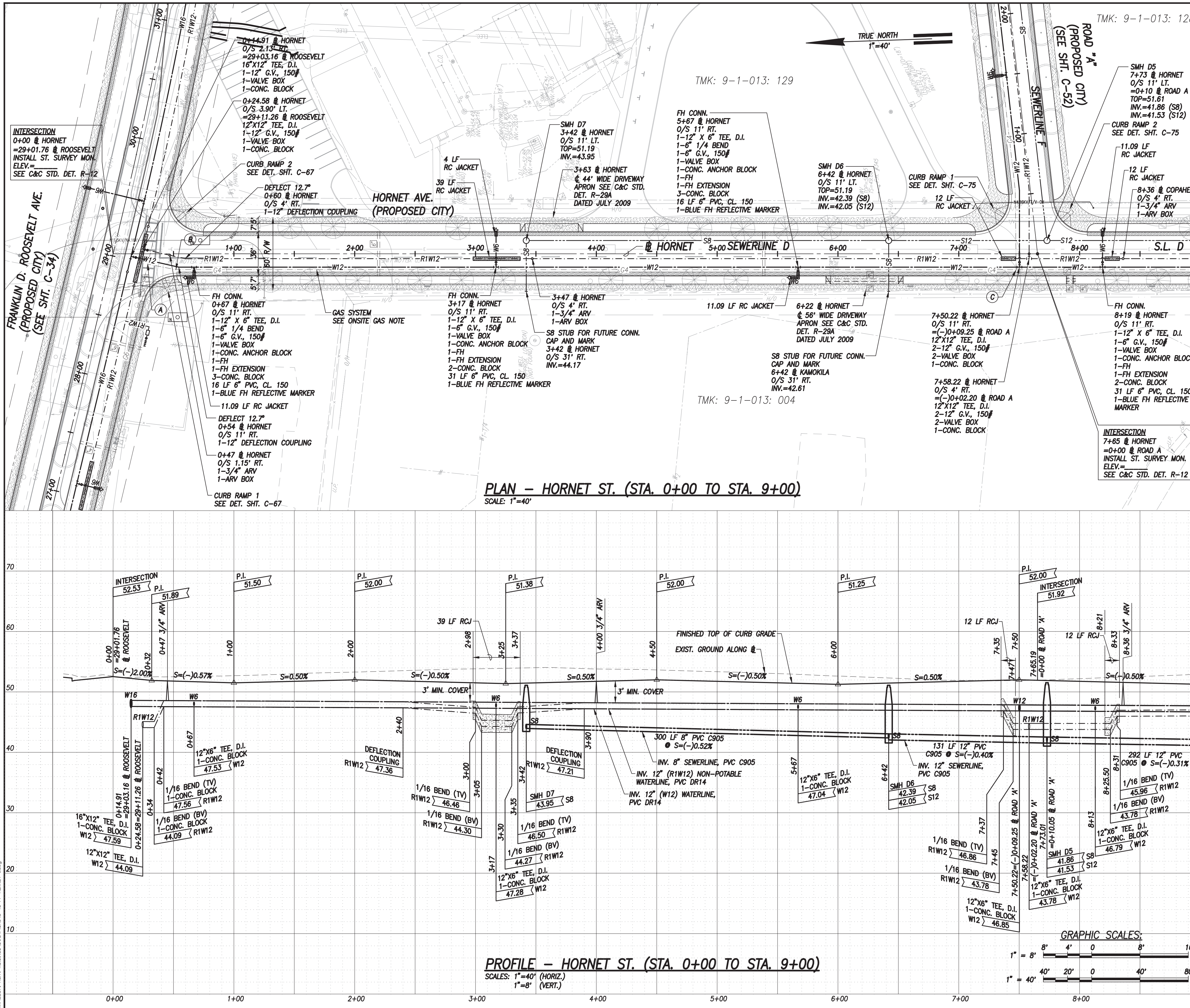
## PLAN AND PROFILE – 2
## COPAHEE AVENUE
## (STA. 9+00 TO END)

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP — DATE — CHIEF, TRAFFIC REVIEW BRANCH, DPP — DATE



| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|
| | | | |




(A) 0+28.71 ℄ HORNET
O/S 8.53' RT.
1-6"X4" GAS TEE

(B) 0+52 ℄ HORNET
O/S 13.50' RT.
1-6" GAS 1/32 BEND (H)

(C) 7+47.47 ℄ HORNET
O/S 13.50' RT.
1-4"X4" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
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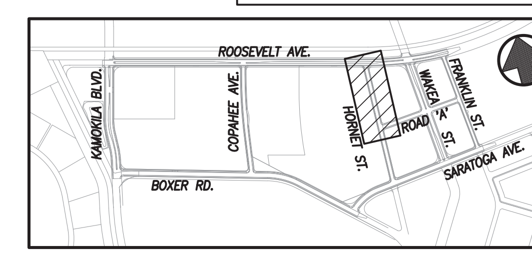
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION
Planning • Engineering • Environmental Services • Photogrammetry • Surveying • Construction Management
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

### PLAN AND PROFILE - 1
### HORNET STREET
### (STA. 0+00 TO STA. 9+00)

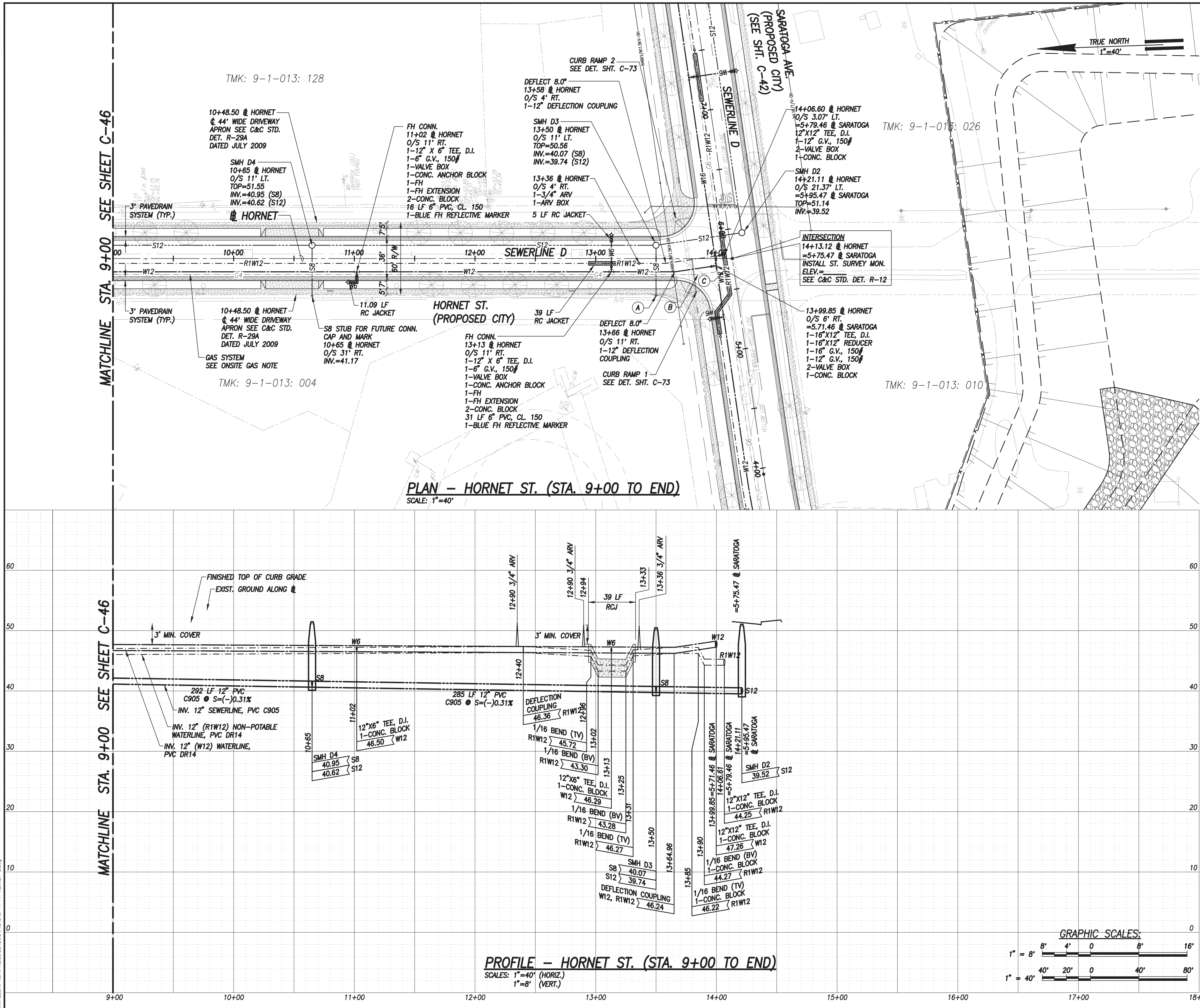
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




Ⓐ S8 STUB FOR FUTURE CONN. CAP AND MARK 13+50 ℄ HORNET O/S 31' RT. INV.=40.29

Ⓑ 13+84.75 ℄ HORNET O/S 13.25' RT. 1-4" GAS DEFLECTION COUPLING

Ⓒ 14+06.22 ℄ HORNET O/S 10.12' RT. 1-6"X4" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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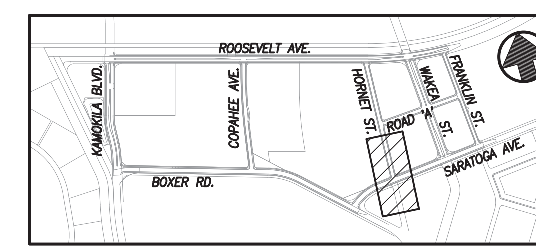
## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION
Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## PLAN AND PROFILE – 2
## HORNET STREET
## (STA. 9+00 TO END)

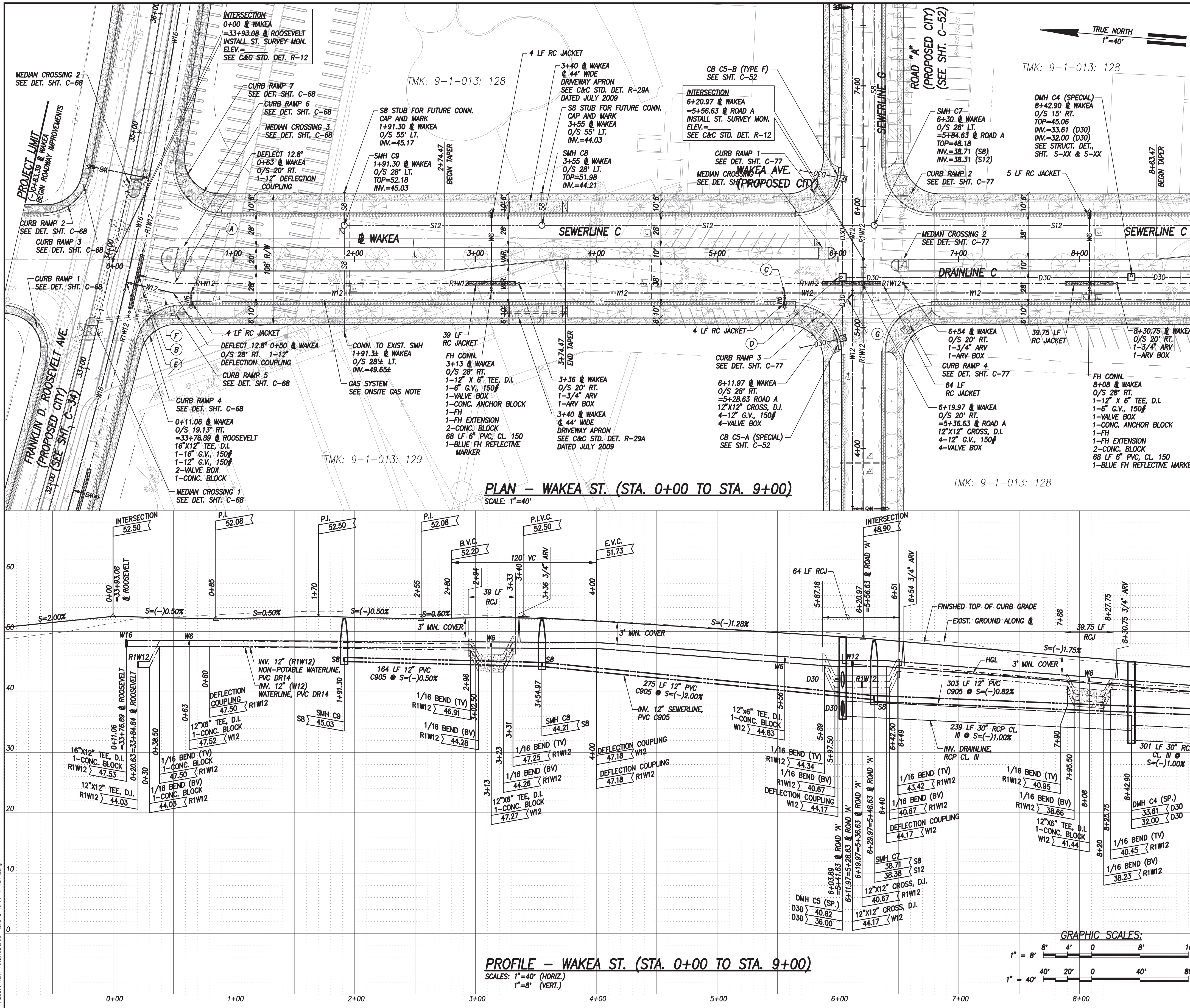
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|



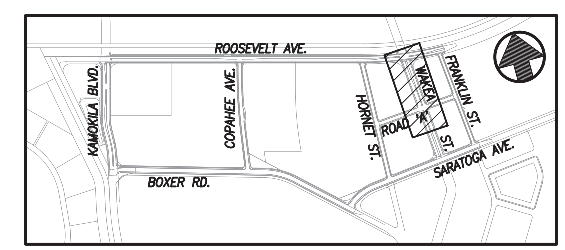

- (A) FH CONN. 0+63 ℄ WAKEA, O/S 28' RT., 1–12" X 6" TEE, D.I., 1–6" G.V., 150#, 1–VALVE BOX, 1–CONC. ANCHOR BLOCK, 1–FH, 1–FH EXTENSION, 2–CONC. BLOCK, 12 LF 6" PVC, CL. 150, 1–BLUE FH REFLECTIVE MARKER
- (B) 0+20.63 ℄ WAKEA, O/S 13.11' RT., =33+84.84 ℄ ROOSEVELT, 12"X12" TEE, D.I., 2–12" G.V., 150#, 2–VALVE BOX, 1–CONC. BLOCK
- (C) FH CONN. 5+56 ℄ WAKEA, O/S 28' RT., 1–12" X 6" TEE, D.I., 1–6" G.V., 150#, 1–VALVE BOX, 1–CONC. ANCHOR BLOCK, 1–FH, 1–FH EXTENSION, 2–CONC. BLOCK, 12 LF 6" PVC, CL. 150, 1–BLUE FH REFLECTIVE MARKER
- (D) DMH C5 (SPECIAL), 6+03.89 ℄ WAKEA, O/S 15' RT., =5+41.63 ℄ ROAD A, TOP=47.89, INV.=40.82 (D30), INV.=36.00 (D30)
- (E) 0+24.68 ℄ WAKEA, O/S 27.22' RT., 1–4"X4" GAS TEE
- (F) 0+43.71 ℄ WAKEA, O/S 33' RT., 1–4" 1/32 BEND (H)
- (G) 6+08.11 ℄ WAKEA, O/S 33' RT., 1–4"X4" GAS TEE

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, PIPE BEDDING AND BACKFILLING FOR INSTALLATION OF THE GAS LINES. HAWAII GAS WILL INSTALL THE GAS LINE AND PROVIDE ALL PIPING, VALVES AND APPURTENANCES. THE CONTRACTOR SHALL COORDINATE INSTALLATION WITH HAWAII GAS.

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
| NON-POTABLE WATER SYSTEM & SIZE | R1W12 |
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




## KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

Planning · Engineering · Environmental Services · Photogrammetry · Surveying · Construction Management

R. M. TOWILL CORPORATION

808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

# PLAN AND PROFILE – 1 WAKEA STREET (STA. 0+00 TO STA. 9+00)

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

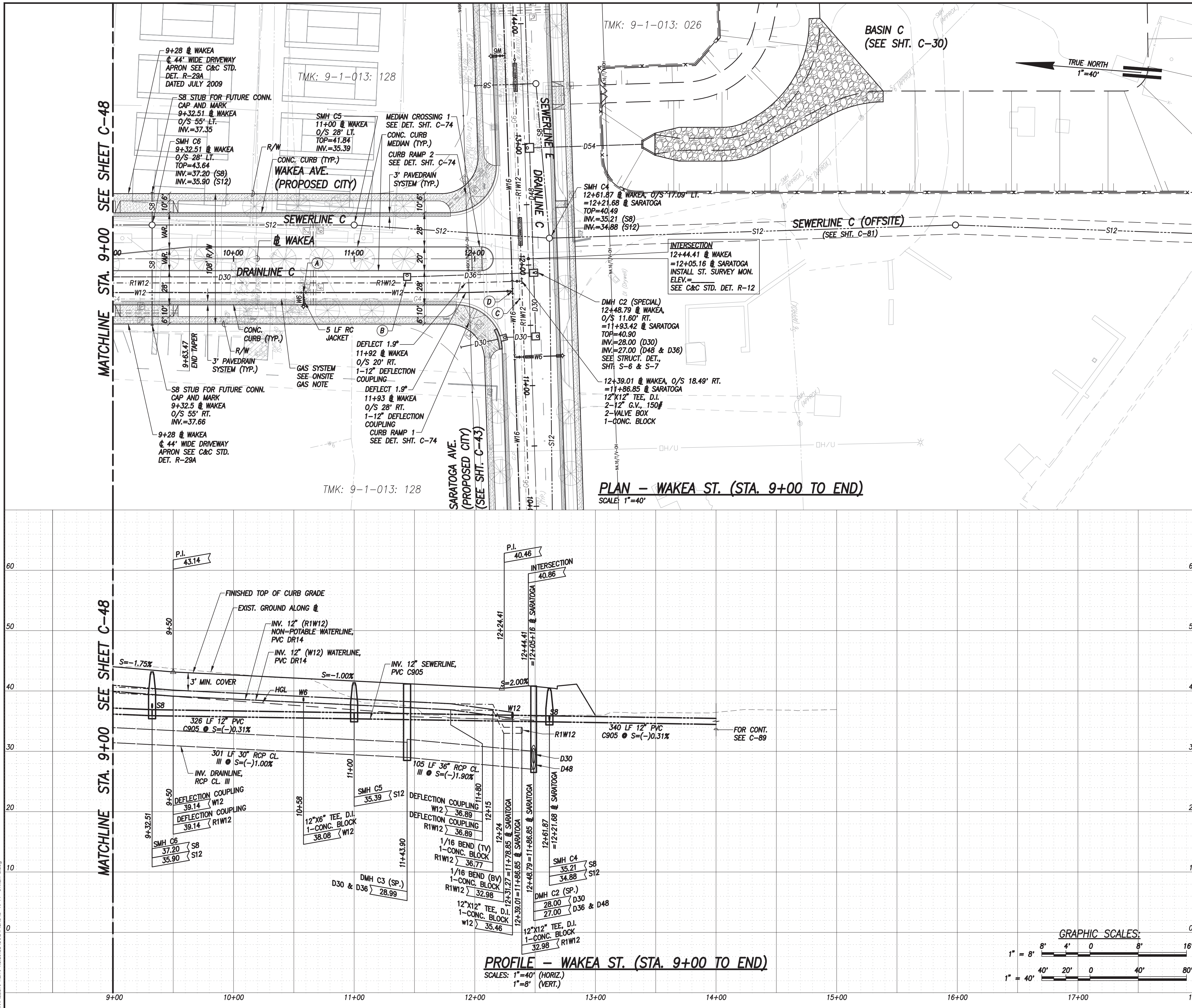
04/20

SIGNATURE DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|




Ⓐ FH CONN.
10+58 ℄ WAKEA
O/S 28' RT.
1-12" X 6" TEE, D.I.
1-6" G.V., 150#
1-VALVE BOX
1-CONC. ANCHOR BLOCK
1-FH
1-FH EXTENSION
2-CONC. BLOCK
12 LF 6" PVC, CL. 150
1-BLUE FH REFLECTIVE MARKER

Ⓑ DMH C3 (SPECIAL)
11+43.90 ℄ WAKEA
O/S 15' RT.
TOP=41.66
INV.=28.99
SEE STRUCT. DET.,
SHT. S-6 & S-7

Ⓒ 12+37.21 ℄ WAKEA
O/S 33.41' RT.
1-6"X4" GAS TEE

Ⓓ 12+31.27 ℄ WAKEA, O/S 26.75' RT.
=11+78.85 ℄ SARATOGA
16"X12" TEE, D.I.
1-16" G.V., 150#
1-12" G.V., 150#
2-VALVE BOX
1-CONC. BLOCK

## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
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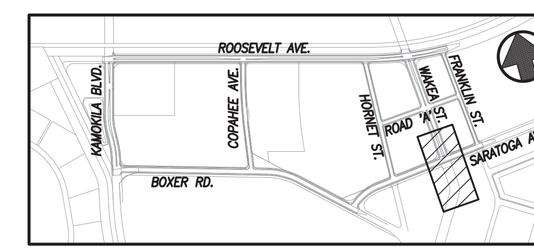
| POTABLE WATER SYSTEM & SIZE | W16 |
| SEWER SYSTEM & SIZE | S8 |
| DRAIN SYSTEM & SIZE | D18 |
| PAVEDRAIN SYSTEM | |




KEY MAP

GRAPHIC SCALES:
1" = 8' — 8' 4' 0 8' 16'
1" = 40' — 40' 20' 0 40' 80'

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

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04/20
SIGNATURE DATE

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION
Planning · Engineering · Environmental Services · Photogrammetry · Surveying · Construction Management
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

# PLAN AND PROFILE – 2
# WAKEA STREET
# (STA. 9+00 TO END)

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
|---|---|---|---|
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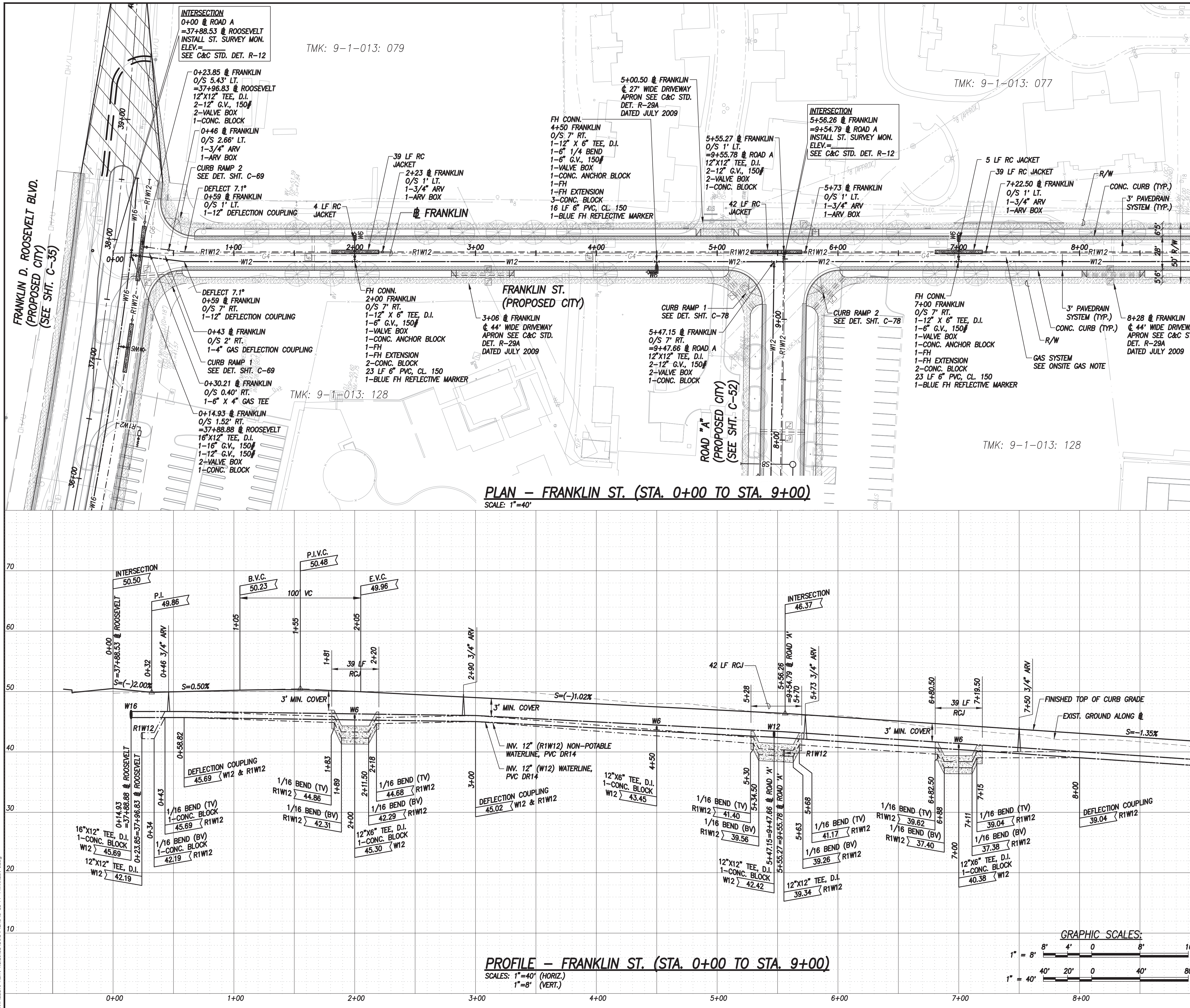


## NOTES:

1. DRIVEWAYS AND SIDEWALKS SHALL COMPLY WITH THE DEPARTMENT OF PLANNING AND PERMITTING "JOINTING REQUIREMENTS FOR CONCRETE SIDEWALKS AND DRIVEWAYS" (ENGINEERING AND POLICY MEMORANDUM NO. CEB-1-09), DATED APRIL 6, 2009.
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|---|---|
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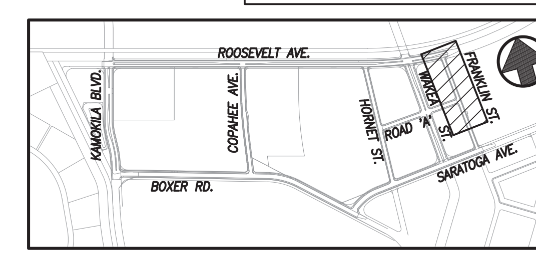
| PAVEDRAIN SYSTEM | |




## KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

## PLAN AND PROFILE – 1 FRANKLIN STREET (STA. 0+00 TO STA. 9+00)

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SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

| FILE | POCKET | FOLDER | NO. |
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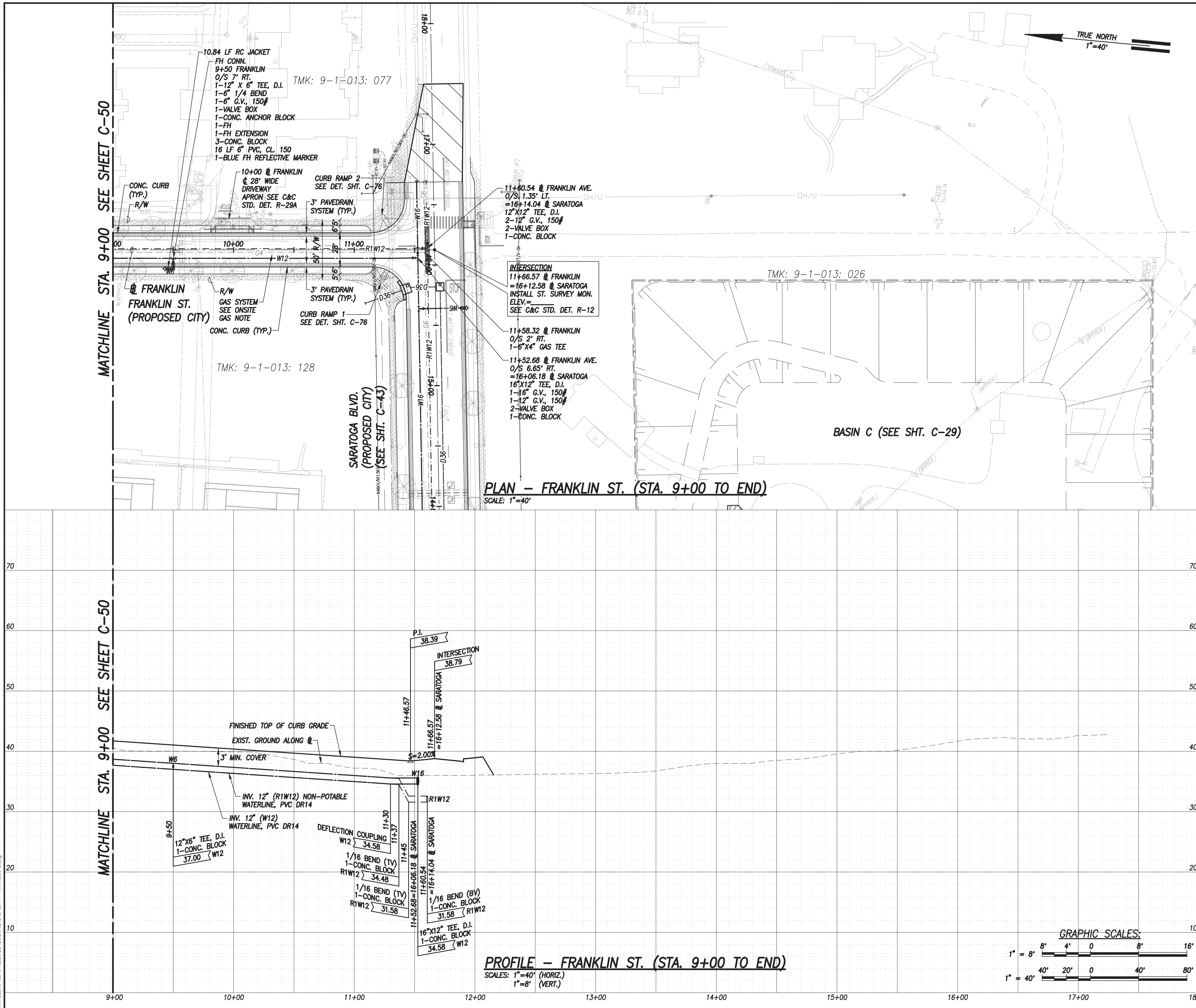


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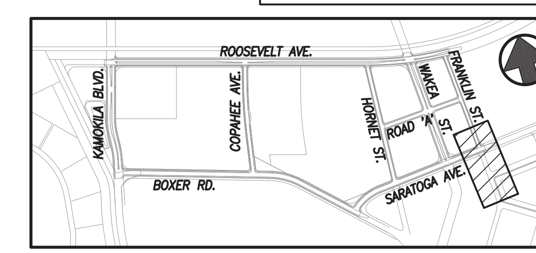


## KEY MAP

ENGINEER CN, WM, CL, JS
DRAFTSMAN CN, WM, JS, JO
CHECKED BY CL

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3
BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

PLAN AND PROFILE - 2
FRANKLIN STREET
(STA. 9+00 TO END)

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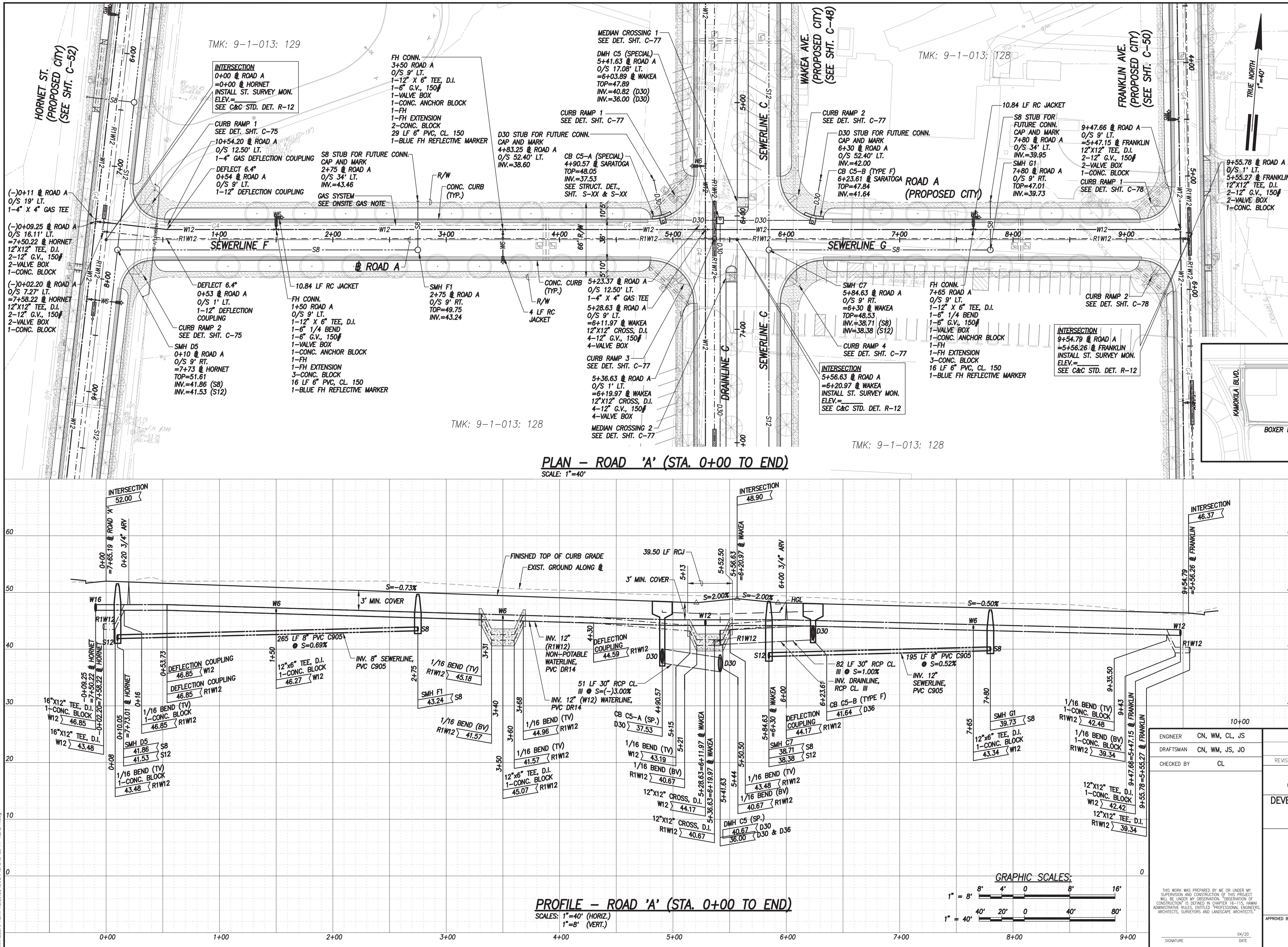
SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE POCKET FOLDER NO.




TRUE NORTH 1"=40'

## LEGEND:

| | |
|---|---|
| IRRIGATION SLEEVE & SIZE | |
| GAS SYSTEM & SIZE | GAS6 |
| EXIST. POTABLE WATER SYSTEM | |
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| POTABLE WATER SYSTEM & SIZE | W16 |
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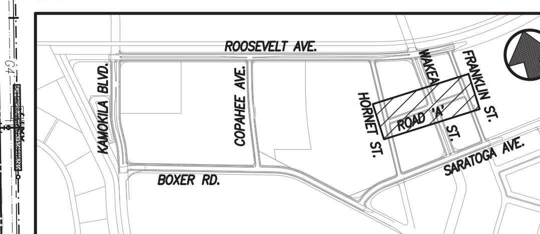


KEY MAP

| | |
|---|---|
| ENGINEER | CN, WM, CL, JS |
| DRAFTSMAN | CN, WM, JS, JO |
| CHECKED BY | CL |

| REVISION | DATE | BRIEF | BY | APPROVED |
|---|---|---|---|---|

R. M. TOWILL CORPORATION

DEVELOPMENT OF KALAELOA PARCELS 1, 2 AND 3 BACKBONE ROADWAY IMPROVEMENTS
TMK: (Div. 1) 9-1-017: 004, 072
HONOULIULI, EWA, OAHU, HAWAII

**PLAN AND PROFILE – 1**
**ROAD 'A'**
**(STA. 0+00 TO END)**

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. "OBSERVATION OF CONSTRUCTION" IS DEFINED IN CHAPTER 16-115, HAWAII ADMINISTRATIVE RULES, ENTITLED "PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS AND LANDSCAPE ARCHITECTS."

SIGNATURE 04/20 DATE

APPROVED BY

CHIEF, CIVIL ENGINEERING BRANCH, DPP DATE CHIEF, TRAFFIC REVIEW BRANCH, DPP DATE

FILE | POCKET | FOLDER | NO.

## ***Appendix B***

*Phase I Environmental Site Assessment,*
*Element Environmental LLC, December 2017*

# Phase I Environmental Site Assessment
# Infrastructure Design for Parcels 1, 2, and 3
# Kalaeloa/Barbers Point, Oahu, Hawaii
## Tax Map Key: (1) 9-1-013: Parcels 002 (portion), 004 (portion), 128 (portion), and 129 (portion)


Prepared for:

R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Prepared by:

element environmental llc
environmental · engineering · water resources
98-030 Hekaha Street, Unit 9
Aiea, Hawaii 96701

December 2017

element environmental llc
environmental · engineering · water resources

December 19, 2017

Mr. Craig Luke, P.E.
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Subject: **Phase I Environmental Site Assessment**
**Proposed Roads for Parcels 1, 2, and 3**
**Portions of Tax Map Key: (1) 9-1-013: Parcels 002, 004, 128, and 129**
**Kalaeloa/Barbers Point, Oahu, Hawaii**

Dear Mr. Luke,

Element Environmental, LLC (E2) has performed a Phase I Environmental Site Assessment (ESA) for the subject property referenced above. The purpose of the Phase I ESA was to identify environmental issues (if any) associated with proposed roadways on four parcels of developed land located within the former Naval Air Station Barbers Point property.

The accompanying report summarizes our findings and relates our opinions with respect to the property and potential sources of contamination at the property. Our findings and opinions are based on information that we obtained on given dates through records review, site reconnaissance, interviews, and related activities. It is possible that other information exists or subsequently has become known, just as it is possible for conditions we observed to have changed after our observation. For these and associated reasons, E2 and many of its peers routinely advise clients for ESA services that it would be a mistake to place unmerited faith in findings and opinions conveyed via ESA reports. E2 cannot under any circumstances warrant or guarantee that not finding indicators of hazardous substances, or petroleum products means that hazardous substances or petroleum products do not exist on the property.

It has been a pleasure conducting this assessment for you. If you have questions regarding this report, please contact me on my mobile phone at (808) 551-9552.

Respectfully submitted,

Element Environmental, LLC

Arlene H. Campbell, L.G.
Senior Geologist

DRAFT

DRAFT

# ELEMENT ENVIRONMENTAL, LLC

# ENVIRONMENTAL CERTIFICATION

| | |
|---|---|
| E2 Project No.: | 170063 |
| Report: | Phase I Environmental Site Assessment, ASTM International E1527-13 |
| Inspection Dates: | October 12, 2017 |
| Report Date: | December 19, 2017 |
| Site: | Infrastructure Design for Parcels 1, 2, and 3<br>Portions of Tax Map Key: (1) 9-1-013: Parcels 002, 004, 128, and 129<br>Kalaeloa/Barbers Point, Oahu, Hawaii |
| Client: | R. M. Towill Corporation |

***ENVIRONMENTAL PROFESSIONAL CERTIFICATION***

We declare that, to the best of our professional knowledge and belief, we meet the definition of *Environmental Professional* as defined in §312.10 of 40 Code of Federal Regulations (CFR) 312.

We have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. We have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Angela Peltier, Geologist — Date: December 19, 2017

Arlene H. Campbell, L.G., Senior Geologist — Date: December 19, 2017

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# Table of Contents



DRAFT

# Table of Contents (Continued)

**Section** **Page**



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# Table of Contents (Continued)

**Section** **Page**



**Tables**



DRAFT

# Table of Contents (Continued)



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# List of Acronyms and Abbreviations

| | |
|---|---|
| % | percent |
| ACM | asbestos-containing material |
| AST | aboveground storage tank |
| ASTM | ASTM International |
| AUL | activity and use limitations |
| BOQ | Bachelor Officers Quarters |
| BRAC | Base Realignment and Closure |
| BWS | Board of Water Supply |
| CCH | City and County of Honolulu |
| CERCLA | Comprehensive Environmental Response Compensation and Liability Act |
| CERCLIS | Comprehensive Environmental Response Compensation and Liability Information System |
| CFR | Code of Federal Regulations |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| CREC | controlled recognized environmental condition |
| CORRACTS | Corrective Action Sites under RCRA |
| CWB | Clean Water Branch |
| CWRM | Commission on Water Resources Management |
| DAGS | State of Hawaii Department of Accounting and General Services |
| DLNR | State of Hawaii Department of Land and Natural Resources |
| DoD | Department of Defense |
| DoN | Department of the Navy |
| DRO | diesel range organics |
| E2 | Element Environmental, LLC |
| EAL | Environmental Action Levels |
| EDR | Environmental Data Resources, Inc. |
| EHW | Environmental Health Warehouse |
| EPA | Environmental Protection Agency, United States |
| ERNS | Emergency Response Notification System |
| ESA | Environmental Site Assessment |
| FDR | Franklin D. Roosevelt |
| FIFRA | Federal Insecticide, Fungicide, & Rodenticide Act |
| FTTS | Federal Insecticide, Fungicide, & Rodenticide Act/Toxic Substances Control Act |
| FUDS | Formerly Used Defense Site |
| GIS | Geographic Information System |
| GTE | GTE Corporation, formerly General Telephone & Electronics Corporation |
| HCDA | State of Hawaii Department of Business, Economic Development, & Tourism, Hawaii Community Development Authority |
| HDOH | State of Hawaii Department of Health |
| HDOE | State of Hawaii Department of Education |
| HDOT | State of Hawaii Department of Transportation |

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# List of Acronyms and Abbreviations (Continued)

| | |
|---|---|
| HECO | Hawaiian Electric Company, Inc. |
| HEER | Hazard Evaluation and Emergency Response |
| HREC | historical recognized environmental condition |
| ICIS | Integrated Compliance Information System |
| IEC | institutional/engineering controls |
| IRHB | Indoor & Radiological Health Branch |
| JCIP | James Campbell Industrial Park |
| Kalaeloa | Kalaeloa Community Development District |
| LBP | lead-based paint |
| LDS | Latter Day Saints |
| LLP | landowner liability protections |
| LQG | large quantity generators |
| LUO | Land Use Ordinance |
| LUST | leaking underground storage tank |
| MCAS | Marine Corps Air Station |
| mg/L | milligrams per liter |
| NASBP | Naval Air Station Barbers Point |
| NAVFAC | Naval Facilities Engineering Command Pacific Division |
| NCore | State's National Core Multi-pollutant Monitoring Station |
| NFA | no further action |
| NFRAP | No Further Remedial Action Planned |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priorities List (Superfund sites) |
| NRCS | Natural Resources Conservation Service |
| OR&L | Oahu Railway and Land Company |
| ORO | oil range organics |
| PCB | polychlorinated biphenyl |
| RCRA | Resource Conservation and Recovery Act |
| REC | recognized environmental condition |
| RMTC | R. M. Towill Corporation |
| ROW | right-of-way |
| SDWB | Safe Drinking Water Branch |
| SEMS | Superfund Enterprise Management System |
| SHWB | Solid and Hazardous Waste Branch |
| SHWS | solid and hazardous waste sites |
| SLAMS | State and Local Air Monitoring Station |
| State | State of Hawaii |
| TMK | tax map key |
| TPH | total petroleum hydrocarbon |
| TSCA | Toxic Substances Control Act |
| TSD | treatment, storage, and disposal |

# List of Acronyms and Abbreviations (Continued)

| | |
|---|---|
| U.S. | United States of America |
| U.S.C | United States Code |
| UIC | underground injection control |
| USDA | United States Department of Agriculture |
| USGS | United States Geological Survey (U.S. Department of the Interior) |
| UST | underground storage tank |
| VRP | Voluntary Response Program |
| WWII | World War II |
| WWTP | Wastewater Treatment Plant |
| WWB | Wastewater Branch |

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# Executive Summary

Element Environmental, LLC was retained by R. M. Towill Corporation (hereinafter "RMTC") to conduct a Phase I Environmental Site Assessment (ESA) in general conformance with ASTM International (ASTM) Practice E 1527-13, *Standard Practice for Environmental Site Assessments*. The purpose of the Phase I ESA was to identify environmental issues (if any) associated with proposed roadways on four parcels of developed land located within the Kalaeloa Community Development District (Kalaeloa) on Oahu, Hawaii, designated as Tax Map Key (TMK): (1) 9-1-013: portions of parcels 002, 004, 128, and 129; hereinafter referred to as the "site, proposed roadways, subject property, and/or the property."

The parcels are located on former Naval Air Station Barbers Point (NASB) property and are owned by the United States (U.S.) and leased by Kalaeloa Ventures, LLC. The roadways are under various jurisdictions, including the Navy; State of Hawaii Department of Business, Economic Development, & Tourism, Hawaii Community Development Authority (HCDA); State of Hawaii Department of Transportation (HDOT), and the City and County of Honolulu (CCH). For the purposes of this report, the subject property is discussed as three distinct areas:

- *Parcel 1* includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcel 002, including:
  - Capahee Avenue, West Perimeter Road and the Kamokila Boulevard Extension and
  - Portions of Saratoga Avenue, Franklin D. Roosevelt (FDR) Avenue, and the Oahu Railway and Land Company (OR&L) utility corridor (including the GTE Corporation [GTE] building).
- *Parcel 2* includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcel 004, including:
  - Portions of Hornet Avenue, FDR Avenue, Saratoga Avenue, Boxer Road, and Structure 272 Transformer Station A (272: Transformer Station A).
- *Parcel 3* includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcels 128 and 129, including:
  - Road "A" and the Wakea Street Extension;
  - Portions of Hornet Avenue, FDR Avenue, Franklin Street, Saratoga Avenue, and the OR&L utility corridor;
  - Structure 1906 Tennis Pro Shop Building (1906: Tennis Pro Shop); and
  - Portions of Structures 73 Paradise West Club Complex (73: Paradise West Club Complex), 68C concrete pad (68C: concrete pad), and 713 tennis courts (713: tennis courts)

A site visit was conducted on October 12, 2017, to observe the general site setting, indications of current and past uses of the subject property, and visible portions of adjoining properties from the subject property. Interviews were conducted with available individuals with knowledge of the current and past uses of the subject adjoining properties.

The assessment has revealed evidence of recognized environmental conditions (RECs) and controlled RECs (CRECs) as defined by ASTM, associated with the site and/or adjoining properties. ASTM guidance defines

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a REC as the presence or likely presence of any hazardous substances or petroleum products, in, on, or at the property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. ASTM defines a CREC as a REC resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority, with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls.

RECs and CRECS are summarized in Tables ES-1 and ES-2, respectively. Table ES-3 provides a summary of potential environmental concerns; while they are not considered to be RECs, they bear mention.

**Table ES-1: Recognized Environmental Conditions**

| Report Component | Section | Concern Noted or Reported | Description<br>Concern |
|---|---|---|---|
| **On-Site Sources and Potential Sources** | 4 | Yes | **Site Listing on Environmental Databases:**<br>Environmental Data Resources, Inc. (EDR) identified "Naval Air Station Barbers Point" (NASBP) on the Department of Defense (DoD) database. It is possible that historical military use has negatively impacted the soil and groundwater beneath the site.<br>EDR also identified "Barbers Point Central Office" (GTE Building) (Parcel 1) on the Underground Storage Tank (UST) database. The UST and associated piping at the site poses a risk of future release of hazardous substances and/or petroleum products to the site. |
| | 4 | Yes | **Pipelines:**<br>"Black oil" and "white gas" pipelines are located within the subject property right of ways (ROWs) on FDR Avenue and the OR&L utility corridor. It is possible that soil and groundwater beneath the site have been or may be impacted by releases associated with the pipelines. |
| | 4 | Yes | **Releases:**<br><u>*272: Transformer Station A:*</u> Transformer 444, installed in the early 1940s, was retrofilled in 1988 because polychlorinated biphenyls (PCBs) were detected in the dielectric fluid and wipe samples collected from the concrete pad. No additional information was available. It is possible that historical releases from the transformer have negatively impacted surface materials in the vicinity of the transformer as well as the soil and groundwater beneath the site. |
| | 5 | Yes | **Solid Waste:**<br>Evidence of illegal dumping of miscellaneous debris and litter adjacent to the ROWs included but was not limited to general household trash, 1-gallon paint cans, several cans of brake fluid, wooden pallets, and electronics. It is possible that illegal dumping activities have negatively impacted soil and groundwater beneath the site. |

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| Report Component | Section | Concern Noted or Reported | Description<br>Concern |
|---|---|---|---|
| | | | **Hazardous Substances and Petroleum Products:**<br>Hazardous and/or regulated substances (e.g., oils, gasoline, grease, petroleum-based products) may be used/stored within the GTE Building (Parcel 1) and 272: Transformer Station A (Parcel 2). The nature of the activities conducted in these two areas poses a material threat of a future release to the environment. |
| **Off-Site Sources and Potential Sources** | 4 | Yes | **Leaking UST:**<br>Adjacent Structure 77 Wakea Garden Apartments (former Bachelor Officers Quarters [BOQ) (interior of Parcel 3) previously had diesel and fuel oil USTs (BP19 and BP20) (installed in 1958). The tanks, boilers, and piping were removed in October 1991, at which time visual evidence of soil contamination was noted. No additional information was available. It is possible that contamination associated with the release(s) remains in the soil and groundwater beneath the site. |
| | 4 | Yes | **Releases:**<br>Contaminated surface soil (arsenic and selenium) and groundwater (total petroleum hydrocarbons [TPH] as diesel range organics and TPH as oil range organics) were identified on an adjacent property to the northwest of Parcel 1 hydraulically upgradient (now occupied by Costco). It is possible that contamination from this site is migrating to the subject property.<br>Soil sampling conducted within Parcel 1 in 2016 indicated the presence of elevated pesticide concentrations in some areas, which will require management during redevelopment. It is possible that subject property is negatively impacted by historical pesticide use on Parcel 1.<br>Soil sampling conducted within drywells located within Parcel 1 and potentially within the proposed roadway expansion indicate the presence of elevated chromium concentrations in well L18-01. It is possible that contamination from this dry well is on or migrating to the subject property. |

**Table ES-2: Controlled Recognized Environmental Conditions**

| Category | Controlled Recognized Environmental Conditions (RECs) |
|---|---|
| Leaking UST (LUST) Sites | The LUST associated with former Building 74 (exact location is unknown; approximated to be within the southwest interior portion of Parcel 3) (Facility ID 9-103191, Release ID 030039), located within the interior of Parcel 3, is listed as Site Cleanup Completed (No Further Action [NFA]). |

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## Table ES-3: Potential Environmental Concerns

| Potential Environmental Concern Category | Potential Environmental Concern |
|---|---|
| Former Military Use | The site is part of the former NASBP and was used by the military during and after World War II, mainly as a housing and recreation area. It is possible that historical military use of the subject property has negatively impacted the site. |
| Former Agricultural Use | The subject property was identified by the State of Hawaii Geographic Information System map as being historically used for activities associated with sugarcane cultivation; however, all other reports indicate it is part of a Sisal Plantation. Typically pesticides and herbicides are not used in sisal crops. If the property was used for sugar cane cultivation, it is possible that soil and/or groundwater beneath the site has been impacted by historical sugarcane use (typically no chemical fertilizers are used for sisal cultivation). |
| Railroad Tracks | According to historical topographic maps and aerial photographs, portions of the railroad tracks were located within the subject property crossing the Kamokila Boulevard Extension and GTE Building on Parcel 1 and Wakea Extention on Parcel 3 from c. 1890 to c. 1970. It is possible that methyl phenols and creosote (used to treat railroad ties), metals and polychlorinated biphenyls (associated with used oil commonly applied to tracks and weeds/dusty roads), and/or pesticides (weed control) may be present in soil and groundwater in the vicinity of the former tracks. |
| Wells | One well (well 3-1904-003), owned by GTE Hawaiian Tel Co. Inc., is located on the subject property (Parcel 1). The well is listed as other. |
| | Stormwater runoff within Kalaeloa is discharged into an extensive system of more than 250 dry wells that are permitted by the State of Hawaii Department of Health (HDOH). Sixteen dry wells are present within the area bounded by the proposed roadways. |
| UST Site | A UST fill pipe was discovered during excavation work for a housing development on the adjacent property northeast of the intersection of FDR and Franklin Street within TMK: (1) 9-1-013: parcel 077. The UST was removed on November 12, 1993, and a closure report was prepared (the report was unavailable). No release was reported. |
| Residual Lead in Soil Attributable to Lead-Based Paint (LBP) | LBP may have been used in the construction and/or maintenance and upkeep of the former/current structures at the site. It is possible that residual levels of lead are present in the soil beneath, and in the vicinity of former structures as a result of normal paint deterioration and/or demolition activities. |
| Residual Lead on roadways from historic use of leaded gasoline | Heavy metals (i.e., lead) may be present in soil along the roadways from the historical use of leaded gasoline in vehicles prior to January 1, 1996. |
| Residual Pesticides Attributable to Termite Treatment | It is possible that residual levels of termiticides (i.e., chlordane) are present in the soil beneath and in the vicinity of the former/current structures at the site. |
| EDR Identified Sites | EDR identified the following sites that may pose potential environmental concerns to the subject property:<br>• One SPILLS, Federal Insecticide, Fungicide, & Rodenticide Act/Toxic Substances Control Act (FTTS), and two underground injection control (UIC) identified on the adjacent Barbers Point Elementary School and Kalaeloa Airport (DWS) (listed at the same address) property.<br>• One Federal Resource Conservation and Recovery Act Large Quantity Generator site, State Hazardous Waste Site, and UST site identified on the Costco Wholesale #10 site, located adjacent to the northwest of Parcel 1 located hydraulically upgradient.<br>• One State LUST site within ¼ mile, NEX Touch N'Go Gas.<br>• One Formerly Used Defense Site was identified approximately ½ mile to the northeast hydraulically upgradient of the site. |
| Unmappable Site | Five of the six unmappable sites listed in the EDR report were determined to be in the vicinity of the subject property: 1) Fort Barrette, 2) Barbers Point Naval Air Station, Mission Street, 3) |

| Potential Environmental Concern Category | Potential Environmental Concern |
|---|---|
| | Hawaii Army National Guard, 4) DLA Disposition Services, and 5) Former Oahu Sugar Company Pump 15 Station. |

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# Section 1 Introduction

## 1.1 Overview

R. M. Towill Corporation (hereinafter, "*RMTC*") retained Element Environmental, LLC (E2) to conduct a Phase I Environmental Site Assessment (ESA) in general conformance with ASTM International (ASTM) Practice E 1527-13, *Standard Practice for Environmental Site Assessments*.

The purpose of the Phase I ESA was to identify environmental issues (if any) associated with proposed roadways on four parcels of developed land located within the Kalaeloa Community Development District (Kalaeloa) on Oahu, Hawaii, designated as Tax Map Key (TMK): (1) 9-1-013: portions of parcels 002, 004, 128, and 129; hereinafter referred to as the "*site, proposed roadways, subject property, and/or the property*." The parcels are located on former Naval Air Station Barbers Point (NASBP) property and are owned by the United States (U.S.) and leased by Kalaeloa Ventures, LLC. The proposed roads are owned by the State of Hawaii (State) and the City and County of Honolulu (CCH). For the purposes of this report, the subject property is discussed as three distinct areas, as identified in Table 1-1, below.

**Table 1-1: Subject Property Identification**

| Identification | TMK | Information |
|---|---|---|
| Parcel 1 | (1) 9-1-013:002 (portion) | U.S (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>No Associated Address |
| | Franklin D. Roosevelt (FDR) Avenue (portion) | right-of-way (ROW) |
| | Oahu Railway & Land Company (OR&L) Easement (Utility Corridor) (portion) | GTE Corporation (GTE), formerly General Telphone & Electronics Corporation, (also known as Hawaiian Telephone) building (portion) to remain on the north side of FDR Avenue. |
| | Copahee Avenue | ROW |
| | Saratoga Avenue (portion) | ROW |
| | Kamokila Boulevard Extension | Proposed extension of the road through the interior of TMK: (1) 9-1-013:002. |
| | West Perimeter Road | Proposed Road adjacent to the James Campell Industrial Park (JCIP) Drainage Canal on the west side. |
| Parcel 2 | (1) 9-1-013:004 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>No associated address |
| | FDR Avenue (portion) | ROW and a portion of structure 272 (Transformer Station A) to remain on the corner of FDR and Hornet Avenues. |
| | Hornet Avenue (portion) | ROW |
| | Boxer Road (portion) | ROW |
| | Saratoga Avenue (portion) | ROW |
| Parcel 3 | (1) 9-1-013:129 (portion) | U.S. (owner)<br>Kalaloa Ventures, LLC (lessee)<br>Kalaeloa BOQ LLC (sub-lessee)<br>91-1245 FDR Avenue |
| | (1) 9-1-013:128 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>91-1267 FDR Avenue |

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| Identification | TMK | Information |
|---|---|---|
| | FDR Avenue (portion) | ROW |
| | OR&L Easement (Utility Corridor) | ROW |
| | Franklin Street (portion) | ROW |
| | Hornet Avenue (portion) | ROW |
| | Saratoga Avenue (portion) | ROW |
| | Road A | Proposed ROW connects Hornet Avenue and Franklin Street. A portion of existing structure 73 (Paradise West Club Complex) is within the ROW and is slated for demolition. |
| | Wakea Street Extention | Proposed ROW connects FDR and Saratoga Avenues. Existing buildings are in the ROW and are slated for demolition, including building 1906 (Tennis Pro Shop), a portion of structure 68C (concrete pad with unknown use), and structure 713 (tennis courts). |

# 1.2 Purpose

The purpose of the ASTM practice is to define good commercial and customary practice in the U.S. for conducting an ESA of a parcel of commercial real estate with respect to the range of contaminants within the scope of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 U.S. Code [U.S.C.] §9601) and petroleum products. As such, this practice is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on CERCLA liability (hereinafter, the "landowner liability protections," or "LLPs"): that is, the practice that constitutes all appropriate inquiries into the previous ownership and uses of the property consistent with good commercial and customary practice as defined at 42 U.S.C. §9601(35)(B).

For the purposes of this practice:

- The definition of a release includes contamination in the soil vapor phase, as well as in soil or groundwater.
- "Migrate" and "migration" refer to the movement of hazardous substances or petroleum products in any form, including solid and liquid, at the surface or subsurface, and vapor in the subsurface.
- Vapor migration/intrusion (excluding impacts to indoor air from releases of hazardous substances into the environment) *does not fall under the category of an Indoor Air Quality concern* and is not included in the ASTM 1527 scope of work.

ASTM guidance defines a recognized environmental concern (REC) as the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment (ASTM 2013).

A controlled REC (CREC) is defined as a REC resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (e.g., as evidenced by the issuance of a no further action (NFA) letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (e.g., property use restrictions, activity and use limitations [AULs], institutional/engineering controls [IECs]) (ASTM 2013).

A historical REC (HREC) is defined as a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (e.g., property use restrictions, AULs, IECs) (ASTM 2013).

RECs do not include *de minimis* conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies (ASTM 2013).

## 1.3 Detailed Scope-of-Services

This Phase I ESA was performed under the conditions of, and, in general accordance with the ASTM *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* (ASTM Designation E 1527-13). Adherence to the ASTM standard is intended to limit the liability of property owners from inherited environmental contamination.

The Phase I ESA included the following tasks:

- **Review of regulatory records.** E2 reviewed standard environmental record sources including the U.S. Environmental Protection Agency (EPA) Superfund Enterprise Management System (SEMS) (formerly Comprehensive Environmental Response Compensation and Liability Information System [CERCLIS]) database, EPA's Resource Conservation and Recovery Act (RCRA) database, U.S. IEC database, EPA's Emergency Response Notification System (ERNS) database, State Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office site list, HDOH Underground Storage Tank (UST) list, HDOH Leaking UST (LUST) list, HDOH list of landfills and other solid and hazardous waste sites (SHWS), HDOH Voluntary Response Program (VRP) sites list, and the HDOH Brownfield sites list.
- **Review of site history.** E2 reviewed reasonably ascertainable standard historical sources including historical maps, aerial photographs, building permits, zoning records, and property tax records available online; various printed publications as well as publications posted on the internet; and documents and/or records provided by the owner/user and/or their representatives.
- **Review of site geology and hydrogeology.** E2 reviewed reasonably ascertainable published information on surface and subsurface conditions at the site and surrounding area. E2 used this information to assess topography, drainage, surface water bodies, anticipated subsurface geology, and groundwater occurrence and usage in the area.
- **Site reconnaissance.** During the site reconnaissance E2 specifically looked for hazardous substances; petroleum products; above-ground storage tanks (ASTs) and USTs; odors; pools of liquid; drums; electrical and hydraulic equipment; means for heating and cooling structures; stains or corrosion; drains and sumps; pits, ponds, or lagoons; stained soil or pavement; stressed vegetation; solid waste; wastewater; wells; and septic systems.

- **Data evaluation and report preparation.** E2 evaluated the information collected and prepared this report that documents our assessment and presents our findings, opinions, and conclusions.

## 1.4 Significant Assumptions

In preparing this report, E2 has relied on certain verbal information and representations provided by government employees and others; responses of government agencies to public requests for information are complete and accurate; documents provided by the Phase I ESA owner/user or their representatives; and a computer search of government databases by a firm whose business is to provide that service. Except as discussed, E2 has relied on that information and did not attempt to verify its accuracy or completeness independently, but did not detect any inconsistency or omission of a nature that might call into question the validity of the data. To the extent that the conclusions in this report are based in whole or in part on such information, they are contingent on its validity. E2 assumes no responsibility for any consequence arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to E2.

## 1.5 Limitations and Exceptions

Phase I ESAs, by their very nature, are limited. E2 has endeavored to meet what it believes is the applicable standard of care and, in so doing is obliged to advise its client, RMTC, of the Phase I ESA limitations. This Phase I ESA did not assess environmental issues or conditions at the property that are outside the scope of ASTM Practice E1527-13, including, but not limited to, asbestos-containing material (ACM), biological agents, cultural and historical resources, ecological resources, endangered species, health and safety, indoor air quality unrelated to releases of hazardous substances or petroleum products into the environment, industrial hygiene, lead-based paint (LBP), lead in drinking water, mold, radon, regulatory compliance, and wetlands, nor did it include any sampling or testing for biological agents and mold, radon, methane, ACM, LBP, or other environmental contaminants. Our investigation was limited to the procedures described in the Phase I ESA Standard Practice (ASTM 2013).

The conclusions presented in this report are professional opinions based solely upon visual observations of the site and vicinity and our interpretation of the available historical and regulatory information and documents reviewed. They are intended exclusively for the purpose outlined herein and apply only to the site location and project indicated.

The findings and opinions are based on information that E2 obtained on given dates through records review, site reconnaissance, interviews, and related activities. It is possible that other information exists or subsequently has become known, just as it is possible for conditions E2 observed to have changed after our observation. For these and associated reasons, E2 and many of its peers routinely advise clients for ESA services that it would be a mistake to place unmerited faith in findings and opinions conveyed via ESA reports. E2 cannot under any circumstances warrant or guarantee that not finding indicators of hazardous substances or petroleum products mean that hazardous substances or petroleum products do not exist on the site.

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# 1.6 Special Terms and Conditions

E2's services are performed, within limits prescribed by our clients, with the usual thoroughness and competence of the consulting profession in accordance with the standard for professional services at the time those services are rendered. No warranty or representation, either expressed or implied, is included or intended in the proposals, contracts, or reports.

Findings and opinions presented herein apply to site conditions existing at the time of E2's investigation and those reasonably foreseeable; they cannot necessarily apply to site changes of which E2 is not aware and has not had the opportunity to evaluate.

# 1.7 Data Gaps

Based on the information obtained during this ESA, it is E2's professional opinion that a historical data failure, as defined in the ASTM guidelines, has occurred in attempting to document the history of the subject property back to the earlier part of 1940 or the first developed usage of the property in five-year increments, as follows:

- Historical information regarding the subject property from 1878 to 1898, 1903 to 1919, 1921 to 1927, 1929 to 1936, 1954 to 1961, and 1986 to 1991 was limited.
- No user questionnaire was completed.
- EDR was unable to obtain fire insurance maps, building permit records, and/or property tax map reports because there is no coverage for the area.
- The current landowner/tenant were not available for interview.
- The OR&L utility corridor and associated structures, including the GTE building, were not included in the site reconnaissance.
- Structures 272: Transformer Station A, 1906: Tennis Pro Shop, and 73: Paradise West Club Complex were not included in the site reconnaissance.

Based on the information obtained, the lack of documentation is not deemed critical and did not affect the ability to identify potential REC(s) associated with the subject property.

# 1.8 User Reliance

This report is intended for the use of RMTC and its assignees. The scope of services performed in execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or re-use of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of the said user.

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# Section 2 Site Description

## 2.1 Location and Legal Description

The subject property is located within the former NASBP facility in the Ewa Plain area of Kalaeloa, Oahu, Hawaii, as shown in Figure 1, included in Appendix A. The site is comprised of proposed roadways on four parcels of land designated as portions of TMK: (1) 4-2-013: parcels 002, 004, 128, and 129 (CCH 2017). The roadways are under various jurisdictions, including the Navy; State Department of Business, Economic Development, & Tourism, Hawaii Community Development Authority (HCDA); State Department of Transportation (HDOT), and the CCH.

## 2.2 Site and Vicinity General Characteristics

The proposed roadways are shown in Figure 2, included in Appendix A. The site consists of approximately 34.6 acres of land within the former NASBP.

- Parcel 1 proposed roadway improvements include the following:
  - FDR Avenue 10-foot widening and a 14-foot setback for future 108-foot ROW Reserve.
  - Copahee Avenue 11-foot widening and an 11-foot setback for future 66-foot ROW Reserve.
  - Saratoga Road 18-foot widening and a 24-foot setback for future 108-foot ROW Reserve
  - Construction of the Kamokila Boulevard Extension with a 108-foot ROW.
  - West Perimeter Road Extension (owned by HCDA) is to be closed after the construction of Kamokila Boulevard Extension.
  - The GTE Building located within the OR&L ROW and on the FDR Avenue 10-foot widening and 14-foot setback near the intersection of Copahee Avenue to remain in use.
- Parcel 2 proposed roadway improvements include the following:
  - FDR Avenue 10-foot widening and a 14-foot setback for future 108-foot ROW Reserve.
  - Hornet Avenue widening to an 80-foot ROW.
  - Saratoga Avenue 18-foot widening and a 6-foot setback for future 108-foot ROW Reserve.
  - Boxer Road 18-foot widening and a 6-foot setback for future 108-foot ROW Reserve.
  - Copahee Avenue 11-foot widening and an 11-foot setback for future 66-foot ROW Reserve.
  - A portion of 272: Transformer Station A to remain.
- Parcel 3 proposed roadway improvements include the following:
  - FDR Avenue 10-foot widening and a 14-foot setback for future 108-foot ROW Reserve.
  - Franklin Street 50-foot ROW.
  - Saratoga Avenue 18-foot widening and a 6-foot setback for future 108-foot ROW Reserve.
  - Hornet Avenue widening to an 80-foot ROW.
  - Construction of Road A with a 66-foot ROW.
  - Demolition of 73: Paradise West Club Complex partially within the proposed Road A ROW.
  - Construction of Wakea Street Extension 108-foot ROW.
  - Demolition of 1906: Tennis Pro Shop within the proposed Wakea Street Extension ROW.
  - Demolition of 68C: concrete pad partially within the proposed Wakea Street Extension ROW.



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- Demolition of the 713: tennis courts partially within the proposed Wakea Street Extension ROW.

## 2.3 Current Use of the Property

The subject property consists mainly of roadway ROWs and adjacent road verge. Seven structures are currently located within the proposed roadways as follows: the GTE building within Parcel 1; 272: Transformer Station A within Parcel 2; and 1906: Tennis Pro Shop and portions of 73: Paradise West Club Complex, , 68C: concrete pad (unknown historical use), and 713: tennis courts on Parcel 3. Only the GTE building (Parcel 1) and 272: Transformer Station A (Parcel 2) are proposed to remain on the subject property.

## 2.4 Current Uses of the Adjacent Properties

Table 2-1 lists the parcel numbers and owner/occupant activities for the adjacent properties. The site is generally bounded by the JCIP Drainage Canal on the east, a solar generating facility on a portion of the former NASBP to the south, and land being developed for residential and business uses to the north and west. Figure 2, included in Appendix A, shows the locations of adjacent properties.

**Table 2-1: Adjacent Properties**

| Parcel Number | Owner/Occupant | Owner/Occupant Activities |
|---|---|---|
| **Parcel within the interior boundary Parcel 1** | | |
| 9-1-013:002 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>No associated address | Vacant (only compacted coral pads from former Coral Rose Manor housing units remain) |
| **Parcels adjacent to the north of Parcel 1** | | |
| | FDR Avenue (portion) | ROW |
| | Renton Road | ROW |
| 9-1-160:014 | Costco Wholesale Corporation (owner)<br>4589 A. Kapolei Parkway | Costco |
| 9-1-160:008 | Hunt Communities Hawaii, LLC (owner)<br>No associated address | Drainage ditch |
| 9-1-160:021 | D.R. Horton – Schuler Homes, LLC (owner)<br>No associated address | Drainage ditch |
| **Parcel adjacent to the east of Parcel 1** | | |
| 9-1-013:003 | State Department of Education (HDOE) (owner)<br>91-1001 Boxer Street<br>(3001 Boxer Road) | Barbers Point Elementary School |
| | Copahee Avenue | ROW |
| | Boxer Road | ROW |
| **Parcels adjacent to the west of Parcel 1** | | |
| | JCIP Drainage Ditch | Waterway |
| 9-1-075:053 | Board of Water Supply (BWS) (owner)<br>115 Uu Place | Hardware Hawaii |
| 9-1-075:039 | BWS (owner)<br>2052 Lauwiliwili Street | Kapolei State and Local Air Monitoring Station (SLAMS) (2002) and State's National Core Multi-pollutant Monitoring Station (NCore) site (2011) |

| Parcel Number | Owner/Occupant | Owner/Occupant Activities |
|---|---|---|
| 9-1-075:040 | John Robert Associates, LLC (owner)<br>Doitnow, Inc. (lessee)<br>2060 Lauwiliwili Street | Carrier Hawaii |
| 9-1-075:041 | Church of Jesus Christ Latter Day Saints (LDS) (owner)<br>2074 Lauwiliwili Street | The Church of Jesus Christ of LDS |
| **Parcels within the interior of Parcel 2** | | |
| 9-1-013:004 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>No associated address | Vacant |
| 9-1-013:003 | HDOE (owner)<br>91-1001 Boxer Street<br>(3001 Boxer Road) | Barbers Point Elementary School |
| | Tulagi Avenue | ROW |
| **Parcel to the north of Parcel 2** | | |
| | FDR Avenue (portion) | ROW |
| | Renton Road | ROW |
| 9-1-160:021 | D.R. Horton – Schuler Homes, LLC (owner)<br>No associated address | Drainage ditch |
| **Parcels adjacent to the east of Parcel 2** | | |
| | Hornet Avenue | ROW |
| 9-1-013:129 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>Kalaloa BOQ, LLC (sub-lessee)<br>91-1245 FDR Avenue | Wakea Garden Apartments at Kalaeloa (former Bachelor Officers Quarters [BOQ] housing for NASBP) |
| 9-1-013:128 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>91-1267 FDR Avenue | |
| **Parcels adjacent to the south of Parcel 2** | | |
| | Saratoga Avenue (portion) | ROW |
| | Boxer Road (portion) | ROW |
| 9-1-013:010 | Kalaeloa Ventures, LLC (owner)<br>91-1010 Saratoga Avenue | |
| 9-1-013:117 | Hawaiian Home Lands (owner)<br>No associated address | |
| 9-1-013:118 | Hawaiian Home Lands (owner)<br>Kalaeloa Solar One, LLC (lessee)<br>No associated address | Solar farm and electrical substation |
| **Parcel adjacent to the west of Parcel 2** | | |
| 9-1-013:003 | HDOE (owner)<br>91-1001 Boxer Street<br>(3001 Boxer Road) | Barbers Point Elementary |
| | Tulagi Avenue | ROW |
| **Parcels within the interior of Parcel 3** | | |
| 9-1-013:129 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>Kalaloa BOQ, LLC (sub-lessee)<br>91-1245 FDR Avenue | Wakea Garden Apartments at Kalaeloa (former BOQ housing for NASBP) |
| 9-1-013:128 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>91-1267 FDR Avenue | |

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| Parcel Number | Owner/Occupant | Owner/Occupant Activities |
|---|---|---|
| **Parcels adjacent to the north of Parcel 3** | | |
| | FDR Avenue (portion) | ROW |
| | Renton Road | ROW |
| 9-1-160:021 | D.R. Horton – Schuler Homes, LLC (owner)<br>No associated address | Drainage ditch |
| **Parcels adjacent to the east of Parcel 3** | | |
| | Franklin Street (portion) | ROW |
| 9-1-013:079 | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>No associated address | |
| 9-1-013:077 | RP Kaimana Owner, LLC (owner)<br>91-1347 FDR Avenue | |
| **Parcels adjacent to the south of Parcel 3** | | |
| | Saratoga Avenue (portion) | ROW |
| 9-1-013:026 | U.S. (owner)<br>Kalaeloa Ventures, LLC (owner)<br>91-1040 Saratoga Avenue | |
| 9-1-013:077 | RP Kaimana Owner, LLC (owner)<br>91-1347 FDR Avenue | |
| **Parcels adjacent to the west of Parcel 3** | | |
| | Hornet Avenue | ROW |
| 9-1-013:004 (portion) | U.S. (owner)<br>Kalaeloa Ventures, LLC (lessee)<br>No associated address | |

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# Section 3 User Provided Information

A completed User Questionnaire has not been submitted as of the date of this draft report.

## 3.1 Reason for Performing the Phase I ESA

The purpose of the Phase I ESA was to identify environmental issues (if any) as part of the proposed improvements to roadways within the former NASBP.

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# Section 4 Records Review

## 4.1 Standard Environmental Record Sources

### 4.1.1 Environmental Data Resources, Inc. Report

To identify the presence of adverse environmental conditions at the subject property, several published sources of environmental records were reviewed. This section lists the records that were searched and the results of each search.

ASTM E1527-13 specifies search distances for specific environmental record sources. Table 4-1, identifies the record sources searched for incidents or sites within the listed search distances of the subject property.

**Table 4-1: Environmental Record Sources Searched**

| Standard Environmental Record Sources | Search Distance (miles) | Number of Sites Identified |
|---|---|---|
| Federal National Priorities List (NPL) site list | 1.0 | 0 |
| Federal Delisted NPL site list | 0.5 | 0 |
| Federal SEMS list (formerly CERCLIS) | 0.5 | 0 |
| Federal SEMS-Archive (formerly CERCLIS No Further Remedial Action Planned [NFRAP]) site list | 0.5 | 0 |
| Federal RCRA Corrective Action Sites under RCRA (CORRACTS) facilities list | 1.0 | 0 |
| Federal RCRA Non-CORRACTS Treatment, Storage, and Disposal (TSD) facilities list | 0.5 | 0 |
| Federal RCRA generators list (conditionally exempt small quantity generators, small quantity generators, and large quantity generators [LQG]) | Subject and Adjacent properties | 1 |
| Federal IEC registries | Subject property only | 0 |
| Federal ERNS list | Subject property only | 0 |
| State list of SHWS identified for investigation or remediation (NPL or CERCLIS equivalents) | 1.0 | 7 |
| State landfill and/or solid waste disposal site lists | 0.5 | 0 |
| State LUST list | 0.5 | 2 |
| State registered UST list | Subject and Adjacent properties | 2 |
| State IEC registries | Subject and Adjacent properties | 0 |
| State VRP sites | 0.5 | 0 |
| State Brownfield sites | 0.5 | 0 |

E2 used an online regulatory database search service, provided by Environmental Data Resources, Inc. (EDR), to review the above listed Federal and State government databases within the prescribed search distance. A copy of the EDR report is included in Appendix B.

In reviewing the environmental databases, it should be noted that the specific regulatory agencies do not instantaneously update such databases. Depending on the database and the agency, updates may be as infrequent as annually. The dates of the most recent updates for the searched environmental databases are listed in the EDR report in Appendix B.

The subject property was identified on databases searched by EDR, including the Department of Defense (DoD) and UST databases.

E2 reviewed the sites identified by EDR within the search radii. The closest sites (those located within a one-eighth mile of the site) and/or those with environmental concerns located beyond a one-eighth mile are listed in Table 4-2. Refer to the EDR report (Appendix B) for a full listing of the sites within the search radius.

**Table 4-2: Sites Located within 1/8-mile of Subject Property and/or Sites with Environmental Concerns Beyond 1/8-mile of Subject Property**

| Facility/Address | Database/List | Location Relative to the Subject Property | Environmental Concerns/Information |
|---|---|---|---|
| NASBP (Closed)<br>NASBP | DoD | Subject and Adjacent Properties | Navy |
| Barbers Point Central Office (Hawaiian Telcom) (GTE Building)<br>Roosevelt & Copahee<br>Kapolei, HI 96707 | UST | Subject Property (Parcel 1) | Facility ID: 9-203295<br><u>Currently in Use:</u><br>550-gallon diesel 1987 |
| Barbers Point Elementary School<br>3001 Boxer Road<br>Kapolei, HI 96707 | SPILLS | Adjacent property within boundaries (equal elevation / crossgradient) | Integrated Compliance Information System (ICIS) Activity Date 09/0/2007 |
| | Federal Insecticide, Fungicide, & Rodenticide Act (FIFRA)/ Toxic Substances Control Act (TSCA) (FTTS) | | Inspection No. 20070905HI-08 1; Violations occurred |
| | Underground Injection Control (UIC) | | UIC Permit Number: UO-2071 (expired 10/30/2004) three injection wells on permit |
| Kalaeloa Airport (DWS)<br>3001 Boxer Road<br>Barbers Point Kapolei<br>Kapolei, HI 96707 | UIC | | UIC Permit Number: UO-2072 (expired 02/14/2016) |
| Costco Wholesale #10<br>4589 Kapolei Parkway<br>Kapolei, HI 96707 | RCRA-LQG | Adjacent to northwest (higher elevation / upgradient) | RCRA-LQG No violations found<br>Wastes listed include ignitable waste, corrosive waste, mercury, selenium, silver, 2,4-dichlorophenoxyacetic acid, benzene, m-cresol, cresol, salts, and nicotine. |

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| Facility/Address | Database/List | Location Relative to the Subject Property | Environmental Concerns/Information |
|---|---|---|---|
| Costco Kapolei<br>Kamokila Boulevard & Kapolei Parkway<br>Kapolei, HI 96825 | UST | | Facility ID 9-203850<br>Currently in use<br>30,000-gallon gasoline 2009<br>30,000-gallon gasoline 2009<br>30,000-gallon gasoline 2009 |
| | SHWS | | 09/30/2006: NFA – Hazard Undetermined Response Not Necessary |
| DLA Disposition Services<br>Building 140, Midway Street<br>Kapolei, HI 96707 | Orphan SEMS | ¼ to ½ mile south (lower elevation / downgradient) | Site ID: 900294<br>NFRAP |
| NEX Touch N'Go Gas<br>Building 1928 Tank 81, 82, 83<br>Saratoga Avenue<br>Kapolei, HI 96707 | LUST | ¼ to ½ mile east (lower elevation / crossgradient) | Facility ID 9-102001,<br>Release ID 130008 – Soil Vapor Sampling 01/28/2015<br>Release ID 070005 – Monitored Natural Attenuation 08/24/2010<br>Release ID 940200 – Monitored Natural Attenuation 08/24/2010<br>Site Cleanup Completed (NFA) |
| Fort Barrette<br>Other, HI | Formerly Used Defense Site (FUDS) | ½ to 1-mile north-northeast (higher elevation / crossgradient) | The site contains exposed cesspools, exposed manholes, underground concrete boxes, septic tanks and fuel tank vaults, an underground reservoir and poses potential safety hazards to Kapolei Regional Park (former Fort Barrette) visitors. The site consists of 38.53 acres of land purchased by the U.S. Government in 1931 and transferred to the Navy in 1956. |

Five of the six unmappable sites listed by EDR were determined to be in the vicinity of the subject property: 1) Fort Barrette (listed in Table 4-2), 2) Barbers Point Naval Air Station, Mission Street, 3) Hawaii Army National Guard, 4) DLA Disposition Services (listed in Table 4-2), and 5) Former Oahu Sugar Company Pump 15 Station. Unmappable sites cannot be plotted due to inaccurate or missing information in the environmental database record provided by its applicable agency.

### 4.1.2 Additional Environmental Record Sources

#### 4.1.2.1 City and County of Honolulu, Department of Planning and Permitting

Available information obtained from the CCH, Department of Planning and Permitting, including zoning, land use, and building permits, is provided below.

Zoning Land Use Ordinance (LUO) Designation

The State Land Use District for the subject property and surrounding area is Urban. The CCH zoning LUO designations for the subject property and surrounding properties to the east, south, and west are F-1 Federal, and surrounding properties to the north are AG-1 Restricted Agriculture, P-2 General Preservation, R-5 Residential, AMX-2 Apartment Mixed Use High-density, and A-1 Apartment Low-density

(CCH 2017). The subject property is not within the Special Management Area, tsunami, or extreme tsunami evacuation zones (CCH 2017).

Building Permits

E2 reviewed the Building Permit information obtained from the CCH Department of Budget and Fiscal Services Real Property Assessment Division regarding the subject property. No building permits maintained by the CCH were identified for the subject property.

#### 4.1.2.2 Land Title Records

E2 is not a professional title search company and does not warrant the completeness or accuracy of the information provided, but considers the data useful in screening the subject property for environmentally suspect owners and/or lessees. Recorded land title records for the subject property were provided by EDR (2017b), previous environmental reports, and the information is included in Table 4-3, below.

**Table 4-3: Summary of Land Title**

| Date | Information |
|---|---|
| 2017-02 | Quitclaim Deed Lot 13049 TMK: (1) 9-1-013:004: Kalaeloa Ventures LLC (grantee) to Hunt Communities Hawaii, LLC (grantor) Deed Document No. T-9807136<br>- Parcel 1: Land CT Lot 13047: Map 957 Land Court Order No. 134783 with Land Court Application 1069, covered by Transfer Certificate of Title No. 529,664 issued to the U.S.<br>- Parcel 2: TMK: (1) 9-1-013:004; Land CT Lot 13049: Map 957 Land Court Order No. 134783 with Land Court Application 1069, covered by Transfer Certificate of Title No. 529,664 issued to the U.S.<br>- Parcel 3: TMK: (1) 9-1-013:128 Land CT Lot 13051-A-1 and (1) 9-1-013:130 Land CT Lot 13051-A-3: Map 1609 Order of Subdivision dated April 2014 and noted on Transfer Certificate of Title No. 529,664 issued to the U.S. |
| 2002-06 | Governor Benjamin Cayetano signed into law Senate Bill 2702 (Act 184) which repealed HRS 206G and transferred responsibility for Kalaeloa Community Development District from the NASBP Redevelopment Commission to HCDA. |
| 2000-04 | The U.S. Navy authorized the sale or lease of approximately 675 acres of Navy retained land in Kalaeloa including the majority of land along Roosevelt Road. |
| 1994 | Hawaii State Legislature established the NASBP Redevelopment Commission for preparing a plan for the conveyance and subsequent reuse of the surplus land at Kalaeloa. |
| 1993 | U.S. DoD through the Base Realignment and Closure (BRAC) process, designated the NASBP for closure and roughly 2,165 acres were declared as surplus, making them available for conveyance to State and local government agencies. |
| 1941 | James Campbell leased what became the NASBP to the U.S. Navy. |
| 1877 | Honouliuli sold to James Campbell |

## 4.2 Other Information Sources

The following sections describe information obtained from other information sources.



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### 4.2.1 State of Hawaii Department of Health File Review

E2 submitted requests to access public information for the subject and adjacent properties as shown in Table 4-4. Responses from HDOH branches are discussed in the sections below.

**Table 4-4: HDOH Public Information Requests**

| HDOH Branch | Contact | Notes: |
|---|---|---|
| Clean Water Branch (CWB) | Mr. Bobbie Teixeria, Environmental Health Specialist | Kalaeloa Solar One, adjacent to the south, HIR10D826<br>Kalaeloa Ventures, LLC HIR10D697 |
| HEER Office | Ms. Mae Rose Domingo, Administrative Assistant | <u>Adjacent property to the northwest, Costco Wholesale Warehouse</u><br>• Phase I ESA and Phase II Environmental Site Investigation conducted by Environet, Inc. and a Rezoning Application completed by LP&D Hawaii. Environmental concerns and/or notes are listed in Table 4-7. |
| Indoor & Radiological Health Branch (IRHB) | Mr. Jeffrey M. Eckerd, Program Manager | Notifications of asbestos abatement were found for TMK: (1) 9-1-013: Parcels 002, 004, 026, 128, and 129. No other communications regarding noise, radiation, indoor air quality, mechanical ventilation, asbestos or lead problems were identified on the subject or adjoining properties. |
| Safe Drinking Water Branch (SDWB) | Mr. Norris Uehara, Supervisor of the Groundwater Pollution Control Section | <u>Navy Retention Area at Barbers Point</u><br>• UIC Permit UO-1995 Change-of-Operator 07-14-2014 from U.S. Department of the Navy (DoN) to Kalaeloa Ventures, LLC.<br>• UIC Permit UO-2986 Change-of-Operator 10/07/2014 from DoN to Kalaeloa Ventures, LLC for 22 of the 56 drainage injection wells which are currently under UIC permit UO-1995. Gravity flow of the runoff water. UIC wells located within Parcels 1, 2, and 3 are shown in Figure 3, included in Appendix B. |
| Solid and Hazardous Waste Branch (SHWB) | Ms. Amy Susana Liana, Planner | <u>Adjacent Property to the northeast of Parcel 1, Costco Wholesale</u><br>- HW-2677 Hazardous Waste and Used Oil Compliance Evaluation Inspection – no violations<br>- UST 9-203850 (3) 30,000-gallon gasoline USTs (two unleaded and one premium) installed on 02/26/2009 and (2) 1,000-gallon diesel UST installed on 02/27/2009. |
| Wastewater Branch (WWB) | Ms. Lori Morikami, Planner | The subject property and surrounding area are connected to the Honouliuli Wastewater Treatment Plant (WWTP). |
| Environmental Health Warehouse (EHW) | Online Database | <u>Adjacent Property, Kapolei City Urban Core (4-7) Roads and Kapolei City Urban Core (4-7 Roads) (area between FDR Avenue and Renton Road)</u><br>-National Pollutant Discharge Elimination System (NPDES) Permit HIR10D042-4 05/16/2008 to 10/21/2012<br>-NPDES Permit HIR10D042-5 05/16/2008 to 06/18/2010 |

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| HDOH Branch | Contact | Notes: |
|---|---|---|
| | | Adjacent Property, Parcel 1 (interior)<br>-UST Site: Facility ID 9-203295, Installation 05/01/1987<br>Adjacent Property, Parcel 3 (interior), Building 74 Tank BP92 NASBP (the building location was not definitely known)<br>-UST Site: Facility ID 9-103191 Installation Date 11/18/1993<br>-LUST Site: Release ID 030039 11/18/1993 Site Cleanup Completed NFA |

## 4.2.2 Department of Land and Natural Resources

E2 interviewed Mr. Jonas Burgon with the State Department of Land and Natural Resources (DLNR) Commission on Water Resources Management (CWRM) on October 14, 2017. According to the maps and documents provided by Mr. Burgon, there is one well on the subject property (Parcel 1). Table 4-5 lists the wells identified within one mile of the subject property.

**Table 4-5: Well Information**

| Well Identification Number | Location to Subject Property | Owner | Well Use/Status |
|---|---|---|---|
| 3-1905-003 Barbers Point | Subject Property within GTE Building (Parcel 1) | GTE Hawaiian Tel. Co. Inc. | Other |
| 3-1905-005 Caprock 1 | Adjacent to the west of Parcel 1 within TMK: (1) 9-1-075: parcel 053 | CCH BWS | Unused |
| 3-1905-004 Ewa Desalt Basal | | CCH BWS | Unused |
| 3-1905-006 Caprock 1 | Adjacent to the west of Parcel 1 within TMK: (1) 9-1-075: parcel 039 | CCH BWS | Abandoned/sealed |
| 3-1905-007 Caprock 2 | | CCH BWS | Unused |
| 3-1905-009 Caprock 3 | | State DLNR | Unused |
| 3-1904-001 EP 31&32 | To the northeast of Parcel 3 across FDR Ave, OR&L utility easement, Renton Road, and drainage basin within TMK: (1) 9-1-160 parcel 063 | Campbell Estate | Abandoned/sealed |
| 3-1904-002 Makakilo G C 1 | | Puu Makakilo | Abandoned/sealed |
| 3-1904-003 Makakilo G C 2 | | Puu Makakilo | Abandoned/sealed |
| 3-1905-010 KBP | To the southwest of Parcel 1 | Not listed | Abandoned/sealed |
| 3-2005-001 Honouliuli | To the north of Parcel 1 across H-1 | Pac Conc Quarry | Abandoned/sealed |
| 3-1805-016 VIP Sanitation | To the northwest of Parcel 1 near the intersection of Saratoga Street and Malakole Street. | VIP Sanitation, Inc. | Industrial use |
| 3-1805-001 Barbers Point | | Campbell Estate | Unused |
| 3-1905-002 Campbell Industrial Park | To the west of Parcel 1 to the west of Highway 95 | Campbell Estate | Other |
| 3-1905-008 Kapolei Irr 1 | To the north of Parcel 2 across FDR Ave, OR&L utility easement, Renton Road, and drainage basin within TMK: (1) 9-1-160 parcel 014 | CCH BWS | Unused |
| 3-1905-010 Kapolei Irr 2 | | CCH BWS | Unused |

## 4.2.3 City and County of Honolulu Fire Department

E2 submitted requests to access public information for the subject and adjacent properties as shown in Table 4-4. Responses from CCH Fire Department, Fire Prevention Bureau, are discussed in the section below. No records were found for the subject property.

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#### 4.2.3.1 Local Electric Utility Company

No transformers were identified within the proposed roadways; therefore, Hawaiian Electric Company, Inc. (HECO) was not contacted, the DoN would most likely own any transformers on the subject property.

## 4.3 Physical Setting Sources

### 4.3.1 U.S. Geological Survey Topographic Map Coverage

Topographic map coverage of the site is included on the U.S. Department of the Interior Geological Survey (USGS) 7.5-minute Ewa quadrangle map, as shown in Figure 1. The property is located approximately 1.5 miles north of the shoreline. The site is located at 21° 19' 23.95" north latitude and 158° 4' 45.66'' west longitude. Kalaeloa is relatively flat, with an average slope across the entire area of about 0.5 percent (%). The ground surface slopes gently southward with an elevation of approximately 52 feet above mean sea level.

### 4.3.2 Climate

The climate in the region of the Kalaeloa has monthly mean temperatures ranging from 62 to 88 degrees Fahrenheit (Western Regional Climate Center 2017) with an average annual rainfall of approximately 21.49 inches per year (Giambelluca et al. 2013).

The prevailing wind direction is from the east and northeast. Northeasterly trade winds prevail over Oahu approximately 80% of the time, with average wind speeds ranging from 10 to 15 miles per hour. The trade winds blow most strongly and consistently from April through November. Southerly or "Kona" winds occur roughly less than half the time during December through March.

### 4.3.3 Geologic and Hydrogeologic Setting

E2 reviewed published geologic and hydrogeologic reports and maps to obtain information regarding subsurface conditions in the general area of the site and to evaluate the potential migration of contaminants.

#### 4.3.3.1 Geology

The island of Oahu is of volcanic origin and was built by the Waianae and the Koolau Volcanoes, which are now deeply eroded (MacDonald et al. 1983). The Waianae Range rises 1.2 kilometers above sea level, making it higher than the younger, adjacent Koolau Range (MacDonald et al. 1983). The Waianae and Koolau Volcanic Shields were built during the late Pliocene and early Pleistocene by thin-bedded lava flows. The main shield building activities ceased approximately 3.5 to 2.5 million years ago (Stearns 1985).

The site is situated on the Ewa Coastal Plain which extends seaward off the southeastern flank of Waianae Volcano and the southwestern flank of the Koolau Volcano. This plain was formed by the accumulation of a thick wedge of sediments and coral reef formations on the flanks of the two volcanoes.

High sea level stands during the Pleistocene Epoch caused the formation of reef deposits at correspondingly higher elevation. Subaerial exposure of the sediments and calcareous materials caused consolidation of the lagoonal deposits and induration of the reef materials.

Sinkholes, depressions in the surface of the earth where there is little fill over the coral reef limestone, are found across the Ewa Plain. Unique anchialine pools, which are sinkholes that connect to the ocean

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through cracks in the substrate, are preserved at the Kalaeloa Unit of the Pearl Harbor National Wildlife Refuge, approximately 1.4 miles south of the proposed roadways.

#### 4.3.3.2 Soils

According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the soil in the area of the site is classified as follows:

- Coral outcrop land consists of coral or cemented calcareous sand. The coral reefs formed in shallow ocean water during the time the ocean stand was at a higher level. Small areas of coral outcrop are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. This type of land is used for military installations, quarries, and urban development.
- Mamala cobbly silty clay loam, 9 to 12% slopes, consists of shallow, well-drained soils along the coastal plains formed in alluvium deposited over coral limestone and consolidated calcareous sand. Runoff is very slow, the erosion hazard slight to moderate, and the permeability is moderate. In a representative profile, the surface layer is dark-reddish-brown stony silty clay loam about 8 inches thick. The subsoil is dark reddish-brown silty clay loam about 11 inches thick. The substratum is coral limestone and consolidated calcareous sand.

#### 4.3.3.3 Hydrogeology

Mink and Lau (1990) identify the following two types of groundwater beneath the majority of the subject property: a shallow, predominantly caprock groundwater system and an underlying deep basal aquifer. They classify the groundwater as within the Ewa Aquifer System of the Pearl Harbor Aquifer Sector in the two systems as follows:

- The uppermost member is characterized as an unconfined basal aquifer contained in sedimentary nonvolcanic lithology layers. This caprock groundwater is given a Status Code of 13321 which indicates that the groundwater has moderate salinity (i.e., with a chloride content of 1,000 to 5,000 milligrams per liter [mg/L]). Under the Mink and Lau system, the code indicates that the shallow caprock groundwater is currently used but not as a drinking or ecologically important groundwater source, is a replaceable resource, and has a high vulnerability to contamination.
- The deep, underlying aquifer is characterized as a confined basal aquifer contained in dike compartments. Under the Mink and Lau system, the groundwater contained in the deep aquifer is given a Status Code of 13213, indicating that the groundwater has a low salinity (i.e., with a chloride content of 250 to 1,000 mg/L). Under the Mink and Lau system, the code indicated that the deep groundwater is currently used as neither a drinking-water or ecologically important source and has a low susceptibility to contamination because of confinement and the overlying caprock.

Up to about 1,650 feet from the coast, the water table is from 3 to 10 feet below the surface and thus is accessible from sinkholes.

The UIC line was established by HDOH to determine groundwater utility. The UIC line is used to determine the level of protectiveness afforded an aquifer as reflected by water quality standard criteria. In general, groundwater situated mauka (inland) of the UIC line is considered a potential source of drinking water. Groundwater situated makai (seaward) of the UIC line is generally considered not to be a potential source

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of drinking water. The subject site lies mauka of the UIC line and groundwater beneath the site is considered a potential source of drinking water.

#### 4.3.3.4 Surface Water

The closest surface water body to the site is the JCIP Drainage Canal adjacent to the west of the property. The location of the site in relation to the JCIP Drainage Canal is shown in Figure 1. Kalaeloa is relatively dry, with little precipitation and the soils in the area are well-drained, there are no streams or rivers in the Kalaeloa area. The Barbers Point portion of the Pacific Ocean is located approximately 1.3 miles to the south of the proposed roadways. During Navy operations, more than 250 dry wells were installed NASBP, primarily for regional stormwater drainage. Sixteen dry wells were identified within the area bounded by the proposed roadways. Dry wells are shown in Figure 3, included in Appendix A.

## 4.4 Historical Use Information

### 4.4.1 Standard Historical Sources

Historical use of the subject and adjacent properties were obtained by reviewing historical sources as listed in Table 4-6 below. A discussion of RECs and/or environmental concerns identified as a result of our review of standard historical sources is included in Section 7 of this report.

**Table 4-6: Historical Sources Reviewed**

| Source Type | Year Reviewed | Source | Environmental Concerns/Notes: |
|---|---|---|---|
| Aerial Photograph | 1944, 1951, 1965, 1968, 1977, 1985, 1992, 2001, 2004, 2006, 2008, 2013, and 2014 | EDR 2017c, University of Hawaii, 2017, and Google Earth 2017 | *Parcel 1*<br>1944: Aerial photo quality is poor. ROWs for FDR Avenue, OR&L, and Renton Road present on the north side; ROW for Copahee Avenue present on the east side; and ROW for Boxer Road extends through the interior portion of TMK: (1) 9-1-013:002; and a GTE structure located on FDR Avenue. The interior portion of TMK: (1) 9-1-013:002 has 17 structures adjacent to the west of Copahee Avenue, and was heavily vegetated on the west side. Areas to the north, south, and west are heavily vegetated.<br>1951: No significant changes with the exception of the following: the JCIP Drainage channel and an access road ROW are adjacent to the west; the area adjacent to the north appears to be cultivated, and the area to the south is heavily vegetated.<br>1965: NASBP including the subject property was blacked out. Areas to the north and east are cultivated.<br>1968-2000: ROW for Saratoga Avenue now constructed on the south. The interior portion of TMK: (1) 9-1-013:002 was redeveloped into housing.<br>2001-2014: No significant changes to the subject property; however, the interior of TMK: (1) 9-1-013:002 the buildings have been mostly removed. In 2006, the adjacent properties to the north appeared to be developed; and in 2013 the adjacent property to the south has been developed into a solar farm. |
| | | | *Parcel 2* |

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| Source Type | Year Reviewed | Source | Environmental Concerns/Notes: |
|---|---|---|---|
| | | | 1944: Aerial photo quality is poor. ROWs for FDR Avenue, OR&L, and Renton Road present on the north side; ROW for Copahee Avenue present on the west side; ROW for Hornet Avenue on the east side; and ROW for Saratoga Avenue and Boxer Road present on the south side. Building (272 Transformer Station A) present on the northeast corner of the OR&L ROW. A total of 13 structures are present within the interior portion of TMK: (1) 9-1-013:004 adjacent to the east of Copahee Avenue and Tulagi Avenue extends through the interior portion. The area to the north is heavily vegetated, and area to the south appears to be developed.<br>1951: Area to the north is heavily vegetated, structures are present to the south.<br>1965: NASBP including the subject property was blacked out. The area to the north is cultivated.<br>1968-2000: ROW for Saratoga Avenue now constructed on the south. The interior portion of TMK: (1) 9-1-013:004 was redeveloped into housing and TMK: (1) 9-1-013:003 the current structure 1674: Barbers Point Elementary was developed.<br>2001-2014: No significant changes to the subject property; however, the interior of TMK: (1) 9-1-013:004 the buildings have been mostly removed except a few on the southwest corner. |
| | | | *Parcel 3*<br>1944: Aerial photo quality is poor. ROWs for FDR Avenue, OR&L, and Renton Road present on the north side; Bennington Street bisects central portion of the site from north to south; Saratoga Avenue present on the south side; and Hornet Avenue present on the west side. The interior portion of TMK: (1) 9-1-013:129 appears to be cleared with possible structures; and the interior portion of TMK: (1) 9-1-013:128 has two "E"-shaped buildings (building numbers unknown) on the west side and one small building (building number unknown) on the east.<br>1951: Proposed Road A has a portion of one building (73: Paradise West Club Complex) and a portion of a roadway that leads to the east portion of the site; and within the proposed Wakea Street Extension one building (1906: Tennis Pro Shop) is present; a portion of a small building (68C) and a portion of the tennis courts (Structure 713) are present. The interior portion of TMK: (1) 9-1-013:129 has three buildings (building numbers unknown) on the west side and one large building on the east (73: Paradise West Club Complex) and three smaller structures (1692: Cold Storage, 943: Pool Bathhouse, 945: Pool Treatment Facility); and the interior portion of TMK: (1) 9-1-013:128 has the two "E"-shaped buildings (building numbers unknown) and 5 structures (building numbers unknown) adjacent to the north of Saratoga Avenue on the west side of the site and two tennis courts (Structure 713) and a small building (Building 68C) on the east side.<br>1965: NASBP including the subject property was blacked out. Areas to the north are cultivated. |

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| Source Type | Year Reviewed | Source | Environmental Concerns/Notes: |
|---|---|---|---|
| | | | 1968-2000: No significant changes on the subject property. The interior portion of TMK: (1) 9-1-013:129 has one building (77: BOQ) on the west side and an outdoor pool (Structure 941), 1724: Transformer Station, 943: Pool Bathhouse, 945: Pool Treatment Facility, 73: Paradise West Club Complex, and 1692: Cold Storage structures on the east; and the interior portion of TMK: (1) 9-1-013:128 has been redeveloped with no structures on the west side and 713: tennis courts and 68C: Unknown use building on the east side<br><br>2001-2014: No significant changes on the subject property. The interior portion of TMK: (1) 9-1-013:128, the 68C building was removed, only the foundation remains. The area to the south is highly developed. In 2013, the area to the north was graded and appeared to be used for construction. |
| Fire Insurance Maps | No Coverage | EDR 2017d | No Coverage |
| USGS Topo Maps (Ewa and Barbers Point Quadrangles) | 1928, 1953, 1962, 1968, 1970, 1983, 1985, 1998, and 2013 | EDR 2017e and U.S. Army 1943 | *Parcel 1*<br><br>1928: OR&L tracks on the north, a portion of access trails on the west and north. No significant features within the interior of TMK: (1) 9-1-013:002 with the exception of a possible pipeline through the southwest corner. The area labeled Honouliuli.<br><br>1943: The ROW for OR&L tracks and FDR Avenue on the north. The interior of TMK: (1) 9-1-013:002 is shown as subdivided into 7 sub-parcels and Boxer Road goes through the central portion of the parcel.<br><br>1953: The ROWs for Renton Road, OR&L tracks, and FDR Avenue on the north, ROW for Copahee Avenue on the east, and the JCIP Drainage Canal on the west. The interior of TMK: (1) 9-1-013:002 developed for housing with over 70 structures. The area labeled NASBP.<br><br>1962-1985: The ROW for Saratoga Avenue on the south side. No other significant changes. TMK: (1) 9-1-013:003 the current structure 1674: Barbers Point School now present.<br><br>1998: No significant changes on the subject property. The interior of TMK: (1) 9-1-013:002 no structures are shown. Area no longer labeled NASBP.<br><br>2013: OR&L tracks no longer present.<br><br>*Parcel 2*<br><br>1928: OR&L tracks on the north and access trail on the north. No significant features within the interior of TMK: (1) 9-1-013:004. The area labeled Honouliuli.<br><br>1943: The ROW for OR&L tracks and FDR Avenue on the north, ROW for Hornet Avenue on the east, roadway for Boxer Road and Saratoga Avenue on the south. The interior of TMK: (1) 9-1-013:004 has no features. |

| Source Type | Year Reviewed | Source | Environmental Concerns/Notes: |
|---|---|---|---|
| | | | 1953: The ROWs for Renton Road, OR&L tracks, and FDR Avenue on the north, ROW for Hornet Avenue on the east, and ROW for Copahee Avenue on the west. The interior of TMK: (1) 9-1-013:004 shows two small buildings (unknown building numbers) on the north side of the site adjacent to FDR Avenue. The area labeled NASBP.<br>1962-1985: No significant changes to the subject property. The interior of TMK: (1) 9-1-013:004 has been developed into housing with over 40 structures on it. The ROW for Tulagi Avenue adjacent to the east of TMK: (1) 9-1-013:004 and TMK: (1) 9-1-013:003 the current structure 1674: Barbers Point School now present.<br>1998: No significant changes on the subject property. The interior of TMK: (1) 9-1-013:004 no structures are shown. Area no longer labeled NASBP.<br>2013: OR&L tracks no longer present. |
| | | | <u>*Parcel 3*</u><br>1928: OR&L tracks on the north. No significant features within the interior of TMK: (1) 9-1-013:0129 and 128 except a stone wall. The area labeled Honouliuli.<br>1943: The ROWs for OR&L tracks and FDR Avenue on the north, ROW for Franklin Street on the east, ROW for Saratoga Avenue on the south, ROW for Hornet Avenue on the west, and a road near the proposed Wakea Extension Street. The interior of TMK: (1) 9-1-013:129 has one “L”-shaped building (unknown building number) and a small rectangular building (unknown building number) on the west side. The interior of TMK: (1) 9-1-013:128 has two “E”-shaped buildings (unknown building numbers) on the west side.<br>1953: The ROWs for Renton Road, OR&L tracks, and FDR Avenue on the north, ROW for Hornet Avenue on the east, ROWs for Boxer Road and Saratoga Avenue on the south, and the ROW for Copahee Avenue on the west. In addition, a portion of 73: Paradise West Club Complex is within the proposed Road A ROW for the subject property. The interior of TMK: (1) 9-1-013:129 has two additional small buildings (unknown building numbers) constructed on the west side, and the current 73: Paradise West Club Complex on the east side; and the interior of TMK: (1) 9-1-013:128 four additional structures (building numbers unknown) are shown adjacent to Saratoga Avenue. The area labeled NASBP.<br>1962: No significant changes to the subject property. The interior area of TMK: (1) 9-1-013:129 has 72: BOQ, and a “T” shaped building (building number unknown) on the west side and 73: Paradise West Club Complex, 943: Bathhouse, and 945: Pool Treatment Facility structures on the east side. The interior of TMK: (1) 9-1-013:128 has only one “E”-shaped building (unknown building number) and the four small structures (unknown building numbers) adjacent to Saratoga Avenue on the west side and no structures on the east side. |

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| Source Type | Year Reviewed | Source | Environmental Concerns/Notes: |
|---|---|---|---|
| | | | 1968: No significant changes to the subject property. The interior area of TMK: (1) 9-1-013:129 had no changes. The interior area of TMK: (1) 9-1-013:128 no structures are shown.<br>1970: No significant changes to the subject property or interior areas with the exception of 943: Bathhouse structure not shown.<br>1983-1985: A portion of 68C: Unknown structure use is within the proposed Road A ROW for the subject property. The interior area of TMK: (1) 9-1-013:129 943: Bathhouse structure present again; and in the interior area of TMK: (1) 9-1-013:128 68C: Unknown structure use shown.<br>1998: No significant changes on the subject property. The interior of TMK: (1) 9-1-013:129 only has two structures 77: BOQ and 73: Paradise West Club Complex are shown; and in the interior of TMK: (1) 9-1-013:129 only 68C: Unknown structure use is shown. Area no longer labeled NASBP.<br>2013: No structures are shown on the subject property or within the interior of TMKs (1) 9-1-013:129 or 128. OR&L tracks no longer present. |
| Street Directories | 1992, 1995, 1999, 2003, 2008, and 2013 (FDR Avenue, Roosevelt Avenue, and Lauwiliwili Street) | EDR 2017f | No environmental concerns or notes. |
| Building Permit Records | No coverage | EDR 2017g | No coverage. |
| Property Tax Map Report | No coverage | EDR 2017h | No coverage. |
| Environmental Lien and AUL Search | 2017 | EDR 2017b | Title records are outlined in Section 4.1.2.2.<br>Quitclaim Deed Kalaeloa Ventures LLC to Hunt Communities Hawaii, LLC |
| Historical Maps | 1876 | State Department of Accounting and General Services (DAGS) 2017 | Area labeled Coral Plain, Total area of Honouliuli including Puuloa 432 A., L.C. Award 11216 |
| | 1899 | Rumsey 1899 | OR&L Railway located to the north of the subject property. The area labeled "Coral Plain." |
| | 1902 | DAGS 2017 and Rumsey 1902 | Area labeled "Coral Plain" and is also located "Sisal Plantation." The area labeled U.S. Coast and Geodetic Survey Magnetic Station. OR&L Railway located on north side of the site. |
| | 1937 | E2 Archives | Ft. Barrette shown approximately 0.6-mile northeast of the subject property hydraulically up/cross gradient of the subject property. |
| State Geographic | 1900, 1920, and 1937 | State Office of Planning 2015 | The 1937 map identifies the subject property within sugarcane lands. |

| Source Type | Year Reviewed | Source | Environmental Concerns/Notes: |
|---|---|---|---|
| Information System (GIS) | | | |

## 4.4.2 Previous Environmental Reports

E2 reviewed previous environmental reports as listed in Table 4-7 below. A discussion of RECs and/or environmental concerns identified as a result of our review of the previous environmental reports is included in Section 7 of this report.

**Table 4-7: Previous Environmental Reports Reviewed**

| Year | Report Title | Environmental Concerns/Notes: |
|---|---|---|
| 1945 | *History of Naval Air Station, Navy No. 14* (Naval Air Station 1945) | • In November 1941, field work was started for the construction of NASBP, and the station was established on 14 April 1942.<br>• Grading and oiling of the coral strip were historically occurring on the airfield prior to being paved in 1943.<br>• Sewage and drainage system complete.<br>• In 1944, recreation facilities constructed.<br>• In 1945, all major construction on the Inshore Patrol Squadron area completed, including parking mat, nose hanger, enlisted barracks, mess hall, BOQs and shop space completed. |
| 1991 | *An Archaeological Survey of the Naval Air Station, Barber's Point, O'ahu, Hawai'I* (Applied Research Group 1991) | • 1825 map indicated the site was within uncultivated plain.<br>• In September 1877, Honouliuli was sold to James Campbell, who leased out rice lands, fishing rights at Pearl Harbor, and a lime quarry.<br>• In 1889, Honouliuli was leased to Benjamin Dillingham for 50 years, and the Ewa Sugar Plantation was established in the lower portion of the ahupuaa, and Oahu Sugar Company's cane fields were developed in the upper portion.<br>• In 1889, Dillingham's OR&L began constructing a railroad in Honouliuli, and by 1895 it was extended to Waianae.<br>• In 1893, sisal was imported from Florida and planted in 1894 for cordage. Part of the NASBP was built on the old sisal plantation, including the area of the subject property. A map 1908 to 1913 shows the subject property as part of "Sisal Plantation."<br>• During the 1930s, the Navy leased the area where a mooring mast was built (to the east of the subject property). In late 1939 or early 1940, when the original lease expired, the Navy acquired more than 3,500 acres from the same estate where the Marine Corps Air Station (MCAS) at Ewa and later, NASBP was built.<br>• In November 1951, ceremonies were held for the opening of "the first housing unit at NASBP" and were expected to be completed by mid-April 1952. The 355 apartments were to house 278 enlisted men and 77 officers. |

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| Year | Report Title | Environmental Concerns/Notes: |
|---|---|---|
| | | • In 1956, announcements were again made for additional housing units at Barbers Point. Twenty-seven units were to be for senior officers, 216 units for junior officers, and 887 for enlisted men.<br>• In 1957, it was announced that the Navy would have trailer houses built by a contractor from the mainland. The metal trailers were 40 to 50 feet in length, and between 8 and 10 feet wide, with metal cabanas on the side. A "pilot" village of 50 trailers was to be installed within the first three months after work had begun.<br>• In 1974, 56.7 acres of Federal land was turned over to the CCH to build the Honouliuli WWTP.<br>• A "permanent zone" of 5,000 yards along the beach and 1,000 yards off-shore was established as a danger zone by NASBP for use by the Navy for target practice, ordnance proving, underwater demolition training, and dummy torpedo firing.<br>• In 1902, a U.S. Coast and Geodetic Survey Magnetic Observatory, also known as the Honolulu Observatory, was established in Honouliuli. |
| 1994 | *Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract No. N62742-90-D-0019 CTO No. 0126, Environmental Baseline Survey for Naval Air Station Berbers Point, Oahu, Hawaii* (Naval Facilities Engineering Command Pacific Division [NAVFAC] 1994) | • *Adjacent property northeast of the intersection of FDR and Franklin Road.* In 1993, a contractor backhoe ran over the fill pipe of this previously unidentified UST during excavation work for a new housing development. The tank was approximately half-full of a petroleum product, and laboratory analysis showed the contents to be a mixture of water and halogenated oil. The UST was excavated on November 12, 1993, and a closure report was prepared in 1993. The original contents and purpose of the tank are unknown, but historical drawings show barracks located in the area from 1945 to 1969.<br>• *Adjacent Property, 77: BOQ*: Diesel and fuel oil storage tanks (BP19 and BP20) were installed in 1958 to fuel boilers in Building 77. The tanks, boilers, and piping were removed in October 1991, at which time visual evidence of soil contamination was noted at the site. Analytical results and subsequent actions are not known.<br>• *Subject Property, 272: Transformer Station A*: The site is a substation which consists of an 850 kilovolt-ampere transformer numbered 444, was constructed in the early 1940s as part of the original electrical grid for the base. Transformer 444 was retro-filled by the Public Works Center on June 28, 1988, due to the detection of polychlorinated biphenyl (PCBs) in the dielectric fluid and wipe samples collected from the concrete pad. Follow-up sampling has not been conducted. |
| 1995 | *Naval Air Station Barbers Point (Marine Corps Air Station Ewa), Franklin D. Roosevelt Street, Essex Street, Pacific Ocean, and Drainage Channel, Ewa Vicinity, Honolulu County, Hawaii, Written Historical and Descriptive Data* (Historic American Building Survey 1995) | • In 1931, the U.S. Army started to build a battery of two 16-inch guns at Puu-o-Kapolei, the only topographic rise in the Ewa plain, just north of what became NASBP. The army installation (Fort Barrette) and the gun emplacement (Battery Hatch) are now part of the Kapolei Regional Park.<br>• In the 1930s, the Army also established training areas and built coastal defenses and a coastal highway in the Ewa Plain. |

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| Year | Report Title | Environmental Concerns/Notes: |
|---|---|---|
| | | • In 1932, the Navy leased 206 acres in the Ewa Plain from the Campbell Estate.<br>• The MCAS facilities constructed in 1941, were attacked by the Japanese in December 1941. The MCAS Ewa was a pilot training center and staging area for men and planes serving throughout the Pacific during World War II (WWII). After the war, the station was disestablished, with the land absorbed by NASBP.<br>• During WWII, NASBP was a major supply, overhaul, and repair station for carrier aircraft. |
| 1997 | *Archaeological Inventory Survey for Construction Projects at Naval Air Station Barbers Point, O'ahu, Hawai'i,* (International Archaeological Research Institute, Inc. 1997) | • An 1825 map, shows all of the central areas of the Ewa Plain labeled as "Low uncultivated Plain" indicating that the entire area was abandoned by 1825.<br>• None of the land records or maps indicate any nearby activity until the construction of the MCAS Ewa in the 1930s and the NASBP in 1940 and 1941. |
| 1998 | *Department of the Navy, FY 1999 Amended Budget Estimates (BRAC 93) Base Closure and Realignment, III Justification Data Submitted to Congress* (DoN 1998) | • NASBP family housing will be retained to address the existing housing shortfalls in the Pearl Harbor region.<br>• 50 points of interests were identified within NASBP. One of the sites, 272: Transformer Station A (1947-1994), is located on the subject property. |
| 2000 | *An Archaeological Curation-Needs Assessment of Military Installations in Selected Western States, Technical Report No. 20, Volume 1* (U.S. Army Corps of Engineers 2000) | • In April 1942, the NASBP was commissioned and used to train pilots and service planes from aircraft carriers in the Pacific theater.<br>• Following the war, it served as a rapid demobilization center and supported functions of all areas of aviation activities.<br>• In 1949, the adjacent MCAS Ewa was incorporated into the NASBP boundary.<br>• During the Korean War, the installation served as a cargo forwarding and personnel replacement center for United Nation forces. |
| 2006 | *Phase I Environmental Site Assessment, Vacant lot (Proposed Costco Wholesale Warehouse location), Corner Kapolei Parkway & Kamokila Boulevard, Kapolei, Oahu, Hawaii 96707, TMK: (1) 9-1-16 Parcel 1 (portion)* (Environet, Inc. 2006a) | • The entire area that is now known as Kapolei has been used for agricultural purposes (i.e., sugarcane) since the mid-1800s.<br>• The vacant lot was leased historically by Ewa Plantation Co. and the Oahu Sugar Company.<br>• "Black Oil" and "White Gas" pipelines located along FDR Avenue and Renton Road within the OR&L ROW. |
| 2006 | *Phase II Environmental Site Investigation Report, Vacant lot (Proposed Costco Wholesale Warehouse location), Corner Kapolei Parkway & Kamokila Boulevard, Kapolei, Oahu, Hawaii 96707, TMK: (1) 9-1-16 Parcel 1 (portion)* (Environet, Inc. 2006b) | • In 2006, Environet, Inc. collected 12 surface soil samples and groundwater samples from five temporary wells. Arsenic and selenium were detected in surface soil at concentrations that exceeded the HDOH Environmental Action Levels (EALs) at the time. Total petroleum hydrocarbons (TPH) as diesel range organics (DRO) and TPH as oil range organics (ORO) were detected in groundwater at concentrations that exceeded HDOH EALs at the time. |
| 2006 | *Rezoning Application Costco Wholesale Kapolei TMK: 9-1-016:001 (por), The City of Kapolei, Honouliuli, Ewa, West Oahu, Hawaii* (LP&D Hawaii 2006) | • Rezoning from P-2 to BMX-3 to allow for the development of a Costco warehouse and gas station facility.<br>• In 1980 approximately 14 miles of the OR&L was transferred from the U.S. to the HDOT. Also referred to as the Pearl Harbor Historic Trail, it is used as a utility corridor with multiple easements granted |

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| Year | Report Title | Environmental Concerns/Notes: |
|---|---|---|
| | | to government agencies, utility companies, and Standard Oil of California.<br>• The regional drainage system consists of a drainage transition area from an open channel to underground box culvert and connects to the JCIP Drainage Canal. The drainage system prevents discharge into the NASBP. The JCIP Drainage Canal is a concrete engineered open channel, carrying drainage from the surrounding area. |
| 2006 | *Kalaeloa Master Plan* (HCDA 2006) | • Roads transferred to the HDOT include Franklin Street and West Perimeter Road.<br>• Roads transferred to the CCH include Saratoga Road, Hornet Avenue, Copahee Road, Boxer Road, and several ROWs for the road extensions.<br>• Stormwater runoff within Kalaeloa is discharged into an extensive system of more than 250 dry wells that are permitted by the HDOH; however, do not conform to City standards.<br>• Runoff from Kapolei City is intercepted by an open channel, north of the OR&L railway alignment and parallel to the northern boundary that discharges to the JCIP Drainage Canal.<br>• Water distribution system in Kalaeloa is currently owned and operated by the U.S. Navy.<br>• The existing sewer system in Kalaeloa is currently owned by the U.S. Navy and operated, under license, by the CCH Department of Environmental Services.<br>• The existing electrical distribution system in Kalaeloa is currently owned and operated by the U.S. Navy.<br>• Telephone and communications cable system in Kalaeloa is currently owned by the U.S. Navy Computer and Telecommunications Area Master Station. |
| 2010 | *Geotechnical Engineering Exploration Kalaeloa Parcel 1 Subdivision, TMK: 9-1-13: 2, Kalaeloa, Oahu, Hawaii* (Belt Collins Hawaii Ltd. 2010) | • The site is underlain by a thin horizon of man-made fill which is underlain by interbedded coral formations and weakly cemented reef detritus-based on six borings installed at the site to depths ranging from about 11.2 to 16.5 feet below ground surface. |
| 2014 | *Development Permit Application, Building 77, 91-1245 Franklin D Roosevelt Ave, Kalaeloa, HI 96707, TMK: 91013011* (Hunt Development Group LLC 2014) | • In 1958, the Navy 77: BOQ located within Parcel 3 was constructed and was abandoned by 1999. The BOQ is located outside the boundaries of the former MCAS Ewa and the 1941 Ewa Field.<br>• 77: BOQ qualifies for the National Register of Historic Places. |
| 2016 | *(Draft) Kalaeloa Potable Water Master Plan* (RMTC 2016) | • Kalaeloa is located in the DLNR CWRM Ewa-Kunia Aquifer System Area and Groundwater Management Area. The Kapolei Aquifer System Area and Ewa Caprock Aquifer are located in Kalaeloa.<br>• TMK: (1) 9-1-013:002 is listed as vacant 49.68-acre lot; TMK: (1) 9-1-013:004 is listed as vacant 30.94-acre lot; and TMK: (1) 9-1-013:128 and 129 is listed as 25.05-acre lot occupied by 77: BOQ, 73: Paradise West Club Complex, 941: Outdoor Pool, 1724: Transformer Station; 943 Pool Bathhouse; 945 Pool Treatment Facility; 1692 Cold Storage; 68C: Concrete Pad; 713: Tennis Courts; and 1906: Tennis Pro Shop. Figure 2, included in Appendix A, shows the locations of the structures. |

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| Year | Report Title | Environmental Concerns/Notes: |
|---|---|---|
| | | • Honouliuli WWTP was originally put into service in December 1984.<br>• The subject property water demands were changed from mixed use to all residential. |
| 2017 | *Drainage Report for Kalaeloa for Naval Air Station Barbers Point (RMTC 2017).* | • Under a recommendation by the U.S. DoD that became an order approved by Congress in 1993, the Navy was required to follow the BRAC process to shut down NASBP and transfer federal real property. In July 1999, the Navy officially closed NASBP.<br>• A CCH-owned makai channel was construction along the north side of FDR Avenue and conveys runoff to the JCIP channel.<br>• The existing drainage systems consist of 253 dry wells that were located randomly around Navy facilities. The existing capacity of the dry wells is unknown, and maintenance has not been done since the closure of the base in 1999. |
| 2017 | *Final Environmental Investigation Report, Parcels 1-5, Kalaeloa Redevelopment Program, Former Naval Air Station, Barber's Point, Oahu, Hawaii* (Weston Solutions, Inc. 2017a) | *Parcel 1, TMK: (1) 9-1-013:002:*<br>• Soil sample results indicated the presence of contaminants at levels exceeding both HDOH EALs and Hawaii soil background levels for metals as follows:<br>- Arsenic – identified at four feet below ground surface;<br>- Chromium (trivalent – non-toxic)- identified at various depths; and<br>- Organochlorine pesticides (heptachlor, heptachlor epoxide, and chlordane) – identified in the surface soils (to the top two feet below ground surface).<br>In this case, Weston Solutions, Inc. established that Chlordane was applied lawfully to the former family housing area for the purpose of termite and pest control.<br>*Parcel 2, TMK: (1) 9-1-013:004:*<br>• Soil sample results indicated the presence of chromium at varying depths at a concentration exceeding HDOH EALs, but below the site-specific background concentrations determined for the site.<br>*Parcel 3, TMK: (1) 9-1-013:128 and 129:*<br>• Soil sample results indicated the presence of chromium at varying depths at concentrations exceeding HDOH EALs, but below site-specific background concentrations.<br>• 73: Paradise West Club Complex (partially on the subject property) and 1906: Tennis Pro Shop (on the subject property) ACM sampling results confirmed ACM at the site within the men's bathroom in the northwestern corner of 73: Paradise West Club Complex and in the office and kitchen area in the southern section of 1906: Tennis Pro Shop.<br>• LBP was detected on the exterior of 73: Paradise West Club Complex (partially on the subject property), 945: Pool Treatment Facility; and 943: Pool Bathhouse buildings.<br>• PCB survey in 73: Paradise West Club Complex (partially on the subject property) was conducted as there was a historical fire that occurred within the building; however, no PCB containing material was identified in the accessible areas of the building. |

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| Year | Report Title | Environmental Concerns/Notes: |
|---|---|---|
| | | • A visual survey of 73: Paradise West Club Complex (partially on the subject property) had potential titanium-containing exit signs at the site.<br>*Dry Wells:*<br>• Samples collected and analyzed from the dry wells indicated chromium and lead above HDOH EALs. Chromium is anticipated to be the same type as that found in the soil borings. |
| 2017 | *Phase I Environmental Site Assessment Parcel 1 Between Saratoga Ave., Franklin Delano Roosevelt Ave. and Copahe'e Ave., TMK # 91013002, Kalaeloa, Hawaii* (Weston Solutions, Inc. 2017b) | • Parcel 1, TMK: (1) 9-1-013:002, samples collected from the soil at the site indicated areas of elevated pesticide concentrations that will require management during redevelopment; however, it does not indicate widespread contamination of the pesticides.<br>• TMK: (1) 9-1-013:002 formerly contained two dry wells (K19-01 and L18-01), that have been cleaned and closed; and currently contains two dry wells K18-02 and L18-01. |

### 4.4.3 Summary of Historical Land Use

E2 reviewed the historical use of the subject and adjacent properties from readily available standard historical sources. A brief summary of the historical use of the area and subject and adjacent properties is provided below.

In the late 1840s, when native tenants of the land were allowed to make claims for private property rights, no claims were made for the property of Kalaeloa.

In the 1880s, the lands of the Kaupea-Kalaeloa region were being turned over to cattle grazing that continued through the early 1900s.

In 1889, James Campbell leased Honouliuli to Benjamin Dillingham who used a section across the Ewa Plain to build the OR&L railroad line in 1890. The railroad line served the major sugar plantations and became the northern boundary of the NASBP.

By 1893, the vicinity including the subject property was used for sisal cultivation, for rope fibers. According to the Historic American Building Survey only ranching under lease to the Hawaiian Meat Company Ltd, and no other commercial uses were noted on the NASBP land before military construction as the entire areas were hard-crusted coral formation untillable pasture and beach.

By 1920, the lands of Honouliuli were used primarily for commercial sugarcane cultivation and ranching. Major land use changes came to western Honouliuli when the U.S. Military began development in the area when the U.S. initiated the Oahu Coast Defense Command, a series of coastal artillery batteries designed to assist in defense of Pearl Harbor and to prevent invasion of Oahu. Military installations were constructed both near the coast, as well as in the foothills and upland areas including Barbers Point Military Reservation (a.k.a. Battery Barbers Point, 1937 to 1942), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155-millimeter guns (Payette 2003). Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation until 1941), located south of Barbers Point Harbor, was used from 1939 as an antiaircraft artillery training firing point (Payette 2003). Gilbert Military Reservation, located east of Barbers Point Harbor, was used from 1922-1944 as a railway battery firing position (Payette 2003). Brown's Camp Military Reservation (a.k.a. Brown's Camp Battery from 1937-1944 and

Battery Awanui from 1940-1945), located near Kahe Point, was a railway battery firing position (Payette 2003). Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Puu Kapolei located approximately 0.6-mile north of the subject property and may have included a portion of the subject property, was in use from 1931 to 1948 for housing four 3-inch antiaircraft batteries (Payette 2003). In the 1950s, the site was used as a NIKE missile base. Palailai Military Reservation (a.k.a. Battery Palailai from 1942-1944), located atop Puu Palailai approximately 1-mile north of the subject property, was used from the 1920s and included Fire Control Station "B" (Payette 2003).

In 1932, the U.S. Marines purchased 206 acres of land at Kalaeloa which became the NASBP. In the 1930s, the coastal highways in the Ewa Plain were constructed. Construction on the MCAS Ewa base began in November 1941; however, the Navy revised the building plans to make the buildings bombproof following the Japanese attacks on Pearl Harbor.

After the war, the MCAS Ewa was disestablished, with the land absorbed by the NASBP which was commissioned on April 15, 1942. The NASBP was the largest and most significant base built in the area and housed numerous naval and defense organizations, including maritime surveillance and antisubmarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet. Between 1944 and 1952, recreational facilities, enlisted barracks, mess hall, and BOQs were constructed at the NASBP. By 1956, the area of the subject property was developed for Naval housing as part of Rose Manor housing. After WWII ended, NASBP became the primary Naval Air Station for Naval operations in the Pacific throughout the Cold War era until its close in 1999. In 2000 to 2001, the Rose Manor housing development was demolished.

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# Section 5 Site Reconnaissance

## 5.1 Methodology and Limitations

A site reconnaissance was conducted by E2 personnel, including Ms. Arlene Campbell, Senior Geologist, and Mr. John Ellis, Environmental Technician, on October 12, 2017. The site reconnaissance included visual surveys of the property and brief surveys of the visible portions of the adjacent parcels. Site photographs are included in Appendix A.

## 5.2 General Observations

At the time of the site reconnaissance on October 12, 2017, the subject property was occupied by asphalt-paved and dirt roadways; OR&L ROW, concrete sidewalks; portions of asphalt-paved parking lots and driveways from former housing units; the GTE Building on Parcel 1; a portion of 272: Transformer Station A on the corner of FDR and Hornet Avenues within Parcel 2; the 1906: Tennis Pro Shop building, portions of 73: Paradise West Club Complex, 68C: concrete pad, and 713: tennis courts on Parcel 3, and portions of the OR&L ROW. The structures and ROW are surrounded by dense trees and bushes. The areas within the subject property have been extensively graded over the years for the development of the ROWs and housing complexes. One unknown concrete structure was identified near the intersection of Saratoga and Copahee Avenues on Parcel 1 that is possibly a WWII pillbox. The site reconnaissance was limited since access was not granted to include the interior of site structures in the site reconnaissance, including the GTE Building, 272: Transformer Station A, 73: Paradise West Club Complex, and 1906: Tennis Pro Shop. Additionally, the OR&L utility corridor was not included in the site reconnaisance.

Observations made during the site reconnaissance are summarized below.

### 5.2.1 Hazardous Substances and Petroleum Products in Connection with Identified Uses

E2 did not observe hazardous substances and/or petroleum products in connection with identified uses within the subject property during the site reconnaissance.

### 5.2.2 Hazardous Substances and Petroleum Products Containers (Not Necessarily in Connection with Identified Uses)

E2 did not observe hazardous substances and/or petroleum products that were not associated with identified uses within subject property during the site reconnaissance.

### 5.2.3 Storage Tanks

E2 did not observe the presence of storage tanks within the subject property during the site reconnaissance.

### 5.2.4 Odors

E2 did not observe strong, pungent, or noxious odor at the subject property during the site reconnaissance.

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### 5.2.5 Pools of Liquid

No pools of liquid were noted on the subject property during the site reconnaissance.

### 5.2.6 Drums

E2 did not observe the presence of drums within the subject property at the time of the site reconnaissance.

### 5.2.7 Polychlorinated Biphenyls

E2 did not observe PCB-containing transformers, electrical equipment, or other signs of PCBs on the subject property at the time of the site reconnaissance with the exception of the following:

- Building 272: Transformer Station within Parcel 2;

### 5.2.8 Pits, Ponds, or Lagoons

E2 did not observe pits, ponds, or lagoons on the subject property during the site reconnaissance.

### 5.2.9 Stained Soil, Concrete, and/or Pavement

E2 did not observe stained soil, concrete, and/or pavement within the subject property during the site reconnaissance.

### 5.2.10 Stressed Vegetation

E2 did not observe stressed vegetation on the subject property during the site reconnaissance.

### 5.2.11 Solid Waste

E2 observed evidence of solid waste at the site as follows:

- Illegal dumping of miscellaneous debris and litter adjacent to the ROWs including small amounts of general household trash, 1-gallon paint cans, several metal cans of brake fluid, wooden pallets, and electronics and
- Small stockpiles of vegetation.

### 5.2.12 Stockpiled Soil

E2 did not observe stockpiled soil from unknown sources on the subject property during the site reconnaissance.

### 5.2.13 Wastewater

Wastewater generation was not observed on the subject property during the site reconnaissance.

### 5.2.14 Stormwater

Stormwater was not observed on the subject property during the site reconnaissance.

### 5.2.15 Wells

E2 did not observe wells within the subject property during the site reconnaissance.

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### 5.2.16 Dry Cleaning Operations

There are currently no dry cleaning operations on the subject property, and historical records did not indicate the presence of a dry cleaning operation on the subject property in the past.

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# Section 6 Interviews

## 6.1 Interviewed Parties

E2 interviewed the following people listed in Table 6-1 regarding the past and current use and activities on the subject and adjacent properties.

**Table 6-1: Interviewed Parties**

| Summary of Parties Interviewed | | |
|---|---|---|
| **Name** | **Affiliation** | **Role** |
| Jinny Cheung | Assistant Development Manager Hawaii Region for Hunt Communities Hawaii, LLC | Owner Representative |
| Mr. Bobbie Teixeria | HDOH CWB | Environmental Health Specialist |
| Ms. Mae Rose Domingo | HDOH HEER Office | Administrative Assistant |
| Mr. Jeffrey M. Eckerd | HDOH IRHB | Program Manager |
| Mr. Norris Uehara | HDOH SDWB Groundwater Pollution Control Section | Supervisor |
| Ms. Amy Susana Liana | Planning & Design Section, HDOH SHWB | Planner |
| Ms. Lori Morikami | Planning & Design Section, HDOH WWB | Planner |
| Mr. Jonas Burgon | DLNR CWRM | Engineer Technician |

## 6.2 Interview Findings

Information obtained during interviews is included in the pertinent sections of this report.

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# Section 7 Findings, Opinions, and Conclusions

RMTC retained E2 to conduct a Phase I ESA in conformance with ASTM Practice E1527-13, *Standard Practice for Environmental Site Assessments*. The subject property is located within the Kalaeloa Community Development District (Kalaeloa) on Oahu, Hawaii, designated as Tax Map Key (TMK): (1) 9-1-013: portions of parcels 002, 004, 128, and 129. The parcels are located on former NASB property and are owned by the U.S. and leased by Kalaeloa Ventures, LLC. The roadways are under various jurisdictions, including the Navy; HCDA; HDOT, and the CCH. For the purposes of this report, the subject property is discussed as three distinct areas:

- *Parcel 1* includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcel 002, including:
  - Capahee Avenue, West Perimeter Road and the Kamokila Boulevard Extension and
  - Portions of Saratoga Avenue, FDR Avenue, and the OR&L utility corridor (including the GTE building).
- *Parcel* includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcel 004, including:
  - Portions of Hornet Avenue, FDR Avenue, Saratoga Avenue, Boxer Road, and 272: Transformer Station A.
- *Parcel 3* includes proposed roadway portions including and surrounding TMK: (1) 9-1-013: parcels 128 and 129, including:
  - Road “A” and the Wakea Street Extension;
  - Portions of Hornet Avenue, FDR Avenue, Franklin Street, Saratoga Avenue, and the OR&L utility corridor;
  - 1906: Tennis Pro Shop; and
  - Portions of 73: Paradise West Club Complex, 68C: concrete pad, and 713: tennis courts.

Any exceptions to, or deletions from, this practice, are described in Section 1.5 of this report.

The assessment has revealed evidence of RECs, as defined by ASTM, associated with the site. Table 7-1 provides a summary of identified RECs and Table 7-2 provides a summary of identified CRECs. Potential environmental concerns, while not considered to be RECs, were identified as listed in Table 7-3.

**Table 7-1: Recognized Environmental Conditions**

| Report Component | Section | Concern Noted or Reported | Description<br>Concern |
|---|---|---|---|
| **On-Site Sources and Potential Sources** | 4 | Yes | **Site Listing on Environmental Databases:**<br>EDR identified “Naval Air Station Barbers Point” (NASBP) on the DoD database. It is possible that historical military use has negatively impacted the soil and groundwater beneath the site. |

| Report Component | Section | Concern Noted or Reported | Description<br>Concern |
|---|---|---|---|
| | | | EDR also identified "Barbers Point Central Office" (GTE Building) (Parcel 1) on the UST database. The UST and associated piping at the site poses a risk of future release of hazardous substances and/or petroleum products to the site. |
| | 4 | Yes | **Pipelines:**<br>"Black oil" and "white gas" pipelines are located within the subject property ROWs on FDR Avenue and the OR&L utility corridor. It is possible that soil and groundwater beneath the site have been or may be impacted by releases associated with the pipelines. |
| | 4 | Yes | **Releases:**<br>*272: Transformer Station A:* Transformer 444, installed in the early 1940s, was retrofilled in 1988 because PCBs were detected in the dielectric fluid and wipe samples collected from the concrete pad. No additional information was available. It is possible that historical releases from the transformer have negatively impacted surface materials in the vicinity of the transformer as well as the soil and groundwater beneath the site. |
| | 5 | Yes | **Solid Waste:**<br>Evidence of illegal dumping of miscellaneous debris and litter adjacent to the ROWs included but was not limited to general household trash, 1-gallon paint cans, several cans of brake fluid, wooden pallets, and electronics. It is possible that illegal dumping activities have negatively impacted soil and groundwater beneath the site. |
| | | | **Hazardous Substances and Petroleum Products:**<br>Hazardous and/or regulated substances (e.g., oils, gasoline, grease, petroleum-based products) may be used/stored within the GTE Building (Parcel 1) and 272: Transformer Station A (Parcel 2). The nature of the activities conducted in these two areas poses a material threat of a future release to the environment. |
| **Off-Site Sources and Potential Sources** | 4 | Yes | **Leaking UST:**<br>Adjacent Structure 77 Wakea Garden Apartments (former BOQ) (interior of Parcel 3) previously had diesel and fuel oil USTs (BP19 and BP20) (installed in 1958). The tanks, boilers, and piping were removed in October 1991, at which time visual evidence of soil contamination was noted. No additional information was available. It is possible that contamination associated with the release(s) remains in the soil and groundwater beneath the site. |
| | 4 | Yes | **Releases:**<br>Contaminated surface soil (arsenic and selenium) and groundwater (TPH-DRO and TPH-ORO) were identified on an adjacent property to the northwest of Parcel 1 hydraulically upgradient (now occupied by Costco). It is possible that contamination from this site is migrating to the subject property. |

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| Report Component | Section | Concern Noted or Reported | Description<br>Concern |
|---|---|---|---|
| | | | Soil sampling conducted within Parcel 1 in 2016 indicated the presence of elevated pesticide concentrations in some areas, which will require management during redevelopment. It is possible that subject property is negatively impacted by historical pesticide use on Parcel 1.<br>Soil sampling conducted within drywells located within Parcel 1 and potentially within the proposed roadway expansion indicate the presence of elevated chromium concentrations in well L18-01. It is possible that contamination from this dry well is on or migrating to the subject property. |

### Table 7-2: Controlled Recognized Environmental Conditions

| Category | Controlled Recognized Environmental Conditions (RECs) |
|---|---|
| LUST Sites | The LUST associated with former Building 74 (exact location is unknown; approximated to be within the southwest interior portion of Parcel 3) (Facility ID 9-103191, Release ID 030039), located within the interior of Parcel 3, is listed as Site Cleanup Completed (NFA). |

### Table 7-3: Potential Environmental Concerns

| Potential Environmental Concern Category | Potential Environmental Concern |
|---|---|
| Former Military Use | The site is part of the former NASBP and was used by the military during and after WWII, mainly as a housing and recreation area. It is possible that historical military use of the subject property has negatively impacted the site. |
| Former Agricultural Use | The subject property was identified by the State GIS map as being historically used for activities associated with sugarcane cultivation; however, all other reports indicate it is part of a Sisal Plantation. Typically pesticides and herbicides are not used in sisal crops. If the property was used for sugar cane cultivation, it is possible that soil and/or groundwater beneath the site has been impacted by historical sugarcane use (typically no chemical fertilizers are used for sisal cultivation). |
| Railroad Tracks | According to historical topographic maps and aerial photographs, portions of the railroad tracks were located within the subject property crossing the Kamokila Boulevard Extension and GTE Building on Parcel 1 and Wakea Extention on Parcel 3 from c. 1890 to c. 1970. It is possible that methyl phenols and creosote (used to treat railroad ties), metals and polychlorinated biphenyls (associated with used oil commonly applied to tracks and weeds/dusty roads), and/or pesticides (weed control) may be present in soil and groundwater in the vicinity of the former tracks. |
| Wells | One well (well 3-1904-003), owned by GTE Hawaiian Tel Co. Inc., is located on the subject property (Parcel 1). The well is listed as other. |
| | Stormwater runoff within Kalaeloa is discharged into an extensive system of more than 250 dry wells that are permitted by the HDOH. Sixteen dry wells are present within the area bounded by the proposed roadways. |
| UST Site | A UST fill pipe was discovered during excavation work for a housing development on the adjacent property northeast of the intersection of FDR and Franklin Street within TMK: (1) 9-1-013: parcel |

| Potential Environmental Concern Category | Potential Environmental Concern |
|---|---|
| | 077. The UST was removed on November 12, 1993, and a closure report was prepared (the report was unavailable). No release was reported. |
| Residual Lead in Soil Attributable to LBP | LBP may have been used in the construction and/or maintenance and upkeep of the former/current structures at the site. It is possible that residual levels of lead are present in the soil beneath, and in the vicinity of former structures as a result of normal paint deterioration and/or demolition activities. |
| Residual Lead on roadways from historic use of leaded gasoline | Heavy metals (i.e., lead) may be present in soil along the roadways from the historical use of leaded gasoline in vehicles prior to January 1, 1996. |
| Residual Pesticides Attributable to Termite Treatment | It is possible that residual levels of termiticides (i.e., chlordane) are present in the soil beneath and in the vicinity of the former/current structures at the site. |
| EDR Identified Sites | EDR identified the following sites that may pose potential environmental concerns to the subject property:<br>• One SPILLS, FTTS, and two UIC identified on the adjacent Barbers Point Elementary School and Kalaeloa Airport (DWS) (listed at the same address) property.<br>• One Federal RCRA-LQG site, SHWS, and UST site identified on the Costco Wholesale #10 site, located adjacent to the northwest of Parcel 1 located hydraulically upgradient.<br>• One State LUST site within ¼ mile, NEX Touch N'Go Gas.<br>• One FUDS was identified approximately ½ mile to the northeast hydraulically upgradient of the site. |
| Unmappable Site | Five of the six unmappable sites listed in the EDR report were determined to be in the vicinity of the subject property: 1) Fort Barrette, 2) Barbers Point Naval Air Station, Mission Street, 3) Hawaii Army National Guard, 4) DLA Disposition Services, and 5) Former Oahu Sugar Company Pump 15 Station. |

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# Section 8 Additional Services

Although E2 was not contracted to conduct additional services; as a courtesy to the client, the following additional services were performed:

- E2 listed potential environmental concerns, which were not considered to be RECs due to a lack of /or limited information, for the subject and adjacent properties, based on their historical use and
- E2 addressed possible ACM and LBP at the subject property.

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# Section 9 Qualifications of Environmental Professionals

Qualifications of the Environmental Professionals are included in Appendix C.

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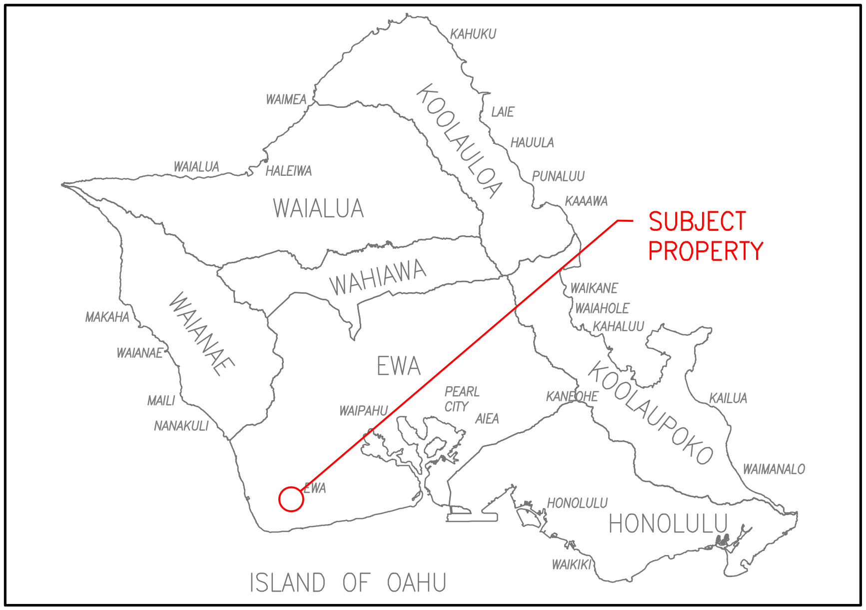
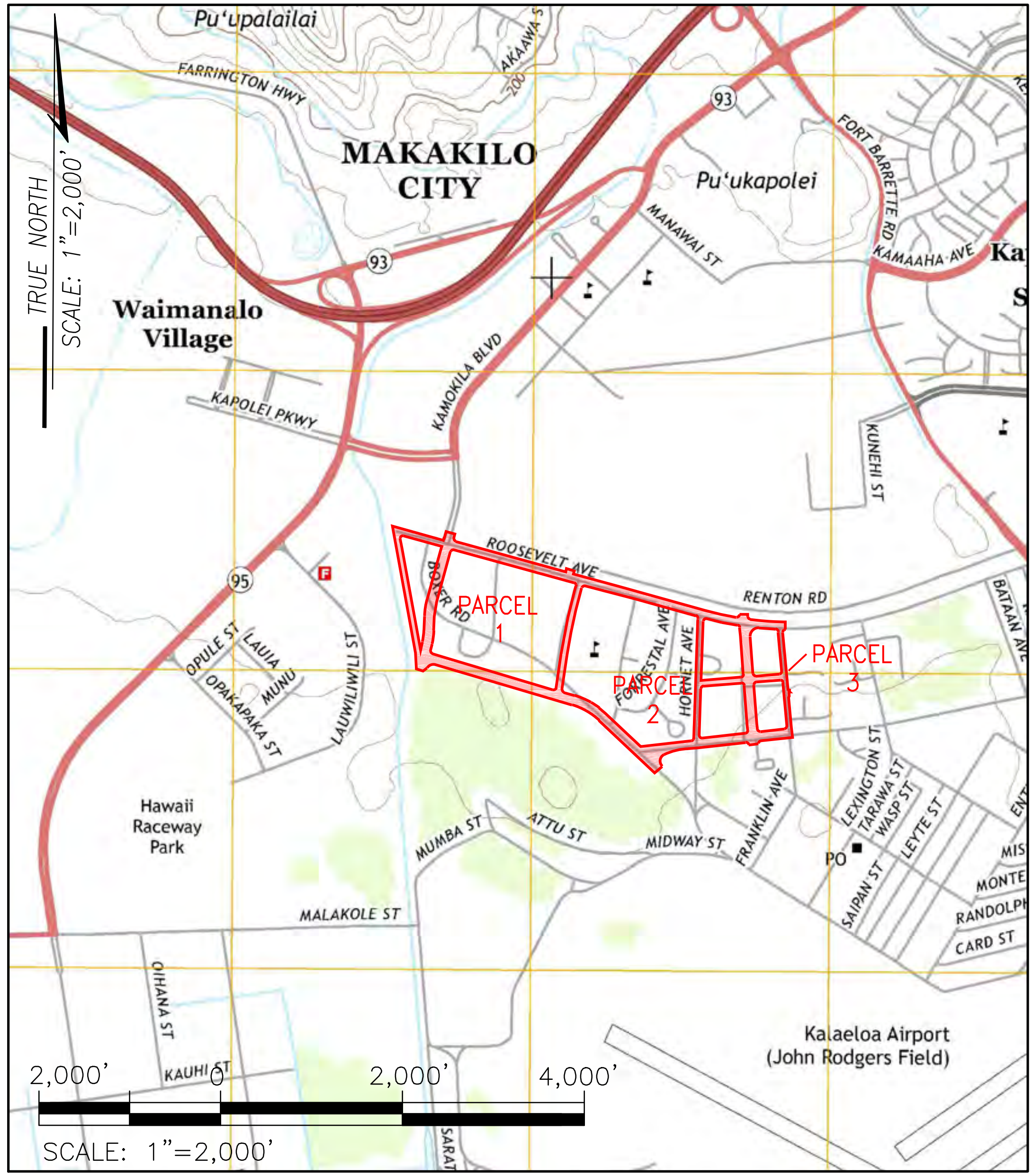
# APPENDIX A

## Figures and Photographs

**Figures**

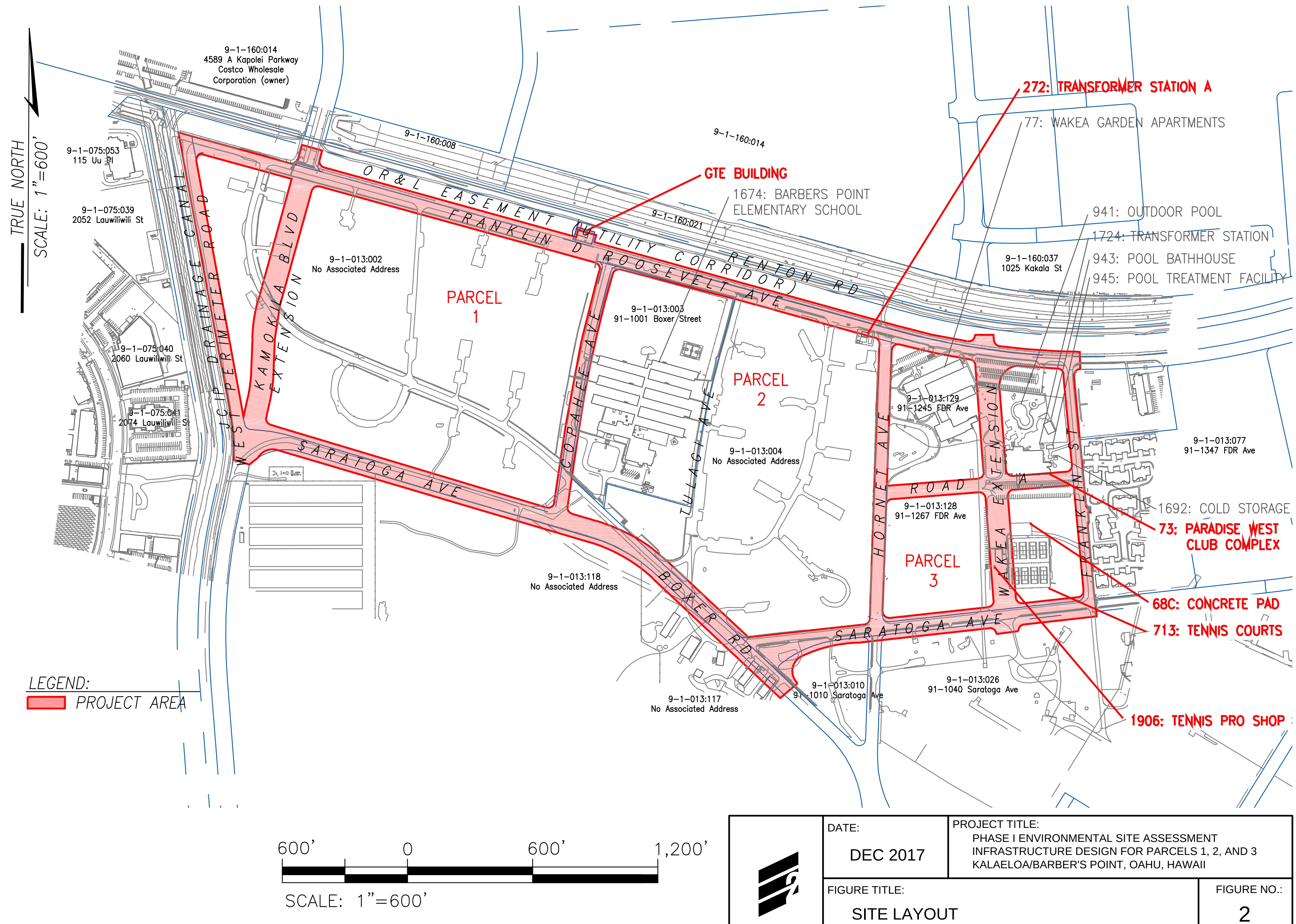






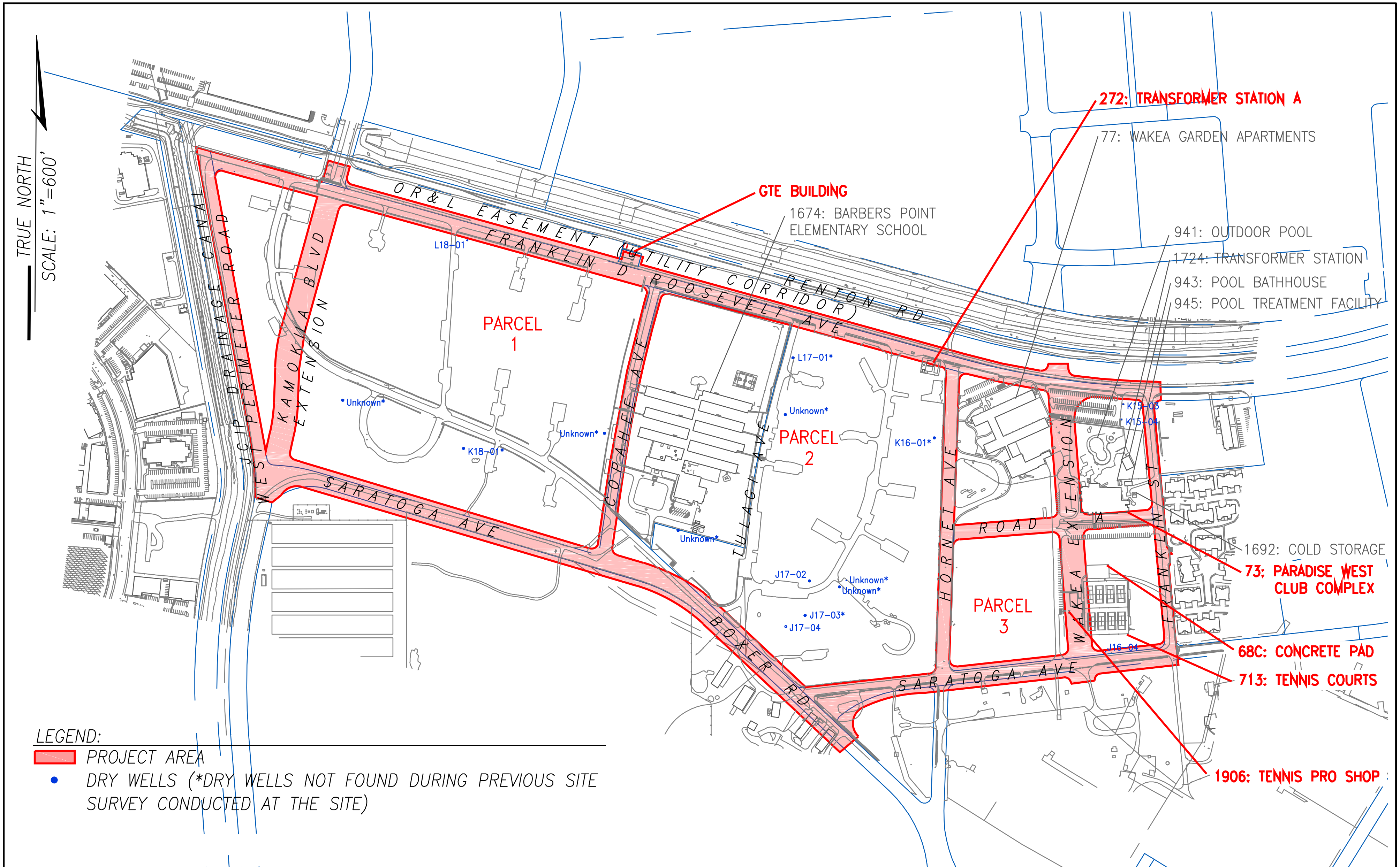

| DATE: | PROJECT TITLE: | |
|---|---|---|
| DEC 2017 | PHASE I ENVIRONMENTAL SITE ASSESSMENT<br>INFRASTRUCTURE DESIGN FOR PARCELS 1, 2, AND 3<br>KALAELOA/BARBER'S POINT, OAHU, HAWAII | |
| FIGURE TITLE: SITE VICINITY AND LOCATION MAP | | FIGURE NO.: 1-1 |

REFERENCES: STATE OF HAWAII 2017, USGS 2013, AND GOOGLE EARTH 2017




| DATE: | PROJECT TITLE: |
|---|---|
| DEC 2017 | PHASE I ENVIRONMENTAL SITE ASSESSMENT<br>INFRASTRUCTURE DESIGN FOR PARCELS 1, 2, AND 3<br>KALAELOA/BARBER'S POINT, OAHU, HAWAII |
| FIGURE TITLE: SITE LAYOUT | FIGURE NO.: 2 |

REFERENCES: RMTC 2017 AND STATE OF HAWAII 2017




LEGEND:

PROJECT AREA

• DRY WELLS (*DRY WELLS NOT FOUND DURING PREVIOUS SITE SURVEY CONDUCTED AT THE SITE)

600' 0 600' 1,200'

SCALE: 1"=600'

REFERENCES: RMTC 2017 AND STATE OF HAWAII 2017

DATE: DEC 2017

PROJECT TITLE:
PHASE I ENVIRONMENTAL SITE ASSESSMENT
INFRASTRUCTURE DESIGN FOR PARCELS 1, 2, AND 3
KALAELOA/BARBER'S POINT, OAHU, HAWAII

FIGURE TITLE:
UNDERGROUND INJECTION CONTROL MAP

FIGURE NO.: 3

**Site Reconnaissance Photographs**

| | | | |
|---|---|---|---|
| **E2 Project No.:** 170063 | **Description** | Parcel 1: Franklin D. Roosevelt (FDR) Avenue and the northern portion of Tax Map Key (TMK): (1) 9-1-013:002. View looking east. | **Photo 1** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date** 10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:** 170063 | **Description** | Parcel 1: FDR Avenue and the northern portion of Tax Map Key (TMK): (1) 9-1-013:002. View looking east-southeast. | **Photo 2** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date** 10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| E2 Project No.: 170063 | Description | Parcel 1: Proposed location of West Perimeter Road and west portion of Tax Map Key (TMK): (1) 9-1-013:002. View looking south-southeast. | **Photo 3** |
|---|---|---|---|
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |


| E2 Project No.: 170063 | Description | Parcel 1: GTE building within Oahu Railway & Land Company (OR&L) utility corridor. View looking north. | **Photo 4** |
|---|---|---|---|
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:** | **Description** | Parcel 1: Proposed location of Kamokila Boulevard Extension. View looking south. | **Photo 5** |
| **170063** | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:** | **Description** | Parcel 1: Saratoga Avenue near the intersection of the proposed West Perimeter Road. View looking northeast. | **Photo 6** |
| **170063** | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |


| | | | |
|---|---|---|---|
| **E2 Project No.:** 170063 | **Description** | Parcel 1: Concrete structure located near the intersection of Saratoga and Copahee Avenues. View looking south-southwest. | **Photo 7** |
| | **Site Name** | KMRS: DOFAW Management & Research Station and Area D: Mokulana Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date** 10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:** 170063 | **Description** | Parcel 1: Solid waste including a 1-gallon metal container or paint and several metal containers of brake fluid. | **Photo 8** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3 Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date** 10/12/2017 |
| | **Client** | R. M. Towill Corporation | |


| E2 Project No.: 170063 | Description | Parcel 1: Pallets adjacent to Saratoga Avenue. View looking west-northwest. | Photo 9 |
|---|---|---|---|
| | Site Name | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | Photo Date 10/12/2017 |
| | Client | R. M. Towill Corporation | |


| E2 Project No.: 170063 | Description | Parcel 1: Electronics adjacent to Saratoga Avenue. View looking south-southeast. | Photo 10 |
|---|---|---|---|
| | Site Name | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | Photo Date 10/12/2017 |
| | Client | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:**<br><br>**170063** | **Description** | Parcel 2: Intersection ob Saratoga Avenue and Boxer Avenue. View looking north. | **Photo 11** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:**<br><br>**170063** | **Description** | Parcel 2: General household debris adjacent to Saratoga Avenue. View looking north. | **Photo 12** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| E2 Project No.: 170063 | Description | Parcel 2: Building 272: Transformer Station A located on the corner of FDR and Hornet Avenues. View looking south. | Photo 13 |
|---|---|---|---|
| | Site Name | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | Photo Date 10/12/2017 |
| | Client | R. M. Towill Corporation | |


| E2 Project No.: 170063 | Description | Parcel 3: Building 1906 Tennis Pro Shop. View looking southwest. | Photo 14 |
|---|---|---|---|
| | Site Name | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | Photo Date 10/12/2017 |
| | Client | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:**<br><br>**170063** | **Description** | Parcel 3: View of the area of proposed Wakea Extension that will cross through Building 1906 Tennis Pro Shop and 713: tennis courts. View looking north. | **Photo 15** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

| | | | |
|---|---|---|---|
| **E2 Project No.:**<br><br>**170063** | **Description** | Parcel 3: Area adjacent to Franklin Street looking west towards Buildings 943: Pool Bathhouse, 945 Pool Treatment Facility, and 1724: Transformer Station. View looking west. | **Photo 16** |
| | **Site Name** | Infrastructure Design for Parcels 1, 2, and 3<br>Kalaeloa/Barbers Point, Oahu, Hawaii | **Photo Date**<br>10/12/2017 |
| | **Client** | R. M. Towill Corporation | |

# APPENDIX B

**EDR Reports**

# The EDR Radius Map with GeoCheck®

**Parcels 1, 2, and 3**
Franklin D Roosevelt Ave
Kapolei, HI 96707

Inquiry Number: 5070053.2s
October 05, 2017

# The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# TABLE OF CONTENTS



***Thank you for your business.***
Please contact EDR at 1-800-352-0050
with any questions or comments.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# EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

**TARGET PROPERTY INFORMATION**

**ADDRESS**

FRANKLIN D ROOSEVELT AVE
KAPOLEI, HI 96707

**COORDINATES**

| | |
|---|---|
| Latitude (North): | 21.3219290 - 21˚ 19' 18.94'' |
| Longitude (West): | 158.0801980 - 158˚ 4' 48.71'' |
| Universal Tranverse Mercator: | Zone 4 |
| UTM X (Meters): | 595392.0 |
| UTM Y (Meters): | 2357916.8 |
| Elevation: | 52 ft. above sea level |

**USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY**

| | |
|---|---|
| Target Property Map: | 5941343 EWA, HI |
| Version Date: | 2013 |

## MAPPED SITES SUMMARY

Target Property Address:
FRANKLIN D ROOSEVELT AVE
KAPOLEI, HI 96707

Click on Map ID to see full detail.

| MAP ID | SITE NAME | ADDRESS | DATABASE ACRONYMS | RELATIVE ELEVATION | DIST (ft. & mi.) DIRECTION |
|---|---|---|---|---|---|
| Reg | BARBERS POINT NAVAL | | DOD | Same | 1 ft. |
| A1 | BARBER'S POINT ELEME | 3001 BOXER ROAD | FINDS | Lower | 1 ft. |
| 2 | BARBERS POINT ELEMEN | | SPILLS 90 | Lower | 1 ft. |
| A3 | BARBER'S POINT ELEME | 3001 BOXER ROAD | FTTS | Lower | 1 ft. |
| A4 | BARBERS POINT ELEMEN | 3001 BOXER RD. | UIC | Lower | 1 ft. |
| A5 | KALAELOA AIRPORT (DW | 3001 BOXER RD. BARBE | UIC | Lower | 1 ft. |
| 6 | BARBERS POINT CENTRA | ROOSEVELT & COPAHEE | UST, Financial Assurance | Higher | 88, 0.017, NW |
| B7 | COSTCO WHOLESALE #10 | 4589 KAPOLEI PARKWAY | RCRA-LQG | Higher | 537, 0.102, NW |
| B8 | COSTCO GASOLINE #103 | 4589 KAPOLEI PARKWAY | UST, Financial Assurance | Higher | 537, 0.102, NW |
| C9 | TRU TAG TECHNOLOGIES | 2045 LAUWILIWILI ST. | RCRA-LQG | Lower | 732, 0.139, West |
| C10 | STATIONARY POWER SYS | 2045 LAUWILIWILI PAR | RCRA NonGen / NLR | Lower | 732, 0.139, West |
| C11 | VISION ENVIRONMENTAL | 2045 LAUWILIWILI ST | RCRA NonGen / NLR | Lower | 732, 0.139, West |
| C12 | INTERNATIONAL PAINT | 2045 LAUWILIWILI ST | RCRA-SQG, FINDS, ECHO | Lower | 732, 0.139, West |
| D13 | KAPOLEI JUVENILE DET | 287 KAMOKILA BLVD | RCRA-CESQG, FINDS, ECHO | Higher | 809, 0.153, NW |
| D14 | KAPOLEI DISTRICT AND | 4675 KAPOLEI PARKWAY | RCRA-CESQG, FINDS, ECHO | Higher | 983, 0.186, NW |
| D15 | COSTCO KAPOLEI | KAMOKILA BLVD & KAPO | SHWS | Higher | 1033, 0.196, NW |
| 16 | NAVAL AIR STATION BA | BLDG 1772 TANK BP97 | LUST, UST | Lower | 1669, 0.316, SE |
| 17 | NEX TOUCH N' GO GAS | BLDG 1928 TANK 81, 8 | LUST, UST, Financial Assurance | Lower | 2423, 0.459, East |
| 18 | HECO - CAMPBELL INDU | 91-550 KALAELOA BLVD | SHWS, ENG CONTROLS, SPILLS | Lower | 3149, 0.596, SW |
| 19 | HAWAIIAN DREDGING CO | 91-063 MALAKOLE ST | SHWS, INST CONTROL, VCP, SPILLS, AIRS | Lower | 3773, 0.715, SW |
| 20 | PALAILAI LANDFILL | 91-402 FARRINGTON HW | SHWS, ENG CONTROLS, INST CONTROL, SPILLS | Higher | 4114, 0.779, NNW |
| 21 | HONSADOR | 91-151 MALAKOLE RD | SHWS, LUST, UST, ENG CONTROLS, INST CONTROL, VCP,.. | Lower | 4165, 0.789, WSW |
| 22 | FORT BARRETTE | | FUDS | Higher | 4615, 0.874, NNE |
| 23 | HAWAII RACEWAY PARK | 91-201 MALAKOLE ST | SHWS, SPILLS | Lower | 5097, 0.965, WSW |
| 24 | KAPOLEI PIPELINE FUE | KAMOKILA BLVD | SHWS, SPILLS | Higher | 5221, 0.989, North |

# EXECUTIVE SUMMARY

**TARGET PROPERTY SEARCH RESULTS**

The target property was not listed in any of the databases searched by EDR.

**DATABASES WITH NO MAPPED SITES**

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

**STANDARD ENVIRONMENTAL RECORDS**

***Federal NPL site list***

NPL National Priority List
Proposed NPL Proposed National Priority List Sites
NPL LIENS Federal Superfund Liens

***Federal Delisted NPL site list***

Delisted NPL National Priority List Deletions

***Federal CERCLIS list***

FEDERAL FACILITY Federal Facility Site Information listing
SEMS Superfund Enterprise Management System

***Federal CERCLIS NFRAP site list***

SEMS-ARCHIVE Superfund Enterprise Management System Archive

***Federal RCRA CORRACTS facilities list***

CORRACTS Corrective Action Report

***Federal RCRA non-CORRACTS TSD facilities list***

RCRA-TSDF RCRA - Treatment, Storage and Disposal

***Federal institutional controls / engineering controls registries***

LUCIS Land Use Control Information System
US ENG CONTROLS Engineering Controls Sites List
US INST CONTROL Sites with Institutional Controls

***Federal ERNS list***

ERNS Emergency Response Notification System

***State and tribal landfill and/or solid waste disposal site lists***

SWF/LF Permitted Landfills in the State of Hawaii

# EXECUTIVE SUMMARY

***State and tribal leaking storage tank lists***

INDIAN LUST................ Leaking Underground Storage Tanks on Indian Land

***State and tribal registered storage tank lists***

FEMA UST.................. Underground Storage Tank Listing
INDIAN UST................ Underground Storage Tanks on Indian Land

***State and tribal institutional control / engineering control registries***

ENG CONTROLS............ Engineering Control Sites
INST CONTROL............ Sites with Institutional Controls

***State and tribal voluntary cleanup sites***

VCP......................... Voluntary Response Program Sites
INDIAN VCP................ Voluntary Cleanup Priority Listing

***State and tribal Brownfields sites***

BROWNFIELDS............. Brownfields Sites

**ADDITIONAL ENVIRONMENTAL RECORDS**

***Local Brownfield lists***

US BROWNFIELDS......... A Listing of Brownfields Sites

***Local Lists of Landfill / Solid Waste Disposal Sites***

INDIAN ODI................. Report on the Status of Open Dumps on Indian Lands
ODI......................... Open Dump Inventory
DEBRIS REGION 9......... Torres Martinez Reservation Illegal Dump Site Locations
IHS OPEN DUMPS.......... Open Dumps on Indian Land

***Local Lists of Hazardous waste / Contaminated Sites***

US HIST CDL............... Delisted National Clandestine Laboratory Register
CDL......................... Clandestine Drug Lab Listing
US CDL..................... National Clandestine Laboratory Register

***Local Land Records***

LIENS 2.................... CERCLA Lien Information

***Records of Emergency Release Reports***

HMIRS...................... Hazardous Materials Information Reporting System
SPILLS...................... Release Notifications

***Other Ascertainable Records***

SCRD DRYCLEANERS...... State Coalition for Remediation of Drycleaners Listing

# EXECUTIVE SUMMARY

US FIN ASSUR - Financial Assurance Information
EPA WATCH LIST - EPA WATCH LIST
2020 COR ACTION - 2020 Corrective Action Program List
TSCA - Toxic Substances Control Act
TRIS - Toxic Chemical Release Inventory System
SSTS - Section 7 Tracking Systems
ROD - Records Of Decision
RMP - Risk Management Plans
RAATS - RCRA Administrative Action Tracking System
PRP - Potentially Responsible Parties
PADS - PCB Activity Database System
ICIS - Integrated Compliance Information System
MLTS - Material Licensing Tracking System
COAL ASH DOE - Steam-Electric Plant Operation Data
COAL ASH EPA - Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER - PCB Transformer Registration Database
RADINFO - Radiation Information Database
HIST FTTS - FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS - Incident and Accident Data
CONSENT - Superfund (CERCLA) Consent Decrees
INDIAN RESERV - Indian Reservations
FUSRAP - Formerly Utilized Sites Remedial Action Program
UMTRA - Uranium Mill Tailings Sites
LEAD SMELTERS - Lead Smelter Sites
US AIRS - Aerometric Information Retrieval System Facility Subsystem
US MINES - Mines Master Index File
ABANDONED MINES - Abandoned Mines
DOCKET HWC - Hazardous Waste Compliance Docket Listing
UXO - Unexploded Ordnance Sites
ECHO - Enforcement & Compliance History Information
FUELS PROGRAM - EPA Fuels Program Registered Listing
AIRS - List of Permitted Facilities
DRYCLEANERS - Permitted Drycleaner Facility Listing
Financial Assurance - Financial Assurance Information Listing

**EDR HIGH RISK HISTORICAL RECORDS**

***EDR Exclusive Records***

EDR MGP - EDR Proprietary Manufactured Gas Plants
EDR Hist Auto - EDR Exclusive Historic Gas Stations
EDR Hist Cleaner - EDR Exclusive Historic Dry Cleaners

**EDR RECOVERED GOVERNMENT ARCHIVES**

***Exclusive Recovered Govt. Archives***

RGA HWS - Recovered Government Archive State Hazardous Waste Facilities List
RGA LF - Recovered Government Archive Solid Waste Facilities List
RGA LUST - Recovered Government Archive Leaking Underground Storage Tank

**SURROUNDING SITES: SEARCH RESULTS**

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

**STANDARD ENVIRONMENTAL RECORDS**

***Federal RCRA generators list***

RCRA-LQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

A review of the RCRA-LQG list, as provided by EDR, and dated 12/12/2016 has revealed that there are 2 RCRA-LQG sites within approximately 0.25 miles of the target property.

| Equal/Higher Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| COSTCO WHOLESALE #10 | 4589 KAPOLEI PARKWAY | NW 0 - 1/8 (0.102 mi.) | B7 | 11 |

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| TRU TAG TECHNOLOGIES | 2045 LAUWILIWILI ST. | W 1/8 - 1/4 (0.139 mi.) | C9 | 16 |

RCRA-SQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

A review of the RCRA-SQG list, as provided by EDR, and dated 12/12/2016 has revealed that there is 1 RCRA-SQG site within approximately 0.25 miles of the target property.

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| ***INTERNATIONAL PAINT*** | ***2045 LAUWILIWILI ST*** | ***W 1/8 - 1/4 (0.139 mi.)*** | ***C12*** | ***22*** |

RCRA-CESQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

A review of the RCRA-CESQG list, as provided by EDR, and dated 12/12/2016 has revealed that there are

2 RCRA-CESQG sites within approximately 0.25 miles of the target property.

| Equal/Higher Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| ***KAPOLEI JUVENILE DET*** | ***287 KAMOKILA BLVD*** | ***NW 1/8 - 1/4 (0.153 mi.)*** | ***D13*** | ***24*** |
| ***KAPOLEI DISTRICT AND*** | ***4675 KAPOLEI PARKWAY*** | ***NW 1/8 - 1/4 (0.186 mi.)*** | ***D14*** | ***26*** |

***State- and tribal - equivalent CERCLIS***

SHWS: The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The data come from the Department of Health.

A review of the SHWS list, as provided by EDR, and dated 03/16/2017 has revealed that there are 7 SHWS sites within approximately 1 mile of the target property.

| Equal/Higher Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| COSTCO KAPOLEI | KAMOKILA BLVD & KAPO | NW 1/8 - 1/4 (0.196 mi.) | D15 | 28 |
| ***PALAILAI LANDFILL*** | ***91-402 FARRINGTON HW*** | ***NNW 1/2 - 1 (0.779 mi.)*** | ***20*** | ***35*** |
| ***KAPOLEI PIPELINE FUE*** | ***KAMOKILA BLVD*** | ***N 1/2 - 1 (0.989 mi.)*** | ***24*** | ***45*** |

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| ***HECO - CAMPBELL INDU*** | ***91-550 KALAELOA BLVD*** | ***SW 1/2 - 1 (0.596 mi.)*** | ***18*** | ***31*** |
| ***HAWAIIAN DREDGING CO*** | ***91-063 MALAKOLE ST*** | ***SW 1/2 - 1 (0.715 mi.)*** | ***19*** | ***33*** |
| ***HONSADOR*** | ***91-151 MALAKOLE RD*** | ***WSW 1/2 - 1 (0.789 mi.)*** | ***21*** | ***37*** |
| ***HAWAII RACEWAY PARK*** | ***91-201 MALAKOLE ST*** | ***WSW 1/2 - 1 (0.965 mi.)*** | ***23*** | ***41*** |

***State and tribal leaking storage tank lists***

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Department of Health's Active Leaking Underground Storage Tank Log Listing.

A review of the LUST list, as provided by EDR, and dated 08/01/2017 has revealed that there are 2 LUST sites within approximately 0.5 miles of the target property.

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| ***NAVAL AIR STATION BA***<br>Release ID: 990048<br>Facility Id: 9-103337<br>Facility Status: Site Cleanup Completed (NFA) | ***BLDG 1772 TANK BP97*** | ***SE 1/4 - 1/2 (0.316 mi.)*** | ***16*** | ***29*** |
| ***NEX TOUCH N' GO GAS***<br>Release ID: 130008<br>Release ID: 070005<br>Release ID: 940200<br>Facility Id: 9-102001<br>Facility Status: Soil Vapor Sampling<br>Facility Status: Monitored Natural Attenuation | ***BLDG 1928 TANK 81, 8*** | ***E 1/4 - 1/2 (0.459 mi.)*** | ***17*** | ***29*** |

# EXECUTIVE SUMMARY

***State and tribal registered storage tank lists***

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Health's Listing of Underground Storage Tanks.

A review of the UST list, as provided by EDR, and dated 08/01/2017 has revealed that there are 2 UST sites within approximately 0.25 miles of the target property.

| Equal/Higher Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| ***BARBERS POINT CENTRA***<br>Tank Status: Currently In Use<br>Facility Id: 9-203295 | ***ROOSEVELT & COPAHEE*** | ***NW 0 - 1/8 (0.017 mi.)*** | ***6*** | ***11*** |
| ***COSTCO GASOLINE #103***<br>Tank Status: Currently in Use<br>Facility Id: 9-203850 | ***4589 KAPOLEI PARKWAY*** | ***NW 0 - 1/8 (0.102 mi.)*** | ***B8*** | ***15*** |

**ADDITIONAL ENVIRONMENTAL RECORDS**

***Records of Emergency Release Reports***

SPILLS 90: Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

A review of the SPILLS 90 list, as provided by EDR, and dated 03/10/2012 has revealed that there is 1 SPILLS 90 site within approximately 0.001 miles of the target property.

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| BARBERS POINT ELEMEN<br>Status: NOT REPORTED<br>Site Id: HIHR19960130-1555 | | 0 - 1/8 (0.000 mi.) | 2 | 8 |

***Other Ascertainable Records***

RCRA NonGen / NLR: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

A review of the RCRA NonGen / NLR list, as provided by EDR, and dated 12/12/2016 has revealed that there are 2 RCRA NonGen / NLR sites within approximately 0.25 miles of the target property.

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| STATIONARY POWER SYS | 2045 LAUWILIWILI PAR | W 1/8 - 1/4 (0.139 mi.) | C10 | 19 |
| VISION ENVIRONMENTAL | 2045 LAUWILIWILI ST | W 1/8 - 1/4 (0.139 mi.) | C11 | 21 |

# EXECUTIVE SUMMARY

FUDS: The Listing includes locations of Formerly Used Defense Sites Properties where the US Army Corps Of Engineers is actively working or will take necessary cleanup actions.

A review of the FUDS list, as provided by EDR, and dated 01/31/2015 has revealed that there is 1 FUDS site within approximately 1 mile of the target property.

| Equal/Higher Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| FORT BARRETTE | | NNE 1/2 - 1 (0.874 mi.) | 22 | 40 |

DOD: Consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

A review of the DOD list, as provided by EDR, and dated 12/31/2005 has revealed that there is 1 DOD site within approximately 1 mile of the target property.

| Equal/Higher Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| BARBERS POINT NAVAL | | 0 - 1/8 (0.000 mi.) | 0 | 8 |

FTTS: FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act) over the previous five years. To maintain currency, EDR contacts the Agency on a quarterly basis.

A review of the FTTS list, as provided by EDR, has revealed that there is 1 FTTS site within approximately 0.001 miles of the target property.

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| BARBER’S POINT ELEME | 3001 BOXER ROAD | 0 - 1/8 (0.000 mi.) | A3 | 9 |

Database: FTTS INSP, Date of Government Version: 04/09/2009

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 07/23/2017 has revealed that there is 1 FINDS site within approximately 0.001 miles of the target property.

| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| BARBER’S POINT ELEME | 3001 BOXER ROAD | 0 - 1/8 (0.000 mi.) | A1 | 8 |

# EXECUTIVE SUMMARY

UIC: A listing of underground injection well locations.

A review of the UIC list, as provided by EDR, and dated 02/07/2013 has revealed that there are 2 UIC sites within approximately 0.001 miles of the target property.

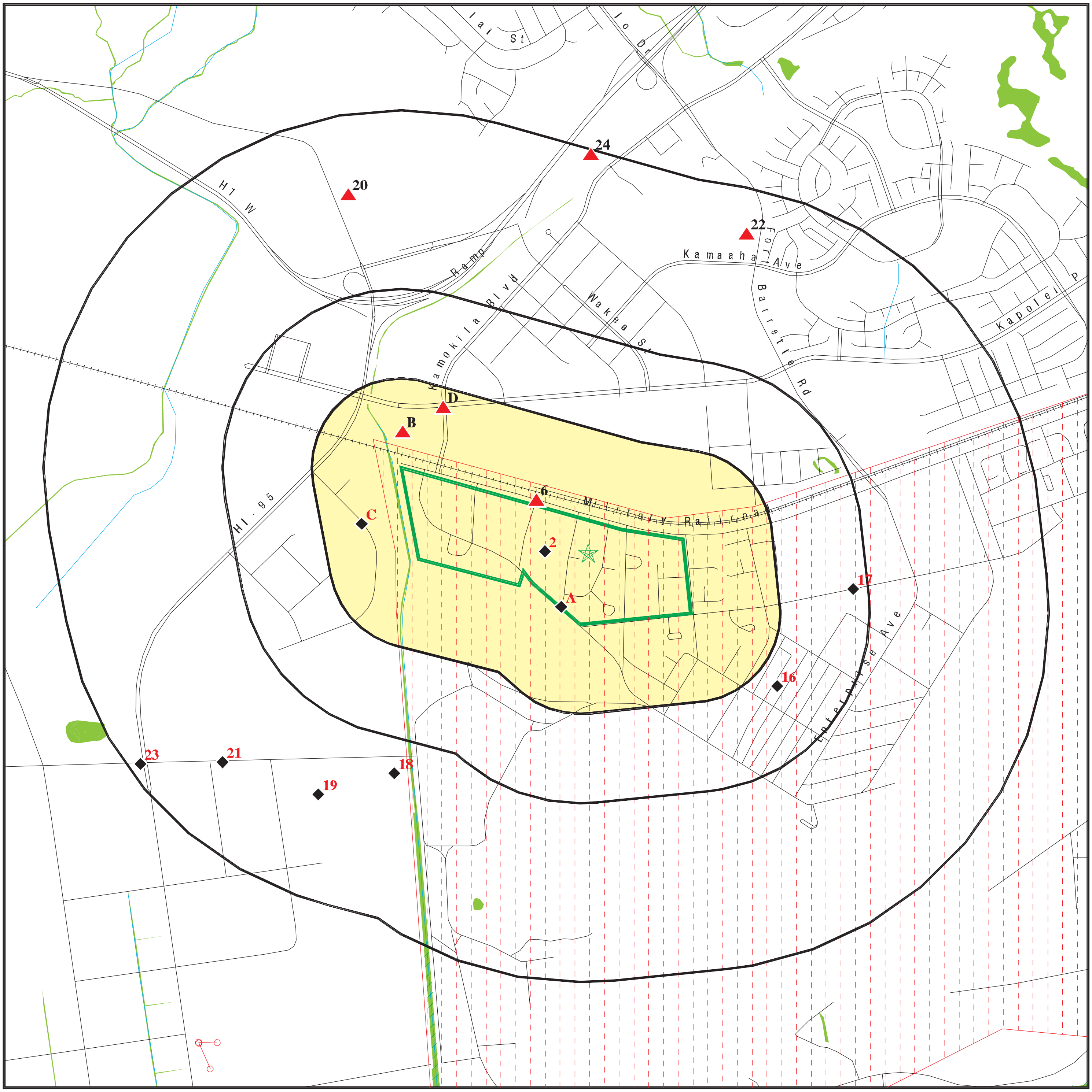
| Lower Elevation | Address | Direction / Distance | Map ID | Page |
|---|---|---|---|---|
| BARBERS POINT ELEMEN<br>Facility Id/Lat Long Min Coord: 3-1905.01.1-3<br>UIC Permit Number: UO-2071 | 3001 BOXER RD. | 0 - 1/8 (0.000 mi.) | A4 | 9 |
| KALAELOA AIRPORT (DW<br>Facility Id/Lat Long Min Coord: 3-1804.02.1-38<br>UIC Permit Number: UO-2072 | 3001 BOXER RD. BARBE | 0 - 1/8 (0.000 mi.) | A5 | 10 |

# EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 6 records.

| Site Name | Database(s) |
|---|---|
| FORT | SHWS, ENG CONTROLS, INST CONTROL |
| BARBERS POINT NAS STATION P | SHWS |
| GRACE PACIFIC KALAELOA HMA PLANT D | SHWS |
| HAWAII ARMY NATIONAL GUARD AT KALA | SHWS, INST CONTROL |
| PUMP 15 STATION, FORMER OAHU SUGAR | SHWS |
| DLA DISPOSITION SERVICES | SEMS-ARCHIVE, RCRA NonGen / NLR |

# OVERVIEW MAP - 5070053.2S




0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Upgradient Area

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

| | | | |
|---|---|---|---|
| SITE NAME: | Parcels 1, 2, and 3 | CLIENT: | Element Environmental , LLC |
| ADDRESS: | Franklin D Roosevelt Ave | CONTACT: | Angie Peltier |
| | Kapolei HI 96707 | INQUIRY #: | 5070053.2s |
| LAT/LONG: | 21.321929 / 158.080198 | DATE: | October 05, 2017 7:25 pm |

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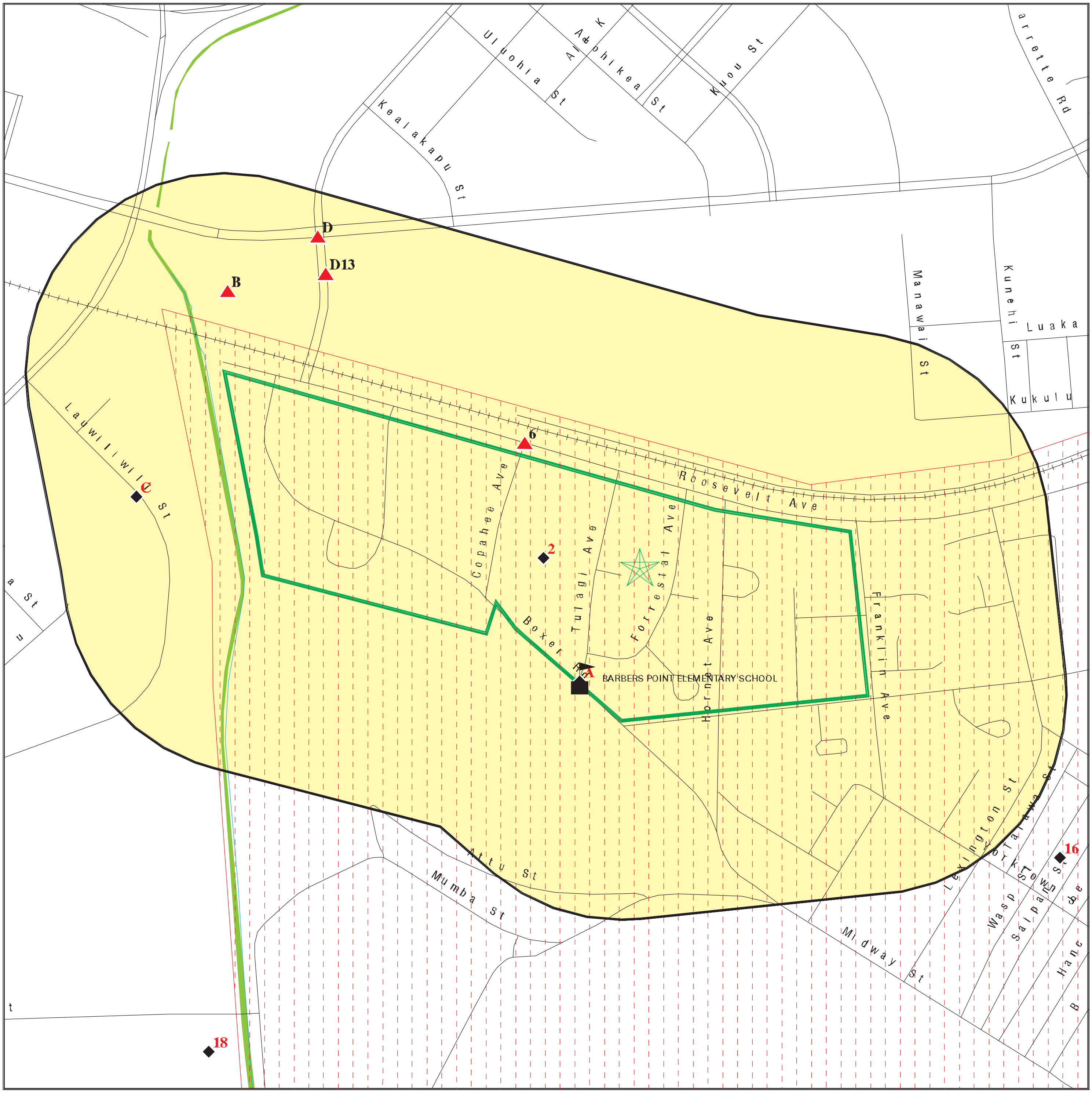
# DETAIL MAP - 5070053.2S




Target Property
Sites at elevations higher than or equal to the target property
Sites at elevations lower than the target property
Manufactured Gas Plants
Sensitive Receptors
National Priority List Sites
Dept. Defense Sites

Indian Reservations BIA
100-year flood zone
500-year flood zone
National Wetland Inventory
State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

| | |
|---|---|
| SITE NAME: Parcels 1, 2, and 3<br>ADDRESS: Franklin D Roosevelt Ave<br>Kapolei HI 96707<br>LAT/LONG: 21.321929 / 158.080198 | CLIENT: Element Environmental , LLC<br>CONTACT: Angie Peltier<br>INQUIRY #: 5070053.2s<br>DATE: October 05, 2017 7:26 pm |

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# MAP FINDINGS SUMMARY

| Database | Search Distance (Miles) | Target Property | < 1/8 | 1/8 - 1/4 | 1/4 - 1/2 | 1/2 - 1 | > 1 | Total Plotted |
|---|---|---|---|---|---|---|---|---|
| **STANDARD ENVIRONMENTAL RECORDS** | | | | | | | | |
| ***Federal NPL site list*** | | | | | | | | |
| NPL | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| Proposed NPL | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| NPL LIENS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| ***Federal Delisted NPL site list*** | | | | | | | | |
| Delisted NPL | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| ***Federal CERCLIS list*** | | | | | | | | |
| FEDERAL FACILITY | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| SEMS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***Federal CERCLIS NFRAP site list*** | | | | | | | | |
| SEMS-ARCHIVE | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***Federal RCRA CORRACTS facilities list*** | | | | | | | | |
| CORRACTS | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| ***Federal RCRA non-CORRACTS TSD facilities list*** | | | | | | | | |
| RCRA-TSDF | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***Federal RCRA generators list*** | | | | | | | | |
| RCRA-LQG | 0.250 | | 1 | 1 | NR | NR | NR | 2 |
| RCRA-SQG | 0.250 | | 0 | 1 | NR | NR | NR | 1 |
| RCRA-CESQG | 0.250 | | 0 | 2 | NR | NR | NR | 2 |
| ***Federal institutional controls / engineering controls registries*** | | | | | | | | |
| LUCIS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| US ENG CONTROLS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| US INST CONTROL | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***Federal ERNS list*** | | | | | | | | |
| ERNS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| ***State- and tribal - equivalent CERCLIS*** | | | | | | | | |
| SHWS | 1.000 | | 0 | 1 | 0 | 6 | NR | 7 |
| ***State and tribal landfill and/or solid waste disposal site lists*** | | | | | | | | |
| SWF/LF | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***State and tribal leaking storage tank lists*** | | | | | | | | |
| LUST | 0.500 | | 0 | 0 | 2 | NR | NR | 2 |
| INDIAN LUST | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***State and tribal registered storage tank lists*** | | | | | | | | |
| FEMA UST | 0.250 | | 0 | 0 | NR | NR | NR | 0 |

# MAP FINDINGS SUMMARY

| Database | Search Distance (Miles) | Target Property | < 1/8 | 1/8 - 1/4 | 1/4 - 1/2 | 1/2 - 1 | > 1 | Total Plotted |
|---|---|---|---|---|---|---|---|---|
| UST | 0.250 | | 2 | 0 | NR | NR | NR | 2 |
| INDIAN UST | 0.250 | | 0 | 0 | NR | NR | NR | 0 |
| ***State and tribal institutional control / engineering control registries*** | | | | | | | | |
| ENG CONTROLS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| INST CONTROL | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***State and tribal voluntary cleanup sites*** | | | | | | | | |
| VCP | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| INDIAN VCP | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***State and tribal Brownfields sites*** | | | | | | | | |
| BROWNFIELDS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| **ADDITIONAL ENVIRONMENTAL RECORDS** | | | | | | | | |
| ***Local Brownfield lists*** | | | | | | | | |
| US BROWNFIELDS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***Local Lists of Landfill / Solid Waste Disposal Sites*** | | | | | | | | |
| INDIAN ODI | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ODI | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| DEBRIS REGION 9 | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| IHS OPEN DUMPS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| ***Local Lists of Hazardous waste / Contaminated Sites*** | | | | | | | | |
| US HIST CDL | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| CDL | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| US CDL | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| ***Local Land Records*** | | | | | | | | |
| LIENS 2 | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| ***Records of Emergency Release Reports*** | | | | | | | | |
| HMIRS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| SPILLS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| SPILLS 90 | 0.001 | | 1 | NR | NR | NR | NR | 1 |
| ***Other Ascertainable Records*** | | | | | | | | |
| RCRA NonGen / NLR | 0.250 | | 0 | 2 | NR | NR | NR | 2 |
| FUDS | 1.000 | | 0 | 0 | 0 | 1 | NR | 1 |
| DOD | 1.000 | | 1 | 0 | 0 | 0 | NR | 1 |
| SCRD DRYCLEANERS | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| US FIN ASSUR | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| EPA WATCH LIST | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| 2020 COR ACTION | 0.250 | | 0 | 0 | NR | NR | NR | 0 |
| TSCA | 0.001 | | 0 | NR | NR | NR | NR | 0 |

# MAP FINDINGS SUMMARY

| Database | Search Distance (Miles) | Target Property | < 1/8 | 1/8 - 1/4 | 1/4 - 1/2 | 1/2 - 1 | > 1 | Total Plotted |
|---|---|---|---|---|---|---|---|---|
| TRIS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| SSTS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| ROD | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| RMP | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| RAATS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| PRP | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| PADS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| ICIS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| FTTS | 0.001 | | 1 | NR | NR | NR | NR | 1 |
| MLTS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| COAL ASH DOE | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| COAL ASH EPA | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| PCB TRANSFORMER | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| RADINFO | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| HIST FTTS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| DOT OPS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| CONSENT | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| INDIAN RESERV | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| FUSRAP | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| UMTRA | 0.500 | | 0 | 0 | 0 | NR | NR | 0 |
| LEAD SMELTERS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| US AIRS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| US MINES | 0.250 | | 0 | 0 | NR | NR | NR | 0 |
| ABANDONED MINES | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| FINDS | 0.001 | | 1 | NR | NR | NR | NR | 1 |
| DOCKET HWC | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| UXO | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| ECHO | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| FUELS PROGRAM | 0.250 | | 0 | 0 | NR | NR | NR | 0 |
| AIRS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| DRYCLEANERS | 0.250 | | 0 | 0 | NR | NR | NR | 0 |
| Financial Assurance | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| UIC | 0.001 | | 2 | NR | NR | NR | NR | 2 |
| **EDR HIGH RISK HISTORICAL RECORDS** | | | | | | | | |
| ***EDR Exclusive Records*** | | | | | | | | |
| EDR MGP | 1.000 | | 0 | 0 | 0 | 0 | NR | 0 |
| EDR Hist Auto | 0.125 | | 0 | NR | NR | NR | NR | 0 |
| EDR Hist Cleaner | 0.125 | | 0 | NR | NR | NR | NR | 0 |
| **EDR RECOVERED GOVERNMENT ARCHIVES** | | | | | | | | |
| ***Exclusive Recovered Govt. Archives*** | | | | | | | | |
| RGA HWS | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| RGA LF | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| RGA LUST | 0.001 | | 0 | NR | NR | NR | NR | 0 |
| - Totals -- | | 0 | 9 | 7 | 2 | 7 | 0 | 25 |

# MAP FINDINGS SUMMARY

| Database | Search Distance (Miles) | Target Property | < 1/8 | 1/8 - 1/4 | 1/4 - 1/2 | 1/2 - 1 | > 1 | Total Plotted |
|---|---|---|---|---|---|---|---|---|

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

**DOD Region** | **BARBERS POINT NAVAL AIR STATION (CLOSED)** | **DOD** | **CUSA147755**
**N/A**

**BARBERS POINT NAVAL AIR S (County), HI**

**< 1/8**
**1 ft.**

DOD:

| | |
|---|---|
| Feature 1: | Navy DOD |
| Feature 2: | Not reported |
| Feature 3: | Not reported |
| URL: | Not reported |
| Name 1: | Barbers Point Naval Air Station (Closed) |
| Name 2: | Not reported |
| Name 3: | Not reported |
| State: | HI |
| DOD Site: | Yes |
| Tile name: | HIHONOLULU |

---

**A1** | **BARBER'S POINT ELEMENTARY SCHOOL** | **FINDS** | **1009737248**
**N/A**

**3001 BOXER ROAD**
**KAPOLEI, HI 96707**

**< 1/8**
**1 ft.**

**Site 1 of 4 in cluster A**

**Relative:**
**Lower**

**Actual:**
**46 ft.**

FINDS:

Registry ID: 110026427356

Environmental Interest/Information System
ICIS (Integrated Compliance Information System) is the Integrated Compliance Information System and provides a database that, when complete, will contain integrated Enforcement and Compliance information across most of EPA's programs. The vision for ICIS is to replace EPA's independent databases that contain Enforcement data with a single repository for that information. Currently, ICIS contains all Federal Administrative and Judicial enforcement actions. This information is maintained in ICIS by EPA in the Regional offices and it Headquarters. A future release of ICIS will replace the Permit Compliance System (PCS) which supports the NPDES and will integrate that information with Federal actions already in the system. ICIS also has the capability to track other activities occurring in the Region that support Compliance and Enforcement programs. These include; Incident Tracking, Compliance Assistance, and Compliance Monitoring.

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

---

**2** | **BARBERS POINT ELEMENTARY SCHOOL PRINCIPAL S OFFICE** | **SPILLS 90** | **S112375374**
**N/A**

**< 1/8**
**1 ft.**

**KAPOLEI, HI 96707**

**Relative:**
**Lower**

**Actual:**
**49 ft.**

Spills:

| | |
|---|---|
| Status: | NOT REPORTED |
| Contact Name: | Not reported |
| Contact Phone: | Not reported |
| Site ID: | HIHR19960130-1555 |

**BARBERS POINT ELEMENTARY SCHOOL PRINCIPAL S OFFICE (Continued)** **S112375374**

| | |
|---|---|
| Secondary ID: | Not reported |
| Cross Street: | Not reported |
| County: | HONOLULU |
| Longitude: | -158082077 |
| Latitude: | 21322076 |
| Elevation: | N/A |

The Hawaii Department Of Health Office Of Hazard Evaluation And Emergency Response (Heer) Release List

| | |
|---|---|
| Island: | Oahu |
| Filed Under: | Not reported |
| Unit: | Barbers Point Elementary School Principal s Office |
| Case Number: | 19960130-1555 |
| Secondary Location Address: | Not reported |
| Supplemental Location: | Not reported |
| Activity Type: | Response |
| Lead And Program: | HEER EP&R |
| Activity Lead: | Bill Perry |
| Emergency Response: | Not reported |
| Substances: | Not reported |
| Amount (Less Or Greater Than): | Not reported |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |

---

**A3** **BARBER’S POINT ELEMENTARY SCHOOL** **FTTS** **1010781965**
**3001 BOXER ROAD** **N/A**
**< 1/8** **KAPOLEI, HI 96707**
**1 ft.**

**Site 2 of 4 in cluster A**

**Relative: Lower**

**Actual: 46 ft.**

FTTS INSP:

| | |
|---|---|
| Inspection Number: | 20070905HI-08 1 |
| Region: | 09 |
| Inspection Date: | 09/05/07 |
| Inspector: | KATHY VON GELDERN |
| Violation occurred: | Yes |
| Investigation Type: | AHERA, Enforcement, State Conducted |
| Investigation Reason: | Neutral Scheme, State |
| Legislation Code: | TSCA |
| Facility Function: | User |

---

**A4** **BARBERS POINT ELEMENTARY SCHOOL (DWS)** **UIC** **S109953148**
**3001 BOXER RD.** **N/A**
**< 1/8** **KAPOLEI, HI 96707**
**1 ft.**

**Site 3 of 4 in cluster A**

**Relative: Lower**

**Actual: 46 ft.**

UIC:

| | |
|---|---|
| UIC Permit Number: | UO-2071 |
| Facility Id/Lat Long Minute Coordinates: | 3-1905.01.1-3 |
| Central Latitude Of The Site: | 21 19 27 |
| Central Longitude Of The Site: | 158 05 01 |
| Flow In Gallons Per Day: | 8,600 gpm |
| Total Number Of Inj. Well(S) On Permit: | 3 |
| Island: | Oahu |
| Location In Relation To UIC Line: | Not reported |

**BARBERS POINT ELEMENTARY SCHOOL (DWS) (Continued)** **S109953148**

| | |
|---|---|
| Facility Type: | DW |
| Subclass: | C |
| Facility Operator, Not Contract Opr: | State of Hawaii - DOE |
| Operator Address: | PO Box 2360 HON, HI 96804 |
| Facility Owner: | State of Hawaii - DOE |
| Owner Address: | PO Box 2360 HON, HI 96804 |
| Tax Map Key Number: | 1: |
| Owner Of Land Property On Leasehold: | none |
| Consultant Serving The Application: | Prepared in-house |
| Receipt Of Initial Application: | 9/14/1999 |
| Public Notice Date: | Not reported |
| Approval-To-Construct Issuance Date: | 10/19/1999 |
| Exemption Issuance Date: | Not reported |
| 1st Issuance Of Permit: | 10/31/1999 |
| Last Issuance Of Permit: | Not reported |
| Type: | Not reported |
| Permit Expiration Date: | 10/30/2004 |
| Date When File Is Closed: | Not reported |
| UIC Project Geologist: | NU |
| Remarks: | Not reported |

---

**A5** **KALAELOA AIRPORT (DWS)** **UIC** **S109953149**
**3001 BOXER RD. BARBERS POINT KAPOLEI** **N/A**
**< 1/8** **OAHU, HI**
**1 ft.**

**Site 4 of 4 in cluster A**

**Relative:**
**Lower**

**Actual:**
**46 ft.**

UIC:

| | |
|---|---|
| UIC Permit Number: | UO-2072 |
| Facility Id/Lat Long Minute Coordinates: | 3-1804.02.1-38 |
| Central Latitude Of The Site: | Not reported |
| Central Longitude Of The Site: | Not reported |
| Flow In Gallons Per Day: | Not reported |
| Total Number Of Inj. Well(S) On Permit: | 38 |
| Island: | Oahu |
| Location In Relation To UIC Line: | Not reported |
| Facility Type: | DW |
| Subclass: | C |
| Facility Operator, Not Contract Opr: | State of Hawaii - DOT/Airport Div. |
| Operator Address: | 400 Rodgers Blvd. Suite 700, HON, HI 96819-1880 |
| Facility Owner: | Airports Div. Department of Transportation State of HI |
| Owner Address: | 400 Rodgers Blvd. Suite 700, HON, HI 96819-1880 |
| Tax Map Key Number: | 1: |
| Owner Of Land Property On Leasehold: | none |
| Consultant Serving The Application: | none |
| Receipt Of Initial Application: | 9/20/1999 |
| Public Notice Date: | Not reported |
| Approval-To-Construct Issuance Date: | 2/4/2000 |
| Exemption Issuance Date: | Not reported |
| 1st Issuance Of Permit: | 2/4/2000 |
| Last Issuance Of Permit: | 5/31/2012 |
| Type: | Not reported |
| Permit Expiration Date: | 2/14/2016 |
| Date When File Is Closed: | Not reported |
| UIC Project Geologist: | NU |
| Remarks: | Not reported |

**6** **NW** **< 1/8** **0.017 mi.** **88 ft.**

**BARBERS POINT CENTRAL OFFICE**
**ROOSEVELT & COPAHEE**
**KAPOLEI, HI 96707**

**UST** **Financial Assurance** — **U003222143** **N/A**

**Relative: Higher**

**Actual: 53 ft.**

UST:

| | |
|---|---|
| Facility ID: | 9-203295 |
| Owner: | Hawaiian Telcom |
| Owner Address: | P.O. Box 2200 |
| Owner City,St,Zip: | Kapolei, 96707 96707 |
| Latitude: | 21.324334 |
| Longitude: | -158.082764 |
| Horizontal Reference Datum Name: | NAD83 |
| Horizontal Collection Method Name: | GPS |

| | |
|---|---|
| Tank ID: | M-1 |
| Date Installed: | 05/01/1987 |
| **Tank Status:** | **Currently In Use** |
| Date Closed: | Not reported |
| Tank Capacity: | 550 |
| Substance: | Diesel |

HI Financial Assurance:

| | |
|---|---|
| Alt Facility ID: | 9-203295 |
| Tank Id: | M-1 |
| Tank Status: | Currently In Use |
| FRTYPE: | Other |
| Expiration Date: | Not reported |

| | |
|---|---|
| Alt Facility ID: | 9-203295 |
| Tank Id: | M-1 |
| Tank Status: | Currently In Use |
| FRTYPE: | Self Insured |
| Expiration Date: | 05/02/2010 |

| | |
|---|---|
| Alt Facility ID: | 9-203295 |
| Tank Id: | M-1 |
| Tank Status: | Currently In Use |
| FRTYPE: | Insurance |
| Expiration Date: | 05/02/2015 |

---

**B7** **NW** **< 1/8** **0.102 mi.** **537 ft.**

**COSTCO WHOLESALE #1038**
**4589 KAPOLEI PARKWAY**
**KAPOLEI, HI 96707**

**RCRA-LQG** — **1012178246** **HIR000139006**

**Site 1 of 2 in cluster B**

**Relative: Higher**

**Actual: 65 ft.**

RCRA-LQG:

| | |
|---|---|
| Date form received by agency: | 03/04/2016 |
| Facility name: | COSTCO WHOLESALE #1038 |
| Facility address: | 4589 KAPOLEI PARKWAY<br>KAPOLEI, HI 96707 |
| EPA ID: | HIR000139006 |
| Mailing address: | GREYHAWK CT, SUITE200<br>CARLSBAD, CA 92010 |
| Contact: | ERIC ENSMINGER |
| Contact address: | GREYHAWK CT, SUITE200<br>CARLSBAD, CA 92010 |

**COSTCO WHOLESALE #1038 (Continued)** **1012178246**

Contact country: Not reported
Contact telephone: (760) 602-8616
Contact email: EENSMINGER@3ECOMPANY.COM
EPA Region: 09
Land type: Private
Classification: Large Quantity Generator
Description: Handler: generates 1,000 kg or more of hazardous waste during any calendar month; or generates more than 1 kg of acutely hazardous waste during any calendar month; or generates more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month; or generates 1 kg or less of acutely hazardous waste during any calendar month, and accumulates more than 1 kg of acutely hazardous waste at any time; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates more than 100 kg of that material at any time

Owner/Operator Summary:

Owner/operator name: COSTCO WHOLESALE CORPORATION
Owner/operator address: Not reported
Not reported
Owner/operator country: Not reported
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 04/30/2008
Owner/Op end date: Not reported

Owner/operator name: MAX RAMOS
Owner/operator address: Not reported
Not reported
Owner/operator country: Not reported
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 11/07/2008
Owner/Op end date: Not reported

Owner/operator name: COSTCO WHOLESALE CORPORATION
Owner/operator address: LAKE DR
ISSAQUAH, WA 98027
Owner/operator country: Not reported
Owner/operator telephone: (425) 313-8100
Legal status: Private
Owner/Operator Type: Owner
Owner/Op start date: 04/30/2008
Owner/Op end date: Not reported

Owner/operator name: COSTCO WHOLESALE CORPORATION
Owner/operator address: 999 LAKE DR
ISSAQUAH, WA 98027
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Owner

**COSTCO WHOLESALE #1038 (Continued)** **1012178246**

Owner/Op start date: 01/01/2008
Owner/Op end date: Not reported

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: D009
. Waste name: MERCURY

. Waste code: D010
. Waste name: SELENIUM

. Waste code: D011
. Waste name: SILVER

. Waste code: D016
. Waste name: 2,4-D (2,4-DICHLOROPHENOXYACETIC ACID)

. Waste code: D018
. Waste name: BENZENE

. Waste code: D024
. Waste name: M-CRESOL

. Waste code: D026
. Waste name: CRESOL

. Waste code: P001
. Waste name: 2H-1-BENZOPYRAN-2-ONE, 4-HYDROXY-3-(3-OXO-1-PHENYLBUTYL)-, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3% (OR) WARFARIN, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3%

. Waste code: P075
. Waste name: NICOTINE, & SALTS (OR) PYRIDINE, 3-(1-METHYL-2-PYRROLIDINYL)-,(S)-, & SALTS

**COSTCO WHOLESALE #1038 (Continued)** **1012178246**

Historical Generators:

| | |
|---|---|
| Date form received by agency: | 05/05/2014 |
| Site name: | COSTCO WHOLESALE # 1038 |
| Classification: | Large Quantity Generator |
| . Waste code: | D001 |
| . Waste name: | IGNITABLE WASTE |
| . Waste code: | D002 |
| . Waste name: | CORROSIVE WASTE |
| . Waste code: | D003 |
| . Waste name: | REACTIVE WASTE |
| . Waste code: | D006 |
| . Waste name: | CADMIUM |
| . Waste code: | D007 |
| . Waste name: | CHROMIUM |
| . Waste code: | D008 |
| . Waste name: | LEAD |
| . Waste code: | D009 |
| . Waste name: | MERCURY |
| . Waste code: | D010 |
| . Waste name: | SELENIUM |
| . Waste code: | D011 |
| . Waste name: | SILVER |
| . Waste code: | D018 |
| . Waste name: | BENZENE |
| . Waste code: | D024 |
| . Waste name: | M-CRESOL |
| . Waste code: | D026 |
| . Waste name: | CRESOL |
| . Waste code: | D035 |
| . Waste name: | METHYL ETHYL KETONE |
| . Waste code: | F003 |
| . Waste name: | THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES. |
| . Waste code: | P001 |

**COSTCO WHOLESALE #1038 (Continued)** **1012178246**

. Waste name: 2H-1-BENZOPYRAN-2-ONE, 4-HYDROXY-3-(3-OXO-1-PHENYLBUTYL)-, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3% (OR) WARFARIN, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3%

. Waste code: P075
. Waste name: NICOTINE, & SALTS (OR) PYRIDINE, 3-(1-METHYL-2-PYRROLIDINYL)-,(S)-, & SALTS

. Waste code: U034
. Waste name: ACETALDEHYDE, TRICHLORO- (OR) CHLORAL

Date form received by agency: 01/05/2009
Site name: COSTCO WHOLESALE NO 1038
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D011
. Waste name: SILVER

. Waste code: D018
. Waste name: BENZENE

Violation Status: No violations found

Evaluation Action Summary:
Evaluation date: 03/16/2015
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

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**B8** **COSTCO GASOLINE #1038** **UST** **U004155572**
**NW** **4589 KAPOLEI PARKWAY** **Financial Assurance** **N/A**
**< 1/8** **KAPOLEI, HI 96707**
**0.102 mi.**
**537 ft.** **Site 2 of 2 in cluster B**

**Relative:**
**Higher**

**Actual:**
**65 ft.**

UST:
Facility ID: 9-203850
Owner: Costco Wholesale Corporation
Owner Address: P.O. Box 35005
Owner City,St,Zip: Kapolei, 96707 96707
Latitude: 21.326840
Longitude: -158.089950
Horizontal Reference Datum Name: NAD83
Horizontal Collection Method Name: GPS

Tank ID: 1
Date Installed: 11/12/2009
**Tank Status:** **Currently in Use**
Date Closed: Not reported
Tank Capacity: 30000
Substance: Gasoline

Tank ID: 2

**COSTCO GASOLINE #1038 (Continued)** **U004155572**

| | |
|---|---|
| Date Installed: | 11/12/2009 |
| **Tank Status:** | **Currently in Use** |
| Date Closed: | Not reported |
| Tank Capacity: | 30000 |
| Substance: | Gasoline |

| | |
|---|---|
| Tank ID: | 3 |
| Date Installed: | 11/12/2009 |
| **Tank Status:** | **Currently in Use** |
| Date Closed: | Not reported |
| Tank Capacity: | 30000 |
| Substance: | Gasoline |

HI Financial Assurance:

| | |
|---|---|
| Alt Facility ID: | 9-203850 |
| Tank Id: | 1 |
| Tank Status: | Currently in Use |
| FRTYPE: | Insurance |
| Expiration Date: | 07/01/2016 |

| | |
|---|---|
| Alt Facility ID: | 9-203850 |
| Tank Id: | 2 |
| Tank Status: | Currently in Use |
| FRTYPE: | Insurance |
| Expiration Date: | 07/01/2016 |

| | |
|---|---|
| Alt Facility ID: | 9-203850 |
| Tank Id: | 3 |
| Tank Status: | Currently in Use |
| FRTYPE: | Insurance |
| Expiration Date: | 07/01/2016 |

---

**C9**
**West**
**1/8-1/4**
**0.139 mi.**
**732 ft.**

**TRU TAG TECHNOLOGIES, INC.**
**2045 LAUWILIWILI ST., UNITS 301-305**
**KAPOLEI, HI 96707**

**RCRA-LQG** **1016168562**
**HIR000141630**

**Site 1 of 4 in cluster C**

**Relative:**
**Lower**

**Actual:**
**49 ft.**

RCRA-LQG:

| | |
|---|---|
| Date form received by agency: | 09/30/2016 |
| Facility name: | TRU TAG TECHNOLOGIES, INC. |
| Facility address: | 2045 LAUWILIWILI ST., UNITS 301-305<br>KAPOLEI, HI 96707 |
| EPA ID: | HIR000141630 |
| Mailing address: | LAUWILIWILI ST., UNITS 301-305<br>KAPOLEI, HI 96707 |
| Contact: | DAVE BROWN |
| Contact address: | LAUWILIWILI ST., UNITS 301-305<br>KAPOLEI, HI 96707 |
| Contact country: | US |
| Contact telephone: | 808-380-2214 |
| Contact email: | DBROWN@TRUTAGS.COM |
| EPA Region: | 09 |
| Land type: | Private |
| Classification: | Large Quantity Generator |
| Description: | Handler: generates 1,000 kg or more of hazardous waste during any |

**TRU TAG TECHNOLOGIES, INC. (Continued)** **1016168562**

calendar month; or generates more than 1 kg of acutely hazardous waste during any calendar month; or generates more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month; or generates 1 kg or less of acutely hazardous waste during any calendar month, and accumulates more than 1 kg of acutely hazardous waste at any time; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates more than 100 kg of that material at any time

Owner/Operator Summary:

Owner/operator name: SFI CAPITAL C/O ISTAR FINANCIAL
Owner/operator address: E. ORANGETHORPE AVE., #200
FULLERTON, CA 92831
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Owner
Owner/Op start date: 08/01/2013
Owner/Op end date: Not reported

Owner/operator name: TRUTAG TECHNOLOGIES, INC.
Owner/operator address: Not reported
Not reported
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 08/01/2013
Owner/Op end date: Not reported

Handler Activities Summary:

U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

**TRU TAG TECHNOLOGIES, INC. (Continued)** **1016168562**

. Waste code: U134
. Waste name: HYDROFLUORIC ACID (C,T) (OR) HYDROGEN FLUORIDE (C,T)

Historical Generators:
Date form received by agency: 08/09/2013
Site name: TRU TAG TECHNOLOGIES, INC.
Classification: Small Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: U134
. Waste name: HYDROFLUORIC ACID (C,T) (OR) HYDROGEN FLUORIDE (C,T)

Facility Has Received Notices of Violations:
Regulation violated: Not reported
Area of violation: Permits - General Information
Date violation determined: 07/11/2014
Date achieved compliance: 08/19/2014
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 07/11/2014
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Regulation violated: Not reported
Area of violation: Generators - Pre-transport
Date violation determined: 07/11/2014
Date achieved compliance: 08/19/2014
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 07/11/2014
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Regulation violated: Not reported
Area of violation: TSD IS-Preparedness and Prevention
Date violation determined: 07/11/2014
Date achieved compliance: 08/19/2014
Violation lead agency: State
Enforcement action: WRITTEN INFORMAL
Enforcement action date: 07/11/2014
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: State

**TRU TAG TECHNOLOGIES, INC. (Continued)** **1016168562**

Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Evaluation Action Summary:
Evaluation date: 05/22/2014
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Generators - Pre-transport
Date achieved compliance: 08/19/2014
Evaluation lead agency: State

Evaluation date: 05/22/2014
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Permits - General Information
Date achieved compliance: 08/19/2014
Evaluation lead agency: State

Evaluation date: 05/22/2014
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: TSD IS-Preparedness and Prevention
Date achieved compliance: 08/19/2014
Evaluation lead agency: State

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**C10** **STATIONARY POWER SYSTEMS INC.** **RCRA NonGen / NLR** **1016956270**
**West** **2045 LAUWILIWILI PARKWAY UNIT 1506** **HIR000142422**
**1/8-1/4** **KAPOLEI, HI 96707**
**0.139 mi.**
**732 ft.** **Site 2 of 4 in cluster C**

**Relative:**
**Lower**

**Actual:**
**49 ft.**

RCRA NonGen / NLR:
Date form received by agency: 06/24/2014
Facility name: STATIONARY POWER SYSTEMS INC.
Facility address: 2045 LAUWILIWILI PARKWAY UNIT 1506
KAPOLEI, HI 96707
EPA ID: HIR000142422
Mailing address: LAUWILIWILI PARKWAY UNIT 1506
KAPOLEI, HI 96707
Contact: GARY TERPSTRA
Contact address: LAUWILIWILI PARKWAY UNIT 1506
KAPOLEI, HI 96707
Contact country: US
Contact telephone: (808) 348-3722
Contact email: GTERPSTRA@SPSYSTEMS.NET
EPA Region: 09
Land type: Private
Classification: Non-Generator
Description: Handler: Non-Generators do not presently generate hazardous waste

Owner/Operator Summary:
Owner/operator name: STAIONARY POWER SYSTEMS INC
Owner/operator address: Not reported
Not reported
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 06/01/2012
Owner/Op end date: Not reported

**STATIONARY POWER SYSTEMS INC. (Continued)** **1016956270**

| | |
|---|---|
| Owner/operator name: | SFI KAPOLEI LLC |
| Owner/operator address: | P.O. BOX 100689<br>PASADENA, CA 91189 |
| Owner/operator country: | US |
| Owner/operator telephone: | (415) 394-4300 |
| Legal status: | Private |
| Owner/Operator Type: | Owner |
| Owner/Op start date: | 06/01/2012 |
| Owner/Op end date: | Not reported |

Handler Activities Summary:

| | |
|---|---|
| U.S. importer of hazardous waste: | No |
| Mixed waste (haz. and radioactive): | No |
| Recycler of hazardous waste: | No |
| Transporter of hazardous waste: | No |
| Treater, storer or disposer of HW: | No |
| Underground injection activity: | No |
| On-site burner exemption: | No |
| Furnace exemption: | No |
| Used oil fuel burner: | No |
| Used oil processor: | No |
| User oil refiner: | No |
| Used oil fuel marketer to burner: | No |
| Used oil Specification marketer: | No |
| Used oil transfer facility: | No |
| Used oil transporter: | No |

Universal Waste Summary:

| | |
|---|---|
| Waste type: | Batteries |
| Accumulated waste on-site: | Yes |
| Generated waste on-site: | Not reported |
| . Waste code: | D002 |
| . Waste name: | CORROSIVE WASTE |
| . Waste code: | D008 |
| . Waste name: | LEAD |

Facility Has Received Notices of Violations:

| | |
|---|---|
| Regulation violated: | Not reported |
| Area of violation: | Universal Waste - Large Quantity Handlers |
| Date violation determined: | 06/05/2014 |
| Date achieved compliance: | 07/11/2014 |
| Violation lead agency: | State |
| Enforcement action: | WRITTEN INFORMAL |
| Enforcement action date: | 06/05/2014 |
| Enf. disposition status: | Not reported |
| Enf. disp. status date: | Not reported |
| Enforcement lead agency: | State |
| Proposed penalty amount: | Not reported |
| Final penalty amount: | Not reported |
| Paid penalty amount: | Not reported |

Evaluation Action Summary:

| | |
|---|---|
| Evaluation date: | 05/14/2014 |

**STATIONARY POWER SYSTEMS INC. (Continued)** **1016956270**

| | |
|---|---|
| Evaluation: | COMPLIANCE EVALUATION INSPECTION ON-SITE |
| Area of violation: | Universal Waste - Large Quantity Handlers |
| Date achieved compliance: | 07/11/2014 |
| Evaluation lead agency: | State |

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**C11**
**West**
**1/8-1/4**
**0.139 mi.**
**732 ft.**

**VISION ENVIRONMENTAL SERVICES, INC.**
**2045 LAUWILIWILI ST**
**KAPOLEI, HI 96707**

**RCRA NonGen / NLR** **1014389679** **HIT000140244**

**Site 3 of 4 in cluster C**

**Relative:** **Lower**

**Actual:** **49 ft.**

RCRA NonGen / NLR:

| | |
|---|---|
| Date form received by agency: | 06/22/2016 |
| Facility name: | VISION ENVIRONMENTAL SERVICES, INC. |
| Facility address: | 2045 LAUWILIWILI ST<br>#710<br>KAPOLEI, HI 96707 |
| EPA ID: | HIT000140244 |
| Contact: | CANA M ULUFALE |
| Contact address: | PMB 318 590 590 FARRINGTON HWY #21<br>KAPOLEI, HI 96707 |
| Contact country: | US |
| Contact telephone: | (808) 306-1878 |
| Contact email: | VISION.CANA@GMAIL.COM |
| EPA Region: | 09 |
| Land type: | Private |
| Classification: | Non-Generator |
| Description: | Handler: Non-Generators do not presently generate hazardous waste |

Owner/Operator Summary:

| | |
|---|---|
| Owner/operator name: | CANA ULUFALE |
| Owner/operator address: | 2045 LAUWILIWILI ST #710<br>KAPOLEI, HI 96707 |
| Owner/operator country: | US |
| Owner/operator telephone: | (808) 306-1878 |
| Legal status: | Private |
| Owner/Operator Type: | Owner |
| Owner/Op start date: | 12/01/2010 |
| Owner/Op end date: | Not reported |

| | |
|---|---|
| Owner/operator name: | ASOTAU ULUFALE |
| Owner/operator address: | 2045 LAUWILIWILI ST #710<br>KAPOLEI, HI 96707 |
| Owner/operator country: | US |
| Owner/operator telephone: | (808) 306-1878 |
| Legal status: | Private |
| Owner/Operator Type: | Operator |
| Owner/Op start date: | 12/01/2010 |
| Owner/Op end date: | Not reported |

Handler Activities Summary:

| | |
|---|---|
| U.S. importer of hazardous waste: | No |
| Mixed waste (haz. and radioactive): | No |
| Recycler of hazardous waste: | No |
| Transporter of hazardous waste: | No |
| Treater, storer or disposer of HW: | No |
| Underground injection activity: | No |
| On-site burner exemption: | No |

**VISION ENVIRONMENTAL SERVICES, INC. (Continued)** **1014389679**

| | |
|---|---|
| Furnace exemption: | No |
| Used oil fuel burner: | No |
| Used oil processor: | No |
| User oil refiner: | No |
| Used oil fuel marketer to burner: | No |
| Used oil Specification marketer: | No |
| Used oil transfer facility: | No |
| Used oil transporter: | No |

Historical Generators:

| | |
|---|---|
| Date form received by agency: | 02/07/2011 |
| Site name: | VISION ENVIRONMENTAL SERVICES, INC. |
| Classification: | Not a generator, verified |
| Violation Status: | No violations found |

Evaluation Action Summary:

| | |
|---|---|
| Evaluation date: | 12/04/2012 |
| Evaluation: | COMPLIANCE EVALUATION INSPECTION ON-SITE |
| Area of violation: | Not reported |
| Date achieved compliance: | Not reported |
| Evaluation lead agency: | State |

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| | | | |
|---|---|---|---|
| **C12** | **INTERNATIONAL PAINT LLC** | **RCRA-SQG** | **1018274566** |
| **West** | **2045 LAUWILIWILI ST SUITE 1202** | **FINDS** | **HIR000143743** |
| **1/8-1/4** | **KAPOLEI, HI 96707** | **ECHO** | |
| **0.139 mi.** | | | |
| **732 ft.** | **Site 4 of 4 in cluster C** | | |

**Relative:**
**Lower**

**Actual:**
**49 ft.**

RCRA-SQG:

| | |
|---|---|
| Date form received by agency: | 05/03/2016 |
| Facility name: | INTERNATIONAL PAINT LLC |
| Facility address: | 2045 LAUWILIWILI ST SUITE 1202<br>KAPOLEI, HI 96707 |
| EPA ID: | HIR000143743 |
| Mailing address: | LAUWILIWILI ST SUITE 1202<br>KAPOLEI, HI 96707 |
| Contact: | ASHLEY LINCOLN |
| Contact address: | LAUWILIWILI ST SUITE 1202<br>KAPOLEI, HI 96707 |
| Contact country: | US |
| Contact telephone: | 808-682-1042 |
| Contact email: | ASHLEY.LINCOLN@AKZONOBEL.COM |
| EPA Region: | 09 |
| Classification: | Small Small Quantity Generator |
| Description: | Handler: generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of hazardous waste at any time |

Owner/Operator Summary:

| | |
|---|---|
| Owner/operator name: | INTERNATIONAL PAINT LLC |
| Owner/operator address: | 6001 ANTOINE DR<br>HOUSTON, TX 77091 |
| Owner/operator country: | US |
| Owner/operator telephone: | 713-682-1711 |

**INTERNATIONAL PAINT LLC (Continued)** **1018274566**

| | |
|---|---|
| Legal status: | Private |
| Owner/Operator Type: | Owner |
| Owner/Op start date: | Not reported |
| Owner/Op end date: | Not reported |

| | |
|---|---|
| Owner/operator name: | INTERNATIONAL PAINT LLC |
| Owner/operator address: | Not reported |
| | Not reported |
| Owner/operator country: | US |
| Owner/operator telephone: | Not reported |
| Legal status: | Private |
| Owner/Operator Type: | Operator |
| Owner/Op start date: | Not reported |
| Owner/Op end date: | Not reported |

Handler Activities Summary:

| | |
|---|---|
| U.S. importer of hazardous waste: | No |
| Mixed waste (haz. and radioactive): | No |
| Recycler of hazardous waste: | No |
| Transporter of hazardous waste: | No |
| Treater, storer or disposer of HW: | No |
| Underground injection activity: | No |
| On-site burner exemption: | No |
| Furnace exemption: | No |
| Used oil fuel burner: | No |
| Used oil processor: | No |
| User oil refiner: | No |
| Used oil fuel marketer to burner: | No |
| Used oil Specification marketer: | No |
| Used oil transfer facility: | No |
| Used oil transporter: | No |

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D005
. Waste name: BARIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

. Waste code: F005

**INTERNATIONAL PAINT LLC (Continued)** **1018274566**

. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, AND 2-NITROPROPANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001, F002, OR F004; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

FINDS:

Registry ID: 110067675368

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

Envid: 1018274566
Registry ID: 110067675368
DFR URL: http://echo.epa.gov/detailed-facility-report?fid=110067675368

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**D13**
**NW**
**1/8-1/4**
**0.153 mi.**
**809 ft.**

**KAPOLEI JUVENILE DETENTION FACILITY** — **RCRA-CESQG** — **1019323205**
**287 KAMOKILA BLVD** — **FINDS** — **HIR000143966**
**KAPOLEI, HI 96707** — **ECHO**

**Site 1 of 3 in cluster D**

**Relative:**
**Higher**

**Actual:**
**66 ft.**

RCRA-CESQG:

Date form received by agency: 08/26/2016
Facility name: KAPOLEI JUVENILE DETENTION FACILITY
Facility address: 287 KAMOKILA BLVD
KAPOLEI, HI 96707
EPA ID: HIR000143966
Mailing address: KAMOKILA BLVD
KAPOLEI, HI 96707
Contact: WAYNE S TANIGUCHI
Contact address: PUNCHBOWL STREET
HONOLULU, HI 96813
Contact country: US
Contact telephone: 808-539-4348
Contact email: WAYNE.S.TANIGUCHI@COURTS.HAWAII.GOV
EPA Region: 09
Classification: Conditionally Exempt Small Quantity Generator
Description: Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar

**KAPOLEI JUVENILE DETENTION FACILITY (Continued)** **1019323205**

month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

Owner/operator name: DEPT OF LAND AND NATURAL RESOURCES
Owner/operator address: 1151 PUNCHBOWL STREET
HONOLULU, HI 96813
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: State
Owner/Operator Type: Owner
Owner/Op start date: 08/01/1959
Owner/Op end date: Not reported

Owner/operator name: THE JUDICIARY - STATE OF HAWAII
Owner/operator address: Not reported
Not reported
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: State
Owner/Operator Type: Operator
Owner/Op start date: 08/04/2008
Owner/Op end date: Not reported

Handler Activities Summary:

U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

**KAPOLEI JUVENILE DETENTION FACILITY (Continued)** **1019323205**

Violation Status: No violations found

FINDS:

Registry ID: 110069517259

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

Envid: 1019323205
Registry ID: 110069517259
DFR URL: http://echo.epa.gov/detailed-facility-report?fid=110069517259

---

**D14**
**NW**
**1/8-1/4**
**0.186 mi.**
**983 ft.**

**KAPOLEI DISTRICT AND FAMILY COURT**
**4675 KAPOLEI PARKWAY**
**KAPOLEI, HI 96707**

**RCRA-CESQG**
**FINDS**
**ECHO**

**1019323204**
**HIR000143958**

**Site 2 of 3 in cluster D**

**Relative:**
**Higher**

**Actual:**
**69 ft.**

RCRA-CESQG:

Date form received by agency: 08/26/2016
Facility name: KAPOLEI DISTRICT AND FAMILY COURT
Facility address: 4675 KAPOLEI PARKWAY
KAPOLEI, HI 96707
EPA ID: HIR000143958
Mailing address: KAPOLEI PARKWAY
KAPOLEI, HI 96707
Contact: WAYNE S TANIGUCHI
Contact address: PUNCHBOWL STREET
HONOLULU, HI 96813
Contact country: US
Contact telephone: 808-539-4348
Contact email: WAYNE.S.TANIGUCHI@COURTS.HAWAII.GOV
EPA Region: 09
Classification: Conditionally Exempt Small Quantity Generator
Description: Handler: generates 100 kg or less of hazardous waste per calendar month, and accumulates 1000 kg or less of hazardous waste at any time; or generates 1 kg or less of acutely hazardous waste per calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of

**KAPOLEI DISTRICT AND FAMILY COURT (Continued)** **1019323204**

any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste

Owner/Operator Summary:

| | |
|---|---|
| Owner/operator name: | DEPT OF LAND AND NATURAL RESOURCES |
| Owner/operator address: | 1151 PUNCHBOWL STREET<br>HONOLULU, HI 96813 |
| Owner/operator country: | US |
| Owner/operator telephone: | 808-587-0400 |
| Legal status: | State |
| Owner/Operator Type: | Owner |
| Owner/Op start date: | 08/01/1959 |
| Owner/Op end date: | Not reported |
| | |
| Owner/operator name: | THE JUDICIARY - STATE OF HAWAII |
| Owner/operator address: | Not reported<br>Not reported |
| Owner/operator country: | US |
| Owner/operator telephone: | Not reported |
| Legal status: | State |
| Owner/Operator Type: | Operator |
| Owner/Op start date: | 09/10/2007 |
| Owner/Op end date: | Not reported |

Handler Activities Summary:

| | |
|---|---|
| U.S. importer of hazardous waste: | No |
| Mixed waste (haz. and radioactive): | No |
| Recycler of hazardous waste: | No |
| Transporter of hazardous waste: | No |
| Treater, storer or disposer of HW: | No |
| Underground injection activity: | No |
| On-site burner exemption: | No |
| Furnace exemption: | No |
| Used oil fuel burner: | No |
| Used oil processor: | No |
| User oil refiner: | No |
| Used oil fuel marketer to burner: | No |
| Used oil Specification marketer: | No |
| Used oil transfer facility: | No |
| Used oil transporter: | No |

| | |
|---|---|
| . Waste code: | D008 |
| . Waste name: | LEAD |
| | |
| . Waste code: | D009 |
| . Waste name: | MERCURY |

Violation Status: No violations found

FINDS:

Registry ID: 110069517240

Environmental Interest/Information System

RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of

**KAPOLEI DISTRICT AND FAMILY COURT (Continued)** **1019323204**

events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

| | |
|---|---|
| Envid: | 1019323204 |
| Registry ID: | 110069517240 |
| DFR URL: | http://echo.epa.gov/detailed-facility-report?fid=110069517240 |

---

**D15** **COSTCO KAPOLEI** **SHWS** **S108859895**
**NW** **KAMOKILA BLVD & KAPOLEI PKWY** **N/A**
**1/8-1/4** **KAPOLEI, HI 96825**
**0.196 mi.**
**1033 ft.** **Site 3 of 3 in cluster D**

**Relative: Higher**

**Actual: 69 ft.**

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Costco Kapolei |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Program: | State |
| Project Manager: | Richard Palmer |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | Hazard Undetermined |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Costco Kapolei |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | Hazard Undetermined |
| Priority: | NFA |
| Assessment: | Response Not Necessary |
| Response: | Not reported |
| Nature of Contamination: | Not reported |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | Undetermined |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No HEER Environmental Interest |
| Document Date: | 09/30/2006 |
| Document Number: | Not reported |
| Document Subject: | Rezoning Application Costco Wholesale Kapolei, TMK 1-9-1-016-001 (por) the City of Kapolei, Honouliuli, Ewa, West, Oahu HI |
| Project Manager: | Richard Palmer |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

**16** **NAVAL AIR STATION BARBERS POINT** **LUST** **U004109525**
**SE** **BLDG 1772 TANK BP97** **UST** **N/A**
**1/4-1/2** **BARBERS POINT NAVAL AIR STATIO, HI 96862**
**0.316 mi.**
**1669 ft.**

**Relative:** **Lower**

**Actual:** **39 ft.**

LUST:

| | |
|---|---|
| Facility ID: | 9-103337 |
| Facility Status: | Site Cleanup Completed (NFA) |
| Facility Status Date: | 10/26/2001 |
| Release ID: | 990048 |
| Project Officer: | Mark Sutterfield |

UST:

| | |
|---|---|
| Facility ID: | 9-103337 |
| Owner: | U.S. DEPT OF THE NAVY |
| Owner Address: | Not reported |
| Owner City,St,Zip: | Barbers Point Naval Air Station, 96862 96862 |
| Latitude: | 21.316618 |
| Longitude: | 158.071772 |
| Horizontal Reference Datum Name: | NAD83 |
| Horizontal Collection Method Name: | Map |
| | |
| Tank ID: | R-M-BP97 |
| Date Installed: | Not reported |
| **Tank Status:** | **Permanently Out of Use** |
| Date Closed: | 10/01/1996 |
| Tank Capacity: | Not reported |
| Substance: | Not Listed |

---

**17** **NEX TOUCH N' GO GAS STATION** **LUST** **U003221711**
**East** **BLDG 1928 TANK 81, 82, 83 SARATOGA AVE** **UST** **N/A**
**1/4-1/2** **KAPOLEI, HI 96707** **Financial Assurance**
**0.459 mi.**
**2423 ft.**

**Relative:** **Lower**

**Actual:** **45 ft.**

LUST:

| | |
|---|---|
| Facility ID: | 9-102001 |
| Facility Status: | Soil Vapor Sampling |
| Facility Status Date: | 01/28/2015 |
| Release ID: | 130008 |
| Project Officer: | Shaobin Li |
| | |
| Facility ID: | 9-102001 |
| Facility Status: | Monitored Natural Attenuation |
| Facility Status Date: | 08/24/2010 |
| Release ID: | 070005 |
| Project Officer: | Shaobin Li |
| | |
| Facility ID: | 9-102001 |
| Facility Status: | Monitored Natural Attenuation |
| Facility Status Date: | 08/24/2010 |
| Release ID: | 940200 |
| Project Officer: | Shaobin Li |

UST:

| | |
|---|---|
| Facility ID: | 9-102001 |
| Owner: | US Navy - Commandar Navy Region Hawaii |
| Owner Address: | 850 Ticonderoga Street, Suite 110 |

**NEX TOUCH N' GO GAS STATION (Continued)** **U003221711**

| | |
|---|---|
| Owner City,St,Zip: | Kapolei, 96707 96707 |
| Latitude: | 21.321355 |
| Longitude: | -158.068387 |
| Horizontal Reference Datum Name: | NAD83 |
| Horizontal Collection Method Name: | GPS |
| | |
| Tank ID: | 1 (83) |
| Date Installed: | 02/28/1988 |
| **Tank Status:** | **Currently In Use** |
| Date Closed: | Not reported |
| Tank Capacity: | 10000 |
| Substance: | Gasoline |
| | |
| Tank ID: | 2 Master (82) |
| Date Installed: | 02/28/1988 |
| **Tank Status:** | **Currently In Use** |
| Date Closed: | Not reported |
| Tank Capacity: | 10000 |
| Substance: | Gasoline |
| | |
| Tank ID: | 3 Slave (81) |
| Date Installed: | 02/28/1988 |
| **Tank Status:** | **Currently In Use** |
| Date Closed: | Not reported |
| Tank Capacity: | 10000 |
| Substance: | Gasoline |

HI Financial Assurance:

| | |
|---|---|
| Alt Facility ID: | 9-102001 |
| Tank Id: | 1 (83) |
| Tank Status: | Currently In Use |
| FRTYPE: | Other |
| Expiration Date: | Not reported |
| | |
| Alt Facility ID: | 9-102001 |
| Tank Id: | 2 Master (82) |
| Tank Status: | Currently In Use |
| FRTYPE: | Other |
| Expiration Date: | Not reported |
| | |
| Alt Facility ID: | 9-102001 |
| Tank Id: | 3 Slave (81) |
| Tank Status: | Currently In Use |
| FRTYPE: | Other |
| Expiration Date: | Not reported |

| | | | |
|---|---|---|---|
| **18**<br>**SW**<br>**1/2-1**<br>**0.596 mi.**<br>**3149 ft.** | **HECO - CAMPBELL INDUSTRIAL PARK SUBSTATION**<br>**91-550 KALAELOA BLVD**<br>**KAPOLEI, HI 96707** | **SHWS**<br>**ENG CONTROLS**<br>**SPILLS** | **S108859678**<br>**N/A** |

**Relative:**
**Lower**

**Actual:**
**19 ft.**

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | HECO - Campbell Industrial Park Substation |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Program: | State |
| Project Manager: | Jordan Nakayama |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Island: | Oahu |
| SDAR Environmental Interest Name: | HECO - Campbell Industrial Park Substation |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | Hazard Managed With Controls |
| Priority: | NFA |
| Assessment: | Response Necessary |
| Response: | Response Complete |
| Nature of Contamination: | Not reported |
| Nature of Residual Contamination: | Diesel fuel impacted soil was excavated and disposed of at Wamanalo Gulch. Impacted area is capped wth HDPE liner to prohibit mobilization of petroleum away from the release area. |
| Use Restrictions: | Controls Required to Manage Contamination |
| Engineering Control: | Engineering Control Required |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | ISST NFA - No Letter |
| Document Date: | 07/10/2012 |
| Document Number: | 2012-413-AH |
| Document Subject: | Concurrence with Hawaiian Electric Company Inc, Campbell Estate Industrial Park Substation, 91-550 Kalaeloa Blvd, Kapolei HI, DOH Release ID 20070625-0700, Jul 7, 2011 |
| Project Manager: | Jordan Nakayama |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

ENG CONTROLS:

| | |
|---|---|
| Supplemental Location Text: | Not reported |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Engineering Control: | Engineering Control Required |

HI SPILLS:

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Not reported |
| Case Number: | 20070625-0700 |
| HID Number: | Not reported |
| Facility Registry Id: | Not reported |

**HECO - CAMPBELL INDUSTRIAL PARK SUBSTATION (Continued)** **S108859678**

| | |
|---|---|
| Lead and Program: | HEER EP&R |
| ER: | Site Visit |
| Units: | HECO - Campbell Industrial Park Substation Diesel Release |
| Substances: | Diesel Fuel |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | 5900 |
| Units: | Gallons |
| Activity Type: | Response |
| Activity Lead: | Liz Galvez |
| Assignment End Date: | 2008-05-06 00:00:00 |
| Result: | SOSC concurrence |
| File Under: | Hawaiian Electric Co., Inc. (HECO) |
| Latitude: | 21.3269 |
| Longitude: | -158.0966 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Not reported |
| Case Number: | 20070625-0700 |
| HID Number: | Not reported |
| Facility Registry Id: | Not reported |
| Lead and Program: | HEER EP&R |
| ER: | Site Visit |
| Units: | HECO - Campbell Industrial Park Substation Diesel Release |
| Substances: | Diesel Fuel |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | 5900 |
| Units: | Gallons |
| Activity Type: | SDAR Referral |
| Activity Lead: | Not reported |
| Assignment End Date: | Not reported |
| Result: | Not reported |
| File Under: | Hawaiian Electric Co., Inc. (HECO) |
| Latitude: | 21.3269 |
| Longitude: | -158.0966 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Not reported |
| Case Number: | 20121003-1401 |
| HID Number: | Not reported |
| Facility Registry Id: | Not reported |
| Lead and Program: | HEER EP&R |
| ER: | None |
| Units: | HECO Pad-Mounted Transformer 59489 Release |
| Substances: | Transformer Oil |
| Less Or Greater Than: | > |
| Numerical Quantity: | 6 |
| Units: | Gallons |
| Activity Type: | Response |
| Activity Lead: | Curtis Martin |
| Assignment End Date: | 2012-10-10 00:00:00 |
| Result: | SOSC NFA |
| File Under: | Hawaiian Electric Co., Inc. (HECO) |
| Latitude: | 21.3269 |
| Longitude: | -158.0966 |

| | | | |
|---|---|---|---|
| **19**<br>**SW**<br>**1/2-1**<br>**0.715 mi.**<br>**3773 ft.** | **HAWAIIAN DREDGING CONSTRUCTION COMPANY, INCORPORAT**<br>**91-063 MALAKOLE ST**<br>**KAPOLEI, HI 96707** | **SHWS**<br>**INST CONTROL**<br>**VCP**<br>**SPILLS**<br>**AIRS** | **1006819223**<br>**N/A** |

**Relative:**
**Lower**

**Actual:**
**10 ft.**

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Hawaiian Dredging |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | SHWB |
| Program: | State |
| Project Manager: | Not reported |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | Hazard Undetermined |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Hawaiian Dredging |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | SHWB |
| Potential Hazard And Controls: | Hazard Undetermined |
| Priority: | NFA |
| Assessment: | Response Necessary |
| Response: | Response Ongoing |
| Nature of Contamination: | Not reported |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | Undetermined |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No HEER Environmental Interest |
| Document Date: | 12/08/2006 |
| Document Number: | Not reported |
| Document Subject: | Former Navy UST NSFI-90 Pearl Harbor Naval Complex, Oahu, Facility ID 9-103299 / Release ID 990250 |
| Project Manager: | Not reported |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Komohana Park Komohana St & Malakole St |
| Island: | Oahu |
| Environmental Interest: | Bank of Hawaii Campbell Industrial Park Site |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013769993 |
| Lead Agency: | HEER |
| Program: | Voluntary Response Program |
| Project Manager: | John Peard |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Bank of Hawaii Campbell Industrial Park Site |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013769993 |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | Hazard Managed With Controls |

**HAWAIIAN DREDGING CONSTRUCTION COMPANY, INCORPORATED (Continued)** **1006819223**

| | |
|---|---|
| Priority: | NFA |
| Assessment: | Response Necessary |
| Response: | Response Complete |
| Nature of Contamination: | Found: Petroleum, PAHs, VOCs, lead in soil and groundwater. |
| Nature of Residual Contamination: | Petroleum, PAHs, lead in soil and groundwater. |
| Use Restrictions: | Controls Required to Manage Contamination |
| Engineering Control: | No Engineering Control Required |
| Description of Restrictions: | Former Hydraulic Shear Area Commercial or Industrial use only. Former 1,000 gallon Waste Oil tank area a) No Groundwater use and no building, digging, or subsurface work.without DOH approval. |
| Institutional Control: | Proprietary - Environmental Covenant |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | Letter of Completion - Restricted Use |
| Document Date: | 06/23/2008 |
| Document Number: | 2008-417-JP |
| Document Subject: | Letter of Completion pursuant to the VRP Agreement, Dec 20, 2001 and revised Jun 11, 2007, TMK 1-9-1-032-092 |
| Project Manager: | John Peard |
| Contact Information: | (808) 933-9921 Environmental Health Bldg, 1582 Kamehameha Ave, Hilo, HI 96720 |

INST CONTROL:

| | |
|---|---|
| Potential hazards and controls: | Hazard Managed With Controls |
| Supplemental Location: | Komohana Park Komohana St & Malakole St |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Institutional Control: | Proprietary - Environmental Covenant |

VCP:

| | |
|---|---|
| Program: | Voluntary Response Program |
| Zip Suffix: | Not reported |
| Supplemental Location: | Komohana Park Komohana St & Malakole St |
| Island: | Oahu |

HI SPILLS:

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Komohana St and Malakole St |
| Case Number: | 20100123-1132 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013789962 |
| Lead and Program: | HEER EP&R |
| ER: | None |
| Units: | GPRM Prestress diesel fuel release |
| Substances: | Diesel Fuel |
| Less Or Greater Than: | > |
| Numerical Quantity: | 300 |
| Units: | Gallons |
| Activity Type: | Response |
| Activity Lead: | CURTIS MARTIN |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |
| File Under: | Grace Pacific Corporation |
| Latitude: | 21.312321 |
| Longitude: | -158.090738 |

| | |
|---|---|
| Island: | Oahu |

**HAWAIIAN DREDGING CONSTRUCTION COMPANY, INCORPORATED (Continued)** **1006819223**

| | |
|---|---|
| Supplemental Loc. Text: | Komohana St and Malakole St |
| Case Number: | 20100123-1132 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013789962 |
| Lead and Program: | HEER EP&R |
| ER: | None |
| Units: | GPRM Prestress diesel fuel release |
| Substances: | Diesel Fuel |
| Less Or Greater Than: | > |
| Numerical Quantity: | 300 |
| Units: | Gallons |
| Activity Type: | Response |
| Activity Lead: | CURTIS MARTIN |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |
| File Under: | Grace Pacific Corporation |
| Latitude: | 21.312908 |
| Longitude: | -158.093207 |

AIRS:

| | |
|---|---|
| Facility ID: | 0346-01-N |
| Island: | Oahu |
| Mailing Address: | 91-063 Malakole Street |
| Locale: | Not reported |
| Business Phone: | 808-682-6000 |
| Mailing City,St,Zip: | Kapolei, Hawaii 96707 |
| Contact Name: | Jim Beaton |
| Contact Title: | Operations Manager |
| Date Permit Issue: | 02/21/2013 |
| Date Permit Expire: | 02/20/2018 |
| Description: | 66-83 yd3/hr Concrete Batch Plant1.Attachment II of this permit encompasses the following equipment and associated appurtenances for the 66-83 yd3/hr concrete batch plant:a.1-1/2 yd3 concrete mixer, model no. 150, serial no. C-2125-88;b.4 yd3 concrete mixer, model no. PM4.0, serial no. 3756-08;c.4 ton cement loading silo;d.30 ton cement loading silo with baghouse;e.Cement screw conveyors;f.Rock and sand storage bins; andg.Rock and sand conveyor. |

---

**20**
**NNW**
**1/2-1**
**0.779 mi.**
**4114 ft.**

**PALAILAI LANDFILL**
**91-402 FARRINGTON HWY**
**EWA BEACH, HI 96706**

**SHWS**
**ENG CONTROLS**
**INST CONTROL**
**SPILLS**

**1006821165**
**N/A**

**Relative:**
**Higher**

**Actual:**
**144 ft.**

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Pacific Concrete & Rock LDFL |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013792529 |
| Lead Agency: | HEER |
| Program: | State |
| Project Manager: | Melody Calisay |
| Hazard Priority: | High |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Island: | Oahu |

**PALAILAI LANDFILL (Continued)** **1006821165**

| | |
|---|---|
| SDAR Environmental Interest Name: | Pacific Concrete & Rock LDFL |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013792529 |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | Hazard Managed With Controls |
| Priority: | High |
| Assessment: | Assessment Ongoing |
| Response: | Response Ongoing |
| Nature of Contamination: | Presumed: Additional groundwater monitoring wells and soil vapor probe were installed. |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | Controls Required to Manage Contamination |
| Engineering Control: | Engineering Control Required |
| Description of Restrictions: | Prohibit Any Activity That May Disturb the Integrity of the Soil Vapor Extraction System |
| Institutional Control: | Government - Hawaii Dept. of Health Letter Issued |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | Not reported |
| Document Date: | Not reported |
| Document Number: | Not reported |
| Document Subject: | Not reported |
| Project Manager: | Melody Calisay |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

ENG CONTROLS:

| | |
|---|---|
| Supplemental Location Text: | Not reported |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Engineering Control: | Engineering Control Required |

INST CONTROL:

| | |
|---|---|
| Potential hazards and controls: | Hazard Managed With Controls |
| Supplemental Location: | Not reported |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Institutional Control: | Government - Hawaii Dept. of Health Letter Issued |

HI SPILLS:

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Not reported |
| Case Number: | 19911121-7 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013792529 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | GRACE PACIFIC CORPORATION, OLD PALAILAI QUARRY |
| Substances: | SEE INCIDENT DESCRIPTION |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Not reported |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |
| File Under: | Grace Pacific Corporation |

**PALAILAI LANDFILL (Continued)** **1006821165**

| | |
|---|---|
| Latitude: | 21.336313 |
| Longitude: | -158.086678 |
| | |
| Island: | Oahu |
| Supplemental Loc. Text: | Not reported |
| Case Number: | 19911121-7 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013792529 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | GRACE PACIFIC CORPORATION, OLD PALAILAI QUARRY |
| Substances: | SEE INCIDENT DESCRIPTION |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Not reported |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |
| File Under: | Grace Pacific Corporation |
| Latitude: | 21.336314 |
| Longitude: | -158.022425 |

---

| | | | |
|---|---|---|---|
| **21** | **HONSADOR** | **SHWS** | **U003221988** |
| **WSW** | **91-151 MALAKOLE RD** | **LUST** | **N/A** |
| **1/2-1** | **KAPOLEI, HI 96707** | **UST** | |
| **0.789 mi.** | | **ENG CONTROLS** | |
| **4165 ft.** | | **INST CONTROL** | |
| | | **VCP** | |
| **Relative: Lower** | | **Financial Assurance** | |
| | | **UIC** | |
| **Actual: 19 ft.** | | | |

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Honsador Lumber Corp |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013785957 |
| Lead Agency: | HEER |
| Program: | Voluntary Response Program |
| Project Manager: | Steve Mow |
| Hazard Priority: | Medium |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Honsador Lumber Corp |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013785957 |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | Hazard Managed With Controls |
| Priority: | Medium |
| Assessment: | Response Necessary |
| Response: | Response Complete |
| Nature of Contamination: | Found: Arsenic |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | Controls Required to Manage Contamination |
| Engineering Control: | Engineering Control Required |
| Description of Restrictions: | Not reported |

**HONSADOR (Continued)** **U003221988**

| | |
|---|---|
| Institutional Control: | Government - Hawaii Dept. of Health Letter Issued |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | RAM LUC |
| Document Date: | 11/30/2010 |
| Document Number: | 2010-721-SPM |
| Document Subject: | Review of Voluntary Response Program Draft Response Action Memorandum, Honsador Lumber Facility (Kapolei) (Nov 4, 2010) by Kevin S. Kennedy Consulting, LLC |
| Project Manager: | Steve Mow |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

LUST:

| | |
|---|---|
| Facility ID: | 9-200822 |
| Facility Status: | Site Cleanup Completed (NFA) |
| Facility Status Date: | 04/04/2003 |
| Release ID: | 980244 |
| Project Officer: | Richard Takaba |

UST:

| | |
|---|---|
| Facility ID: | 9-200822 |
| Owner: | HONSADOR |
| Owner Address: | 91-151 MALAKOLE RD |
| Owner City,St,Zip: | Kapolei, 96707 96707 |
| Latitude: | 21.312578 |
| Longitude: | -158.096226 |
| Horizontal Reference Datum Name: | NAD83 |
| Horizontal Collection Method Name: | GPS |

| | |
|---|---|
| Tank ID: | R-1 |
| Date Installed: | 03/21/1974 |
| **Tank Status:** | **Permanently Out of Use** |
| Date Closed: | 03/02/1992 |
| Tank Capacity: | 2000 |
| Substance: | Gasoline |

| | |
|---|---|
| Tank ID: | R-2 |
| Date Installed: | 03/21/1974 |
| **Tank Status:** | **Permanently Out of Use** |
| Date Closed: | 03/02/1992 |
| Tank Capacity: | 4000 |
| Substance: | Gasoline |

| | |
|---|---|
| Tank ID: | R-3 |
| Date Installed: | 03/22/1979 |
| **Tank Status:** | **Permanently Out of Use** |
| Date Closed: | 08/22/1998 |
| Tank Capacity: | 10000 |
| Substance: | Diesel |

ENG CONTROLS:

| | |
|---|---|
| Supplemental Location Text: | Not reported |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Potential Hazards And Controls: | Hazard Managed With Controls |

**HONSADOR (Continued)** **U003221988**

Engineering Control: Engineering Control Required

INST CONTROL:

| | |
|---|---|
| Potential hazards and controls: | Hazard Managed With Controls |
| Supplemental Location: | Not reported |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Institutional Control: | Government - Hawaii Dept. of Health Letter Issued |

VCP:

| | |
|---|---|
| Program: | Voluntary Response Program |
| Zip Suffix: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |

HI Financial Assurance:

| | |
|---|---|
| Alt Facility ID: | 9-200822 |
| Tank Id: | R-1 |
| Tank Status: | Permanently Out of Use |
| FRTYPE: | Insurance |
| Expiration Date: | Not reported |

| | |
|---|---|
| Alt Facility ID: | 9-200822 |
| Tank Id: | R-2 |
| Tank Status: | Permanently Out of Use |
| FRTYPE: | Insurance |
| Expiration Date: | Not reported |

| | |
|---|---|
| Alt Facility ID: | 9-200822 |
| Tank Id: | R-3 |
| Tank Status: | Permanently Out of Use |
| FRTYPE: | Insurance |
| Expiration Date: | Not reported |

UIC:

| | |
|---|---|
| UIC Permit Number: | UO-2510 |
| Facility Id/Lat Long Minute Coordinates: | 3-1805.10.1 |
| Central Latitude Of The Site: | 21 18 58 |
| Central Longitude Of The Site: | 158 05 56 |
| Flow In Gallons Per Day: | 1640 gpd |
| Total Number Of Inj. Well(S) On Permit: | 1 |
| Island: | Oahu |
| Location In Relation To UIC Line: | Not reported |
| Facility Type: | SEW |
| Subclass: | B |
| Facility Operator, Not Contract Opr: | Honsador Lumber LLC |
| Operator Address: | 91-151 Malakole St, Kapolei, Oahu, HI 96707 |
| Facility Owner: | Honsador Lumber LLC |
| Owner Address: | Not reported |
| Tax Map Key Number: | 1:9-1-032:62 |
| Owner Of Land Property On Leasehold: | Not reported |
| Consultant Serving The Application: | Clayton Group Services |
| Receipt Of Initial Application: | 10/14/2005 |
| Public Notice Date: | Not reported |
| Approval-To-Construct Issuance Date: | Not reported |

**HONSADOR (Continued)** **U003221988**

| | |
|---|---|
| Exemption Issuance Date: | Not reported |
| 1st Issuance Of Permit: | 5/31/2007 |
| Last Issuance Of Permit: | 8/15/2012 |
| Type: | Not reported |
| Permit Expiration Date: | 8/14/2017 |
| Date When File Is Closed: | Not reported |
| UIC Project Geologist: | Not reported |
| Remarks: | Not reported |

---

**22**
**NNE**
**1/2-1**
**0.874 mi.**
**4615 ft.**

**FORT BARRETTE** **FUDS** **1012129405**
**N/A**

**OTHER, HI**

**Relative:**
**Higher**

**Actual:**
**98 ft.**

FUDS:

| | |
|---|---|
| EPA Region: | 09 |
| Congressional District: | 01 |
| FUDS Number: | H09HI0087 |
| State: | HI |
| Facility Name: | FORT BARRETTE |
| Fiscal Year: | 2013 |
| City: | OTHER |
| Federal Facility ID: | HI9799F3828 |
| Telephone: | 808-835-4004 |
| INST ID: | 54583 |
| County: | HONOLULU |
| RAB: | Not reported |
| **CORPS_DIST**: | Honolulu District (POH) |
| NPL Status: | Not Listed |
| CTC: | 1352.7 |
| Current Owner: | Other Federal Government; Private Sector |
| Future Prog: | Not reported |
| Description: | THE SITE CONTAINS EXPOSED CESS POOLS, EXPOSED MANHOLES, UNDERGROUND CONCRETE BOXES, SEPTIC TANKS AND FUEL TANK VAULTS, AN UNDERGROUND RESERVOIR. THESE STRUCTURES POSE POTENTIAL SAFETY HAZARDS TO FUTUR E PARK VISITORS. |
| Current Program: | Not reported |
| History: | THE PROJECT SITE CONSISTED OF 38.53 ACRES PURCHASED BY THE US GOVERNMENT ON NOVEMBER 1931. ON APRIL 23, 1956 THE 38.53 ACRE INSTALLATION WAS DECLARED EXCESS TO THE NEEDS OF THE ARMY AND WAS TRANSFERRE D TO THE NAVY. |
| Latitude Degree: | 21 |
| Latitude Minute: | 20 |
| Latitude Second: | 6 |
| Latitude Direction: | N |
| Longitude Degree: | -158 |
| Longitude Minute: | 4 |
| Longitude Second: | 24 |
| Longitude Direction: | E |

| | | | |
|---|---|---|---|
| **23**<br>**WSW**<br>**1/2-1**<br>**0.965 mi.**<br>**5097 ft.** | **HAWAII RACEWAY PARK**<br>**91-201 MALAKOLE ST**<br>**KAPOLEI, HI 96707** | **SHWS**<br>**SPILLS** | **S106817374**<br>**N/A** |

**Relative:**
**Lower**

**Actual:**
**10 ft.**

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Kalaeloa Blvd & Malakole St |
| Island: | Oahu |
| Environmental Interest: | Hawaii Raceway Park |
| HID Number: | HID984467779 |
| Facility Registry Identifier: | 110013789061 |
| Lead Agency: | HEER |
| Program: | State |
| Project Manager: | Diane England |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | No Hazard |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Hawaii Raceway Park |
| HID Number: | HID984467779 |
| Facility Registry Identifier: | 110013789061 |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | No Hazard |
| Priority: | NFA |
| Assessment: | Response Not Necessary |
| Response: | Not reported |
| Nature of Contamination: | Found: Petroleum, metals, and PCBs in soil |
| Nature of Residual Contamination: | No (petroleum, metals, and PCBs in soil) contamination left on site is above EALs. |
| Use Restrictions: | No Hazard Present For Unrestricted Residential Use |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No Further Action Letter - Unrestricted Residential Use |
| Document Date: | 11/09/2006 |
| Document Number: | 2006-673-DE |
| Document Subject: | No Further Action Determination |
| Project Manager: | Diane England |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

HI SPILLS:

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 19910618-4 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | HAWAII RACEWAY PARK intential dumping of oil/sulfuric acid |
| Substances: | Oil, Sulfuric Acid |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Not reported |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |

**HAWAII RACEWAY PARK (Continued)** **S106817374**

| | |
|---|---|
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.371298 |
| Longitude: | -158.083048 |
| | |
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 19910618-4 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | HAWAII RACEWAY PARK intential dumping of oil/sulfuric acid |
| Substances: | Oil, Sulfuric Acid |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Not reported |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.315397 |
| Longitude: | -158.094784 |
| | |
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 19910618-4 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | HAWAII RACEWAY PARK intential dumping of oil/sulfuric acid |
| Substances: | Oil, Sulfuric Acid |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Not reported |
| Assignment End Date: | Not reported |
| Result: | SOSC NFA |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.315183 |
| Longitude: | -158.094434 |
| | |
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 20040924-1600 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | None |
| Units: | Hawaii Raceway Park fire |
| Substances: | Not reported |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |

**HAWAII RACEWAY PARK (Continued)** **S106817374**

| | |
|---|---|
| Activity Lead: | Curtis Martin |
| Assignment End Date: | Not reported |
| Result: | Not reported |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.315183 |
| Longitude: | -158.094434 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 20040924-1600 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | None |
| Units: | Hawaii Raceway Park fire |
| Substances: | Not reported |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Curtis Martin |
| Assignment End Date: | Not reported |
| Result: | Not reported |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.371298 |
| Longitude: | -158.083048 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 20040924-1600 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | None |
| Units: | Hawaii Raceway Park fire |
| Substances: | Not reported |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Curtis Martin |
| Assignment End Date: | Not reported |
| Result: | Not reported |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.315397 |
| Longitude: | -158.094784 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 19920423-2 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | Hawaii Raceway Park potential dumping and storage of hazardous material |
| Substances: | Various |
| Less Or Greater Than: | Not reported |

**HAWAII RACEWAY PARK (Continued)** **S106817374**

| | |
|---|---|
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Bryce Hataoka |
| Assignment End Date: | Not reported |
| Result: | Refer to ISST |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.315397 |
| Longitude: | -158.094784 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 19920423-2 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | Hawaii Raceway Park potential dumping and storage of hazardous material |
| Substances: | Various |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Bryce Hataoka |
| Assignment End Date: | Not reported |
| Result: | Refer to ISST |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.315183 |
| Longitude: | -158.094434 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kalaeloa Blvd & Malakole St |
| Case Number: | 19920423-2 |
| HID Number: | HID984467779 |
| Facility Registry Id: | 110013789061 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | Hawaii Raceway Park potential dumping and storage of hazardous material |
| Substances: | Various |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Bryce Hataoka |
| Assignment End Date: | Not reported |
| Result: | Refer to ISST |
| File Under: | Hawaii Raceway Park |
| Latitude: | 21.371298 |
| Longitude: | -158.083048 |

| Map ID<br>Direction<br>Distance<br>Elevation | Site | Database(s) | EDR ID Number<br>EPA ID Number |
|---|---|---|---|

MAP FINDINGS

**24** **KAPOLEI PIPELINE FUEL SPILL** **SHWS** **1006819246**
**North** **KAMOKILA BLVD** **SPILLS** **N/A**
**1/2-1** **EWA BEACH, HI 96707**
**0.989 mi.**
**5221 ft.**

**Relative:**
**Higher**

**Actual:**
**96 ft.**

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Kamokila Blvd b/w Makakilo Rd and Road I |
| Island: | Oahu |
| Environmental Interest: | Kapolei Fuel Spill |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013770222 |
| Lead Agency: | HEER |
| Program: | State |
| Project Manager: | Not reported |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | No Hazard |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Kapolei Fuel Spill |
| HID Number: | Not reported |
| Facility Registry Identifier: | 110013770222 |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | No Hazard |
| Priority: | NFA |
| Assessment: | Response Necessary |
| Response: | Response Complete |
| Nature of Contamination: | Not reported |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | No Hazard Present For Unrestricted Residential Use |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No Further Action Letter - Unrestricted Residential Use |
| Document Date: | 08/02/1993 |
| Document Number: | Not reported |
| Document Subject: | Response to Report of Cleanup Activities, Jet Fuel Pipeline Rupture, Kapolei Pkwy |
| Project Manager: | Not reported |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

HI SPILLS:

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kamokila Blvd b/w Makakilo Rd and Road I |
| Case Number: | 19930114 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013770222 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | HIRI Pipeline Underground At Kapolei |
| Substances: | Jet Fuel |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Mike Cripps |
| Assignment End Date: | 1993-08-02 00:00:00 |
| Result: | SOSC NFA |

**KAPOLEI PIPELINE FUEL SPILL (Continued)** **1006819246**

| | |
|---|---|
| File Under: | Tesoro Hawaii Corporation |
| Latitude: | 21.338245 |
| Longitude: | -158.080089 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kamokila Blvd b/w Makakilo Rd and Road I |
| Case Number: | 19930114 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013770222 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | HIRI Pipeline Underground At Kapolei |
| Substances: | Jet Fuel |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Mike Cripps |
| Assignment End Date: | 1993-08-02 00:00:00 |
| Result: | SOSC NFA |
| File Under: | Tesoro Hawaii Corporation |
| Latitude: | 21.371298 |
| Longitude: | -158.083048 |

| | |
|---|---|
| Island: | Oahu |
| Supplemental Loc. Text: | Kamokila Blvd b/w Makakilo Rd and Road I |
| Case Number: | 19930114 |
| HID Number: | Not reported |
| Facility Registry Id: | 110013770222 |
| Lead and Program: | HEER EP&R |
| ER: | Not reported |
| Units: | HIRI Pipeline Underground At Kapolei |
| Substances: | Jet Fuel |
| Less Or Greater Than: | Not reported |
| Numerical Quantity: | Not reported |
| Units: | Not reported |
| Activity Type: | Response |
| Activity Lead: | Mike Cripps |
| Assignment End Date: | 1993-08-02 00:00:00 |
| Result: | SOSC NFA |
| File Under: | Tesoro Hawaii Corporation |
| Latitude: | 21.331941 |
| Longitude: | -158.083929 |

Count: 6 records.

ORPHAN SUMMARY

| City | EDR ID | Site Name | Site Address | Zip | Database(s) |
|---|---|---|---|---|---|
| BARBERS POINT NAS | S111704672 | BARBERS POINT NAS STATION P | MISSION ST | 96707 | SHWS |
| KAPOLEI | 1001112113 | DLA DISPOSITION SERVICES | BLDG. 140 MIDWAY STREET (KALAE | 96707 | SEMS-ARCHIVE, RCRA NonGen / NL |
| KAPOLEI | S115488695 | FORT | KALAELOA BLVD | | SHWS, ENG CONTROLS, INST CONT |
| KAPOLEI | S120822095 | GRACE PACIFIC KALAELOA HMA PLANT D | 91-500 MALAKOLE ST | | SHWS |
| KAPOLEI | S118422808 | HAWAII ARMY NATIONAL GUARD AT KALA | MIDWAY STREET | | SHWS, INST CONTROL |
| KAPOLEI | S106820144 | PUMP 15 STATION, FORMER OAHU SUGAR | OLD FARRINGTON HWY | 96707 | SHWS |

# GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

**Number of Days to Update:** Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

**STANDARD ENVIRONMENTAL RECORDS**

***Federal NPL site list***

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 05/30/2017
Date Data Arrived at EDR: 06/08/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 99

Source: EPA
Telephone: N/A
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 05/30/2017
Date Data Arrived at EDR: 06/09/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 98

Source: EPA
Telephone: N/A
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

***Federal Delisted NPL site list***

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 05/30/2017
Date Data Arrived at EDR: 06/09/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 98

Source: EPA
Telephone: N/A
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

***Federal CERCLIS list***

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 11/07/2016
Date Data Arrived at EDR: 01/05/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 92

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System

SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 02/07/2017
Date Data Arrived at EDR: 04/19/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Quarterly

***Federal CERCLIS NFRAP site list***

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 02/07/2017
Date Data Arrived at EDR: 04/19/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Quarterly

***Federal RCRA CORRACTS facilities list***

CORRACTS: Corrective Action Report
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Quarterly

***Federal RCRA non-CORRACTS TSD facilities list***

RCRA-TSDF: RCRA - Treatment, Storage and Disposal
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Quarterly

***Federal RCRA generators list***

RCRA-LQG: RCRA - Large Quantity Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

| | |
|---|---|
| Date of Government Version: 12/12/2016 | Source: Environmental Protection Agency |
| Date Data Arrived at EDR: 12/28/2016 | Telephone: (415) 495-8895 |
| Date Made Active in Reports: 02/10/2017 | Last EDR Contact: 09/26/2017 |
| Number of Days to Update: 44 | Next Scheduled EDR Contact: 01/08/2018 |
| | Data Release Frequency: Quarterly |

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

| | |
|---|---|
| Date of Government Version: 12/12/2016 | Source: Environmental Protection Agency |
| Date Data Arrived at EDR: 12/28/2016 | Telephone: (415) 495-8895 |
| Date Made Active in Reports: 02/10/2017 | Last EDR Contact: 09/26/2017 |
| Number of Days to Update: 44 | Next Scheduled EDR Contact: 01/08/2018 |
| | Data Release Frequency: Varies |

***Federal institutional controls / engineering controls registries***

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

| | |
|---|---|
| Date of Government Version: 05/22/2017 | Source: Department of the Navy |
| Date Data Arrived at EDR: 06/13/2017 | Telephone: 843-820-7326 |
| Date Made Active in Reports: 09/15/2017 | Last EDR Contact: 08/10/2017 |
| Number of Days to Update: 94 | Next Scheduled EDR Contact: 11/27/2017 |
| | Data Release Frequency: Varies |

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

| | |
|---|---|
| Date of Government Version: 02/13/2017 | Source: Environmental Protection Agency |
| Date Data Arrived at EDR: 02/28/2017 | Telephone: 703-603-0695 |
| Date Made Active in Reports: 06/09/2017 | Last EDR Contact: 08/30/2017 |
| Number of Days to Update: 101 | Next Scheduled EDR Contact: 12/11/2017 |
| | Data Release Frequency: Varies |

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

| | |
|---|---|
| Date of Government Version: 02/13/2017 | Source: Environmental Protection Agency |
| Date Data Arrived at EDR: 02/28/2017 | Telephone: 703-603-0695 |
| Date Made Active in Reports: 06/09/2017 | Last EDR Contact: 08/30/2017 |
| Number of Days to Update: 101 | Next Scheduled EDR Contact: 12/11/2017 |
| | Data Release Frequency: Varies |

***Federal ERNS list***

ERNS: Emergency Response Notification System
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/26/2016
Date Data Arrived at EDR: 09/29/2016
Date Made Active in Reports: 11/11/2016
Number of Days to Update: 43

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 09/21/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

***State- and tribal - equivalent CERCLIS***

SHWS: Sites List
Facilities, sites or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

Date of Government Version: 03/16/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 182

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Semi-Annually

***State and tribal landfill and/or solid waste disposal site lists***

SWF/LF: Permitted Landfills in the State of Hawaii
Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 09/17/2012
Date Data Arrived at EDR: 04/03/2013
Date Made Active in Reports: 05/10/2013
Number of Days to Update: 37

Source: Department of Health
Telephone: 808-586-4245
Last EDR Contact: 09/29/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Varies

***State and tribal leaking storage tank lists***

LUST: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 08/01/2017
Date Data Arrived at EDR: 08/30/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 16

Source: Department of Health
Telephone: 808-586-4228
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Semi-Annually

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 10/17/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 10/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 10/07/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 10/06/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 09/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 10/14/2016
Date Data Arrived at EDR: 01/27/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 98

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Semi-Annually

***State and tribal registered storage tank lists***

FEMA UST: Underground Storage Tank Listing

A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 07/14/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Varies

UST: Underground Storage Tank Database

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 08/01/2017
Date Data Arrived at EDR: 08/30/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 16

Source: Department of Health
Telephone: 808-586-4228
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 10/14/2016
Date Data Arrived at EDR: 01/27/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 98

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 01/14/2017
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 10/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 10/17/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 10/06/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 10/07/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

***State and tribal institutional control / engineering control registries***

ENG CONTROLS: Engineering Control Sites

A listing of sites with engineering controls in place.

Date of Government Version: 03/16/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 182

Source: Department of Health
Telephone: 404-586-4249
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

INST CONTROL: Sites with Institutional Controls

Voluntary Remediation Program and Brownfields sites with institutional controls in place.

Date of Government Version: 03/16/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 182

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

***State and tribal voluntary cleanup sites***

VCP: Voluntary Response Program Sites

Sites participating in the Voluntary Response Program. The purpose of the VRP is to streamline the cleanup process in a way that will encourage prospective developers, lenders, and purchasers to voluntarily cleanup properties.

Date of Government Version: 03/16/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 182

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 07/27/2015
Date Data Arrived at EDR: 09/29/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 142

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 09/25/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

***State and tribal Brownfields sites***

BROWNFIELDS: Brownfields Sites

With certain legal exclusions and additions, the term ‘brownfield site’ means real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Date of Government Version: 03/16/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 182

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

## ADDITIONAL ENVIRONMENTAL RECORDS

***Local Brownfield lists***

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 06/19/2017
Date Data Arrived at EDR: 06/20/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 87

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 09/20/2017
Next Scheduled EDR Contact: 01/01/2018
Data Release Frequency: Semi-Annually

***Local Lists of Landfill / Solid Waste Disposal Sites***

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations
A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 07/24/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IHS OPEN DUMPS: Open Dumps on Indian Land
A listing of all open dumps located on Indian Land in the United States.

Date of Government Version: 04/01/2014
Date Data Arrived at EDR: 08/06/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 176

Source: Department of Health & Human Serivces, Indian Health Service
Telephone: 301-443-1452
Last EDR Contact: 08/29/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

***Local Lists of Hazardous waste / Contaminated Sites***

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 02/09/2017
Date Data Arrived at EDR: 03/08/2017
Date Made Active in Reports: 06/09/2017
Number of Days to Update: 93

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: No Update Planned

CDL: Clandestine Drug Lab Listing
A listing of clandestine drug lab site locations.

Date of Government Version: 08/04/2010
Date Data Arrived at EDR: 09/10/2010
Date Made Active in Reports: 10/22/2010
Number of Days to Update: 42

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/09/2017
Date Data Arrived at EDR: 03/08/2017
Date Made Active in Reports: 06/09/2017
Number of Days to Update: 93

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Quarterly

***Local Land Records***

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 07/26/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

***Records of Emergency Release Reports***

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/28/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 37

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 09/21/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

SPILLS: Release Notifications

Releases of hazardous substances to the environment reported to the Office of Hazard Evaluation and Emergency Response since 1988.

Date of Government Version: 03/16/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 182

Source: Department of Health
Telephone: 808-586-4249
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 03/10/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/11/2013
Number of Days to Update: 39

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

***Other Ascertainable Records***

# GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Varies

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 01/31/2015
Date Data Arrived at EDR: 07/08/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 97

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 07/12/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 07/14/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 01/01/2017
Date Data Arrived at EDR: 02/03/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 63

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 05/10/2017
Date Data Arrived at EDR: 05/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 121

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 6

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/15/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 14

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 09/22/2017
Next Scheduled EDR Contact: 01/01/2018
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 133

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 08/23/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

| | |
|---|---|
| Date of Government Version: 12/31/2009 | Source: EPA |
| Date Data Arrived at EDR: 12/10/2010 | Telephone: 202-564-4203 |
| Date Made Active in Reports: 02/25/2011 | Last EDR Contact: 07/28/2017 |
| Number of Days to Update: 77 | Next Scheduled EDR Contact: 11/08/2017 |
| | Data Release Frequency: Annually |

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

| | |
|---|---|
| Date of Government Version: 11/25/2013 | Source: EPA |
| Date Data Arrived at EDR: 12/12/2013 | Telephone: 703-416-0223 |
| Date Made Active in Reports: 02/24/2014 | Last EDR Contact: 09/08/2017 |
| Number of Days to Update: 74 | Next Scheduled EDR Contact: 12/18/2017 |
| | Data Release Frequency: Annually |

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

| | |
|---|---|
| Date of Government Version: 02/01/2017 | Source: Environmental Protection Agency |
| Date Data Arrived at EDR: 02/09/2017 | Telephone: 202-564-8600 |
| Date Made Active in Reports: 04/07/2017 | Last EDR Contact: 07/24/2017 |
| Number of Days to Update: 57 | Next Scheduled EDR Contact: 11/08/2017 |
| | Data Release Frequency: Varies |

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

| | |
|---|---|
| Date of Government Version: 04/17/1995 | Source: EPA |
| Date Data Arrived at EDR: 07/03/1995 | Telephone: 202-564-4104 |
| Date Made Active in Reports: 08/07/1995 | Last EDR Contact: 06/02/2008 |
| Number of Days to Update: 35 | Next Scheduled EDR Contact: 09/01/2008 |
| | Data Release Frequency: No Update Planned |

PRP: Potentially Responsible Parties

A listing of verified Potentially Responsible Parties

| | |
|---|---|
| Date of Government Version: 10/25/2013 | Source: EPA |
| Date Data Arrived at EDR: 10/17/2014 | Telephone: 202-564-6023 |
| Date Made Active in Reports: 10/20/2014 | Last EDR Contact: 08/08/2017 |
| Number of Days to Update: 3 | Next Scheduled EDR Contact: 11/20/2017 |
| | Data Release Frequency: Quarterly |

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB’s who are required to notify the EPA of such activities.

Date of Government Version: 01/20/2016
Date Data Arrived at EDR: 04/28/2016
Date Made Active in Reports: 09/02/2016
Number of Days to Update: 127

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/10/2017
Next Scheduled EDR Contact: 07/24/2017
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 11/18/2016
Date Data Arrived at EDR: 11/23/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 79

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 08/30/2016
Date Data Arrived at EDR: 09/08/2016
Date Made Active in Reports: 10/21/2016
Number of Days to Update: 43

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 10/03/2017
Next Scheduled EDR Contact: 12/18/2017
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 09/08/2017
Next Scheduled EDR Contact: 12/18/2017
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

RADINFO: Radiation Information Database
The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/04/2017
Date Data Arrived at EDR: 01/06/2017
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 35

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 07/12/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 09/30/2016
Date Data Arrived at EDR: 11/18/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 77

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 09/25/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2015
Date Data Arrived at EDR: 02/22/2017
Date Made Active in Reports: 09/28/2017
Number of Days to Update: 218

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 09/21/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/14/2015
Date Made Active in Reports: 01/10/2017
Number of Days to Update: 546

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 07/11/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program

DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 12/23/2016
Date Data Arrived at EDR: 12/27/2016
Date Made Active in Reports: 02/17/2017
Number of Days to Update: 52

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 08/22/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 05/30/2017
Date Data Arrived at EDR: 06/09/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 98

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 09/26/2017
Next Scheduled EDR Contact: 01/08/2018
Data Release Frequency: Annually

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 02/08/2017
Date Data Arrived at EDR: 02/28/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 38

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Semi-Annually

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing

This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 12/05/2005
Date Data Arrived at EDR: 02/29/2008
Date Made Active in Reports: 04/18/2008
Number of Days to Update: 49

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 09/01/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 09/01/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

ABANDONED MINES:  Abandoned Mines

An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The inventory contains information on the location, type, and extent of AML impacts, as well as, information on the cost associated with the reclamation of those problems. The inventory is based upon field surveys by State, Tribal, and OSMRE program officials. It is dynamic to the extent that it is modified as new problems are identified and existing problems are reclaimed.

Date of Government Version: 03/14/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 21

Source:  Department of Interior
Telephone:  202-208-2609
Last EDR Contact: 09/25/2017
Next Scheduled EDR Contact: 12/25/2017
Data Release Frequency: Quarterly

FINDS:  Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 07/23/2017
Date Data Arrived at EDR: 09/06/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 9

Source:  EPA
Telephone:  (415) 947-8000
Last EDR Contact: 09/06/2017
Next Scheduled EDR Contact: 12/18/2017
Data Release Frequency: Quarterly

ECHO:  Enforcement & Compliance History Information

ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 03/19/2017
Date Data Arrived at EDR: 03/21/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 52

Source:  Environmental Protection Agency
Telephone:  202-564-2280
Last EDR Contact: 09/06/2017
Next Scheduled EDR Contact: 12/18/2017
Data Release Frequency: Quarterly

DOCKET HWC:  Hazardous Waste Compliance Docket Listing

A complete list of the Federal Agency Hazardous Waste Compliance Docket Facilities.

Date of Government Version: 06/02/2016
Date Data Arrived at EDR: 06/03/2016
Date Made Active in Reports: 09/02/2016
Number of Days to Update: 91

Source:  Environmental Protection Agency
Telephone:  202-564-0527
Last EDR Contact: 09/21/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

UXO:  Unexploded Ordnance Sites

A listing of unexploded ordnance site locations

Date of Government Version: 10/25/2015
Date Data Arrived at EDR: 01/29/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 67

Source:  Department of Defense
Telephone:  571-373-0407
Last EDR Contact: 07/17/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

FUELS PROGRAM:  EPA Fuels Program Registered Listing

This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 08/17/2017
Date Data Arrived at EDR: 08/17/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 29

Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 08/17/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

AIRS: List of Permitted Facilities
A listing of permitted facilities in the state.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 01/04/2017
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 57

Source: Department of Health
Telephone: 808-586-4200
Last EDR Contact: 09/27/2017
Next Scheduled EDR Contact: 01/15/2018
Data Release Frequency: Varies

DRYCLEANERS: Permitted Drycleaner Facility Listing
A listing of permitted drycleaner facilities in the state.

Date of Government Version: 07/07/2017
Date Data Arrived at EDR: 07/11/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 66

Source: Department of Health
Telephone: 808-586-4200
Last EDR Contact: 09/27/2017
Next Scheduled EDR Contact: 01/15/2018
Data Release Frequency: Varies

Financial Assurance: Financial Assurance Information Listing
A listing of financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 06/15/2017
Date Data Arrived at EDR: 06/19/2017
Date Made Active in Reports: 09/15/2017
Number of Days to Update: 88

Source: Department of Health
Telephone: 808-586-4226
Last EDR Contact: 09/25/2017
Next Scheduled EDR Contact: 12/25/2017
Data Release Frequency: Varies

UIC: Underground Injection Wells Listing
A listing of underground injection well locations.

Date of Government Version: 02/07/2013
Date Data Arrived at EDR: 02/12/2013
Date Made Active in Reports: 04/09/2013
Number of Days to Update: 56

Source: Department of Health
Telephone: 808-586-4258
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

## EDR HIGH RISK HISTORICAL RECORDS

### *EDR Exclusive Records*

EDR MGP: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

**EDR RECOVERED GOVERNMENT ARCHIVES**

***Exclusive Recovered Govt. Archives***

RGA HWS: Recovered Government Archive State Hazardous Waste Facilities List

The EDR Recovered Government Archive State Hazardous Waste database provides a list of SHWS incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/08/2014
Number of Days to Update: 191

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/17/2014
Number of Days to Update: 200

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Health in Hawaii.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/03/2014
Number of Days to Update: 186

Source: Department of Health
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

**OTHER DATABASE(S)**

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Oil/Gas Pipelines
Source: PennWell Corporation
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data
Source: PennWell Corporation
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Office of Planning
Telephone: 808-587-2895

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

**STREET AND ADDRESS INFORMATION**

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# GEOCHECK ® - PHYSICAL SETTING SOURCE ADDENDUM

**TARGET PROPERTY ADDRESS**

PARCELS 1, 2, AND 3
FRANKLIN D ROOSEVELT AVE
KAPOLEI, HI 96707

**TARGET PROPERTY COORDINATES**

| | |
|---|---|
| Latitude (North): | 21.321929 - 21˚ 19’ 18.94’’ |
| Longitude (West): | 158.080198 - 158˚ 4’ 48.71’’ |
| Universal Tranverse Mercator: | Zone 4 |
| UTM X (Meters): | 595392.0 |
| UTM Y (Meters): | 2357916.8 |
| Elevation: | 52 ft. above sea level |

**USGS TOPOGRAPHIC MAP**

| | |
|---|---|
| Target Property Map: | 5941343 EWA, HI |
| Version Date: | 2013 |

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

# GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

## GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

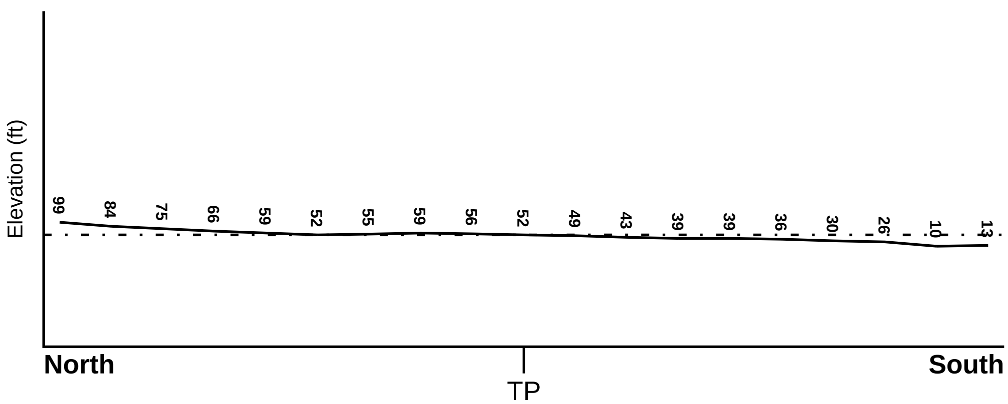
## TOPOGRAPHIC INFORMATION

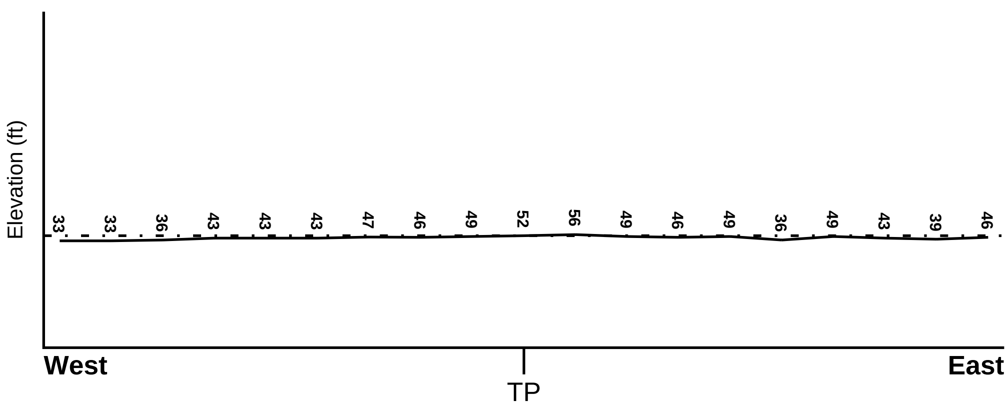
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

### TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General South

### SURROUNDING TOPOGRAPHY: ELEVATION PROFILES




**Target Property Elevation: 52 ft.**

0 1/2 1 Miles

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

# GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

**HYDROLOGIC INFORMATION**

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

**FEMA FLOOD ZONE**

| Flood Plain Panel at Target Property | FEMA Source Type |
|---|---|
| 15003C0310G | FEMA FIRM Flood data |

| Additional Panels in search area: | FEMA Source Type |
|---|---|
| 15003C0304G | FEMA FIRM Flood data |
| 15003C0312G | FEMA FIRM Flood data |
| 15003C0316H | FEMA FIRM Flood data |

**NATIONAL WETLAND INVENTORY**

| NWI Quad at Target Property | NWI Electronic Data Coverage |
|---|---|
| EWA | YES - refer to the Overview Map and Detail Map |

**HYDROGEOLOGIC INFORMATION**

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

**AQUIFLOW®**

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

| MAP ID | LOCATION FROM TP | GENERAL DIRECTION GROUNDWATER FLOW |
|---|---|---|
| Not Reported | | |

# GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

## GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

## GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

**ROCK STRATIGRAPHIC UNIT**

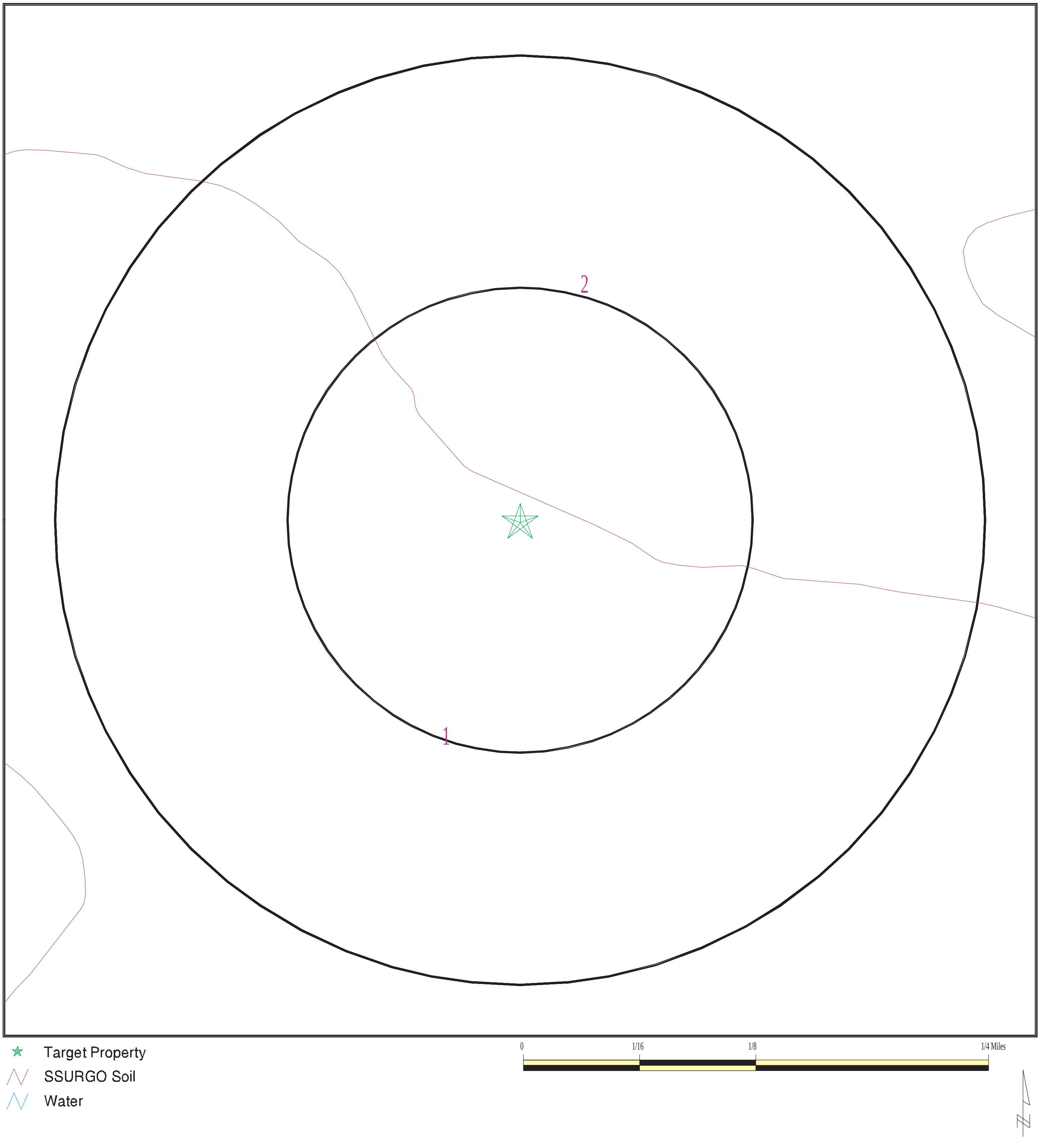
| | |
|---|---|
| Era: | - |
| System: | - |
| Series: | - |
| Code: | N/A *(decoded above as Era, System & Series)* |

**GEOLOGIC AGE IDENTIFICATION**

Category: -

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

# SSURGO SOIL MAP - 5070053.2s




| | | | |
|---|---|---|---|
| SITE NAME: | Parcels 1, 2, and 3 | CLIENT: | Element Environmental , LLC |
| ADDRESS: | Franklin D Roosevelt Ave | CONTACT: | Angie Peltier |
| | Kapolei HI 96707 | INQUIRY #: | 5070053.2s |
| LAT/LONG: | 21.321929 / 158.080198 | DATE: | October 05, 2017 7:26 pm |

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### DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

---

**Soil Map ID: 1**

Soil Component Name: Coral outcrop

Soil Surface Texture: bedrock

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Excessively drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

| Soil Layer Information | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Boundary** | | | **Classification** | | **Saturated hydraulic conductivity micro m/sec** | |
| **Layer** | **Upper** | **Lower** | **Soil Texture Class** | **AASHTO Group** | **Unified Soil** | | **Soil Reaction (pH)** |
| 1 | 0 inches | 59 inches | bedrock | Not reported | Not reported | Max: 42<br>Min: 1.41 | Max: Min: |

---

**Soil Map ID: 2**

Soil Component Name: Mamala

Soil Surface Texture: stony silty clay loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 48 inches

Depth to Watertable Min: > 0 inches

# GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

| Soil Layer Information | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Boundary | | | Classification | | Saturated hydraulic conductivity micro m/sec | Soil Reaction (pH) |
| Layer | Upper | Lower | Soil Texture Class | AASHTO Group | Unified Soil | | |
| 1 | 0 inches | 7 inches | stony silty clay loam | Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils. | CL-K (proposed) | Max: 14 Min: 4.23 | Max: 7.3 Min: 6.6 |
| 2 | 7 inches | 18 inches | stony silty clay loam | Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils. | CL-K (proposed) | Max: 14 Min: 4.23 | Max: 7.8 Min: 7.4 |
| 3 | 18 inches | 29 inches | bedrock | Not reported | Not reported | Max: 0.42 Min: 0.02 | Max: Min: |

## LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

## WELL SEARCH DISTANCE INFORMATION

| DATABASE | SEARCH DISTANCE (miles) |
|---|---|
| Federal USGS | 1.000 |
| Federal FRDS PWS | Nearest PWS within 0.001 miles |
| State Database | 1.000 |

## FEDERAL USGS WELL INFORMATION

| MAP ID | WELL ID | LOCATION FROM TP |
|---|---|---|
| A1 | USGS40000269831 | 1/8 - 1/4 Mile NW |
| B3 | USGS40000269847 | 1/4 - 1/2 Mile NNW |
| C7 | USGS40000269827 | 1/2 - 1 Mile WNW |
| C9 | USGS40000269829 | 1/2 - 1 Mile WNW |
| D15 | USGS40000269841 | 1/2 - 1 Mile WNW |
| E16 | USGS40000269873 | 1/2 - 1 Mile NE |
| D18 | USGS40000269842 | 1/2 - 1 Mile WNW |
| F19 | USGS40000269840 | 1/2 - 1 Mile ENE |
| G21 | USGS40000269750 | 1/2 - 1 Mile SW |

# GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

**FEDERAL USGS WELL INFORMATION**

| MAP ID | WELL ID | LOCATION FROM TP |
|---|---|---|
| H23 | USGS40000269839 | 1/2 - 1 Mile WNW |

**FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION**

| MAP ID | WELL ID | LOCATION FROM TP |
|---|---|---|

No PWS System Found

Note: PWS System location is not always the same as well location.

**STATE DATABASE WELL INFORMATION**

| MAP ID | WELL ID | LOCATION FROM TP |
|---|---|---|
| A2 | HI9000000000867 | 1/8 - 1/4 Mile NW |
| B4 | HI9000000000872 | 1/4 - 1/2 Mile North |
| B5 | HI9000000000874 | 1/4 - 1/2 Mile NNW |
| C6 | HI9000000000870 | 1/2 - 1 Mile WNW |
| C8 | HI9000000000871 | 1/2 - 1 Mile WNW |
| C10 | HI9000000000873 | 1/2 - 1 Mile WNW |
| D11 | HI9000000000868 | 1/2 - 1 Mile WNW |
| D12 | HI9000000000869 | 1/2 - 1 Mile WNW |
| E13 | HI9000000000864 | 1/2 - 1 Mile NE |
| E14 | HI9000000000865 | 1/2 - 1 Mile NE |
| F17 | HI9000000000863 | 1/2 - 1 Mile ENE |
| G20 | HI9000000000635 | 1/2 - 1 Mile SW |
| G22 | HI9000000000650 | 1/2 - 1 Mile SW |
| H24 | HI9000000000866 | 1/2 - 1 Mile WNW |

# PHYSICAL SETTING SOURCE MAP - 5070053.2s


County Boundary
Major Roads
Contour Lines
Airports
Earthquake epicenter, Richter 5 or greater
Water Wells
Public Water Supply Wells
Cluster of Multiple Icons

0 1/4 1/2 1 Miles

Groundwater Flow Direction
GI Indeterminate Groundwater Flow at Location
GV Groundwater Flow Varies at Location

| | | | |
|---|---|---|---|
| SITE NAME: | Parcels 1, 2, and 3 | CLIENT: | Element Environmental , LLC |
| ADDRESS: | Franklin D Roosevelt Ave | CONTACT: | Angie Peltier |
| | Kapolei HI 96707 | INQUIRY #: | 5070053.2s |
| LAT/LONG: | 21.321929 / 158.080198 | DATE: | October 05, 2017 7:26 pm |

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| Map ID<br>Direction<br>Distance<br>Elevation | Database | EDR ID Number |
|---|---|---|
| **A1**<br>**NW**<br>**1/8 - 1/4 Mile**<br>**Higher** | **FED USGS** | **USGS40000269831** |

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211939158050801 | | |
| Monloc name: | 3-1905.01 -03/W275-4 | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.324343 |
| Longitude: | -158.0828113 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 56.00 |
| Vert measure units: | feet | Vertacc measure val: | 2 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19660718 | Welldepth: | 70 |
| Welldepth units: | ft | Wellholedepth: | 70 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 1

| Date | Feet below Surface | Feet to Sealevel |
|---|---|---|
| 1966-08-05 | 53.30 | |

| Map ID<br>Direction<br>Distance<br>Elevation | Database | EDR ID Number |
|---|---|---|
| **A2**<br>**NW**<br>**1/8 - 1/4 Mile**<br>**Higher** | **HI WELLS** | **HI9000000000867** |

| | | | |
|---|---|---|---|
| Wid: | 3-1905-003 | Island: | Oahu |
| Well name: | Barbers Point | Old name: | Not Reported |
| Yr drilled: | 1966 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.082778 | | |
| Lat83dd: | 21.324444 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Hawaiian Telephone Co. | | |
| Land owner: | Not Reported | | |
| Pump insta: | Not Reported | | |
| Old number: | 275-4 | Well type: | PER |
| Casing dia: | 8 | Ground el: | 56 |
| Well depth: | 70 | | |
| Solid case: | Not Reported | Perf case: | Not Reported |
| Use: | Other | | |
| Use year: | Not Reported | | |
| Init head: | 2.3 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 288 | | |
| Test date: | Not Reported | Test gpm: | Not Reported |

| | | | |
|---|---|---|---|
| Test ddown: | Not Reported | Test chlor: | Not Reported |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | -14 |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | Not Reported | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-016:011 |
| Aqui code: | 30208 | | |
| Latest hd: | Not Reported | Wcr: | 01-JAN-66 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000867 |

**B3**
**NNW**
**1/4 - 1/2 Mile**
**Lower**

**FED USGS** **USGS40000269847**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211947158050401 | | |
| Monloc name: | 3-1905.04 | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3265649 |
| Longitude: | -158.0817 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 5 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 55.00 |
| Vert measure units: | feet | Vertacc measure val: | 4 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19800901 | Welldepth: | Not Reported |
| Welldepth units: | Not Reported | Wellholedepth: | 35 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 0

**B4**
**North**
**1/4 - 1/2 Mile**
**Lower**

**HI WELLS** **HI9000000000872**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-008 | Island: | Oahu |
| Well name: | Kapolei Irr 1 | Old name: | Not Reported |
| Yr drilled: | 1991 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.081111 | | |
| Lat83dd: | 21.327222 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Board of Water Supply, BWS | | |
| Land owner: | D.R. Horton - Schuler Homes LLC | | |
| Pump insta: | Beylik Drilling & Pump Service Inc. | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | 65 |
| Well depth: | 84 | | |
| Solid case: | 64 | Perf case: | 84 |
| Use: | IRR - Landscape/Water Features | | |
| Use year: | Not Reported | | |
| Init head: | Not Reported | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 4/10/1991 | Test gpm: | 750 |
| Test ddown: | 6.4 | Test chlor: | 545 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 550 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 2007 | | |
| Draft yr: | Not Reported | Bot hole: | -19 |
| Bot solid: | 1 | Bot perf: | -19 |
| Spec capac: | 117 | | |
| Pump mgd: | .792 | | |
| Draft mgd: | Not Reported | Pump elev: | -10 |
| Pump depth: | 75 | Tmk: | (1) 9-1-160:037 |
| Aqui code: | 30208 | | |
| Latest hd: | Not Reported | Wcr: | 01-JAN-91 |
| Pir: | 11/14/2007 | | |
| Surveyor: | Alden Kajioka | | |
| T: | Not Reported | Site id: | HI9000000000872 |

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**B5**
**NNW**
**1/4 - 1/2 Mile**
**Lower**

**HI WELLS** **HI9000000000874**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-010 | Island: | Oahu |
| Well name: | Kapolei Irr 2 | Old name: | Not Reported |
| Yr drilled: | 1993 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.081667 | | |
| Lat83dd: | 21.327222 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Board of Water Supply, BWS | | |
| Land owner: | D.R. Horton - Schuler Homes LLC | | |

| | | | |
|---|---|---|---|
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | ROT |
| Casing dia: | 14 | Ground el: | 65 |
| Well depth: | 94 | | |
| Solid case: | 54 | Perf case: | 94 |
| Use: | IRR - Landscape/Water Features | | |
| Use year: | Not Reported | | |
| Init head: | 1.25 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 450 | | |
| Test date: | 8/5/1993 | Test gpm: | 600 |
| Test ddown: | 9.7 | Test chlor: | 470 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 550 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 1994 | | |
| Draft yr: | Not Reported | Bot hole: | -29 |
| Bot solid: | 9 | Bot perf: | -29 |
| Spec capac: | 62 | | |
| Pump mgd: | .792 | | |
| Draft mgd: | Not Reported | Pump elev: | -10 |
| Pump depth: | 75 | Tmk: | (1) 9-1-160:037 |
| Aqui code: | 30208 | | |
| Latest hd: | Not Reported | Wcr: | 20-AUG-93 |
| Pir: | 4/1/1994 | | |
| Surveyor: | Alden Kajioka | | |
| T: | Not Reported | Site id: | HI9000000000874 |

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**C6**
**WNW**
**1/2 - 1 Mile**
**Lower**

**HI WELLS** **HI9000000000870**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-006 | Island: | Oahu |
| Well name: | Caprock 1 | Old name: | Not Reported |
| Yr drilled: | 1990 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.088889 | | |
| Lat83dd: | 21.323889 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Board of Water Supply, BWS | | |
| Land owner: | Board of Water Supply, BWS | | |
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | 47 |
| Well depth: | 72 | | |
| Solid case: | 44 | Perf case: | 72 |
| Use: | ABN - Sealed | | |
| Use year: | Not Reported | | |
| Init head: | 0.4 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 12/3/1990 | Test gpm: | 500 |

| | | | |
|---|---|---|---|
| Test ddown: | 5.3 | Test chlor: | 630 |
| Test temp: | 24.4 | Test unit: | C |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | -25 |
| Bot solid: | -3 | Bot perf: | -25 |
| Spec capac: | 94 | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-075:039 |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 01-DEC-90 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000870 |

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**C7**
**WNW**
**1/2 - 1 Mile**
**Lower**

**FED USGS** **USGS40000269827**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211937158053006 | | |
| Monloc name: | 3-1905-06 EWA DESALT PLANT | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3237869 |
| Longitude: | -158.088922 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | Not Reported |
| Vert measure units: | Not Reported | Vertacc measure val: | Not Reported |
| Vert accmeasure units: | Not Reported | | |
| Vertcollection method: | Not Reported | | |
| Vert coord refsys: | Not Reported | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19901105 | Welldepth: | 72 |
| Welldepth units: | ft | Wellholedepth: | 73 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 1

| Date | Feet below Surface | Feet to Sealevel |
|---|---|---|
| 1990-11-05 | 46 | |

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**C8**
**WNW**
**1/2 - 1 Mile**
**Higher**

**HI WELLS** **HI9000000000871**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-007 | Island: | Oahu |
| Well name: | Caprock 2 | Old name: | Not Reported |
| Yr drilled: | 1991 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.088889 | | |
| Lat83dd: | 21.324167 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Board of Water Supply, BWS | | |
| Land owner: | Board of Water Supply, BWS | | |
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | 49 |
| Well depth: | 78 | | |
| Solid case: | 48 | Perf case: | 78 |
| Use: | UNU - Unused | | |
| Use year: | Not Reported | | |
| Init head: | 0.5 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 2/19/1991 | Test gpm: | 625 |
| Test ddown: | 1.1 | Test chlor: | 690 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | -29 |
| Bot solid: | -1 | Bot perf: | -29 |
| Spec capac: | 568 | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-075:039 |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 01-FEB-91 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000871 |

**C9**
**WNW**
**1/2 - 1 Mile**
**Higher**

**FED USGS** **USGS40000269829**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211938158053007 | | |
| Monloc name: | 3-1905-07 EWA DESALT PLANT | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3240646 |
| Longitude: | -158.088922 | Sourcemap scale: | 24000 |

| | | | |
|---|---|---|---|
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 49 |
| Vert measure units: | feet | Vertacc measure val: | 5 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19910119 | Welldepth: | 78 |
| Welldepth units: | ft | Wellholedepth: | 78 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 1

| Date | Feet below Surface | Feet to Sealevel |
|---|---|---|
| 1991-01-19 | 48.5 | |

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**C10**
**WNW**
**1/2 - 1 Mile**
**Higher**

**HI WELLS** **HI9000000000873**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-009 | Island: | Oahu |
| Well name: | Caprock 3 | Old name: | Not Reported |
| Yr drilled: | 1992 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.088889 | | |
| Lat83dd: | 21.324722 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Land Division Oahu, DLNR-LD | | |
| Land owner: | Not Reported | | |
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | 54 |
| Well depth: | 80 | | |
| Solid case: | 60 | Perf case: | 80 |
| Use: | UNU - Unused | | |
| Use year: | Not Reported | | |
| Init head: | 2.25 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 10/5/1992 | Test gpm: | 600 |
| Test ddown: | 5.6 | Test chlor: | 900 |
| Test temp: | 24.5 | Test unit: | C |
| Pump gpm: | 780 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 1992 | | |
| Draft yr: | Not Reported | Bot hole: | -26 |
| Bot solid: | -6 | Bot perf: | -26 |
| Spec capac: | 107 | | |

| | | | |
|---|---|---|---|
| Pump mgd: | 1.123 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | Not Reported |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 01-SEP-92 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000873 |

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**D11**
**WNW**
**1/2 - 1 Mile**
**Higher**

**HI WELLS** **HI9000000000868**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-004 | Island: | Oahu |
| Well name: | Ewa Desalt Basal | Old name: | Not Reported |
| Yr drilled: | 1988 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.089417 | | |
| Lat83dd: | 21.325861 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Engineering Division, DLNR | | |
| Land owner: | Board of Water Supply, BWS | | |
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | Not Reported |
| Well depth: | 380 | | |
| Solid case: | 275 | Perf case: | Not Reported |
| Use: | UNU - Unused | | |
| Use year: | Not Reported | | |
| Init head: | Not Reported | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 1/19/1988 | Test gpm: | 500 |
| Test ddown: | 1 | Test chlor: | 510 |
| Test temp: | 23.3 | Test unit: | C |
| Pump gpm: | 780 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | TWB | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | Not Reported |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | 500 | | |
| Pump mgd: | 1.123 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-075:053 |
| Aqui code: | 30204 | | |
| Latest hd: | Not Reported | Wcr: | 01-FEB-88 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000868 |

| Map ID<br>Direction<br>Distance<br>Elevation | | | Database | EDR ID Number |
|---|---|---|---|---|
| **D12**<br>**WNW**<br>**1/2 - 1 Mile**<br>**Higher** | | | **HI WELLS** | **HI9000000000869** |

| | | | |
|---|---|---|---|
| Wid: | 3-1905-005 | Island: | Oahu |
| Well name: | Caprock 1 | Old name: | Not Reported |
| Yr drilled: | 1988 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.089556 | | |
| Lat83dd: | 21.325917 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Engineering Division, DLNR | | |
| Land owner: | Board of Water Supply, BWS | | |
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 14 | Ground el: | Not Reported |
| Well depth: | 80 | | |
| Solid case: | 52 | Perf case: | 80 |
| Use: | UNU - Unused | | |
| Use year: | Not Reported | | |
| Init head: | Not Reported | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 2/17/1988 | Test gpm: | 100 |
| Test ddown: | 15.1 | Test chlor: | 970 |
| Test temp: | 24.4 | Test unit: | C |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | Not Reported |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | 7 | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-075:053 |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 01-FEB-88 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000869 |

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| | | | | |
|---|---|---|---|---|
| **E13**<br>**NE**<br>**1/2 - 1 Mile**<br>**Higher** | | | **HI WELLS** | **HI9000000000864** |

| | | | |
|---|---|---|---|
| Wid: | 3-1904-002 | Island: | Oahu |
| Well name: | Makakilo G C 1 | Old name: | Not Reported |
| Yr drilled: | 1991 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.071944 | | |
| Lat83dd: | 21.328056 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Puu Makakilo Inc. | | |
| Land owner: | Not Reported | | |

| | | | |
|---|---|---|---|
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | Not Reported |
| Well depth: | 77 | | |
| Solid case: | 57 | Perf case: | 77 |
| Use: | ABN - Sealed | | |
| Use year: | Not Reported | | |
| Init head: | Not Reported | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 11/22/1991 | Test gpm: | 450 |
| Test ddown: | 4.5 | Test chlor: | 860 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | Not Reported |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | 100 | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-016:001 |
| Aqui code: | 30208 | | |
| Latest hd: | Not Reported | Wcr: | 25-NOV-91 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000864 |

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**E14**
**NE**
**1/2 - 1 Mile**
**Higher**

**HI WELLS** **HI9000000000865**

| | | | |
|---|---|---|---|
| Wid: | 3-1904-003 | Island: | Oahu |
| Well name: | Makakilo G C 2 | Old name: | Not Reported |
| Yr drilled: | 1992 | | |
| Driller: | Roscoe Moss Hawaii Inc | | |
| Quad map: | 6 | | |
| Long83dd: | -158.071944 | | |
| Lat83dd: | 21.328056 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | Puu Makakilo Inc. | | |
| Land owner: | Not Reported | | |
| Pump insta: | Not Reported | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 12 | Ground el: | Not Reported |
| Well depth: | 70 | | |
| Solid case: | 50 | Perf case: | 70 |
| Use: | ABN - Sealed | | |
| Use year: | Not Reported | | |
| Init head: | Not Reported | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 0 | | |
| Test date: | 1/7/1992 | Test gpm: | 425 |

| | | | |
|---|---|---|---|
| Test ddown: | 3.5 | Test chlor: | 910 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | Not Reported |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | 121 | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-016:001 |
| Aqui code: | 30208 | | |
| Latest hd: | Not Reported | Wcr: | 10-JAN-92 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000865 |

---

**D15**
**WNW**
**1/2 - 1 Mile**
**Higher**

**FED USGS** **USGS40000269841**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211945158053401 | | |
| Monloc name: | 3-1905-04 EWA DESALT PLANT | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3260087 |
| Longitude: | -158.090033 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 60. |
| Vert measure units: | feet | Vertacc measure val: | 5 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 198712 | Welldepth: | 380 |
| Welldepth units: | ft | Wellholedepth: | 380 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 0

---

**E16**
**NE**
**1/2 - 1 Mile**
**Higher**

**FED USGS** **USGS40000269873**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211953158042801 | | |
| Monloc name: | 3-1904-02 MAKAKILO | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3282319 |
| Longitude: | -158.0717003 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 30. |
| Vert measure units: | feet | Vertacc measure val: | .5 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Level or other surveying method | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19891026 | Welldepth: | 80 |
| Welldepth units: | ft | Wellholedepth: | 80 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 1

| Date | Feet below Surface | Feet to Sealevel |
|---|---|---|
| 1989-10-26 | 50. | |

**F17**
**ENE**
**1/2 - 1 Mile**
**Lower**

**HI WELLS** **HI9000000000863**

| | | | |
|---|---|---|---|
| Wid: | 3-1904-001 | Island: | Oahu |
| Well name: | EP 31&32 | Old name: | Kekona’s Pit |
| Yr drilled: | 1965 | | |
| Driller: | Royal Contracting | | |
| Quad map: | 6 | | |
| Long83dd: | -158.070068 | | |
| Lat83dd: | 21.325618 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | D.R. Horton - Schuler Homes LLC | | |
| Land owner: | D.R. Horton - Schuler Homes LLC | | |
| Pump insta: | Not Reported | | |
| Old number: | DW42- | Well type: | DUG |
| Casing dia: | Not Reported | Ground el: | 5 |
| Well depth: | 8 | | |
| Solid case: | Not Reported | Perf case: | Not Reported |
| Use: | ABN - Sealed | | |
| Use year: | Not Reported | | |
| Init head: | 2.2 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 405 | | |
| Test date: | Not Reported | Test gpm: | 790 |

| | | | |
|---|---|---|---|
| Test ddown: | 2.1 | Test chlor: | 415 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | -3 |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | 376 | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-016:124 |
| Aqui code: | 30208 | | |
| Latest hd: | Not Reported | Wcr: | 01-JAN-65 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000863 |

**D18**
**WNW**
**1/2 - 1 Mile**
**Higher**

**FED USGS** **USGS40000269842**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211945158053501 | | |
| Monloc name: | 3-1905-05 EWA DESALT PLANT | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3260087 |
| Longitude: | -158.0903108 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 60. |
| Vert measure units: | feet | Vertacc measure val: | 5 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 198712 | Welldepth: | 79 |
| Welldepth units: | ft | Wellholedepth: | 79 |
| Wellholedepth units: | ft | | |

Ground-water levels, Number of Measurements: 0

**F19**
**ENE**
**1/2 - 1 Mile**
**Lower**

**FED USGS** **USGS40000269840**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211945158042201 | | |
| Monloc name: | 3-1904-01 D 42 BRB P | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.32601 |
| Longitude: | -158.0700338 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 5.00 |
| Vert measure units: | feet | Vertacc measure val: | 2 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19650101 | Welldepth: | 8 |
| Welldepth units: | ft | Wellholedepth: | Not Reported |
| Wellholedepth units: | Not Reported | | |

Ground-water levels, Number of Measurements: 0

**G20**
**SW**
**1/2 - 1 Mile**
**Lower**

**HI WELLS** **HI9000000000635**

| | | | |
|---|---|---|---|
| Wid: | 3-1805-001 | Island: | Oahu |
| Well name: | Barbers Point | Old name: | Not Reported |
| Yr drilled: | 1957 | | |
| Driller: | Samson/Smock | | |
| Quad map: | 6 | | |
| Long83dd: | -158.088056 | | |
| Lat83dd: | 21.313333 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | ABP KOMOHANA LLC | | |
| Land owner: | ABP KOMOHANA LLC | | |
| Pump insta: | Not Reported | | |
| Old number: | T81- | Well type: | Not Reported |
| Casing dia: | 7 | Ground el: | 22 |
| Well depth: | 50 | | |
| Solid case: | 2 | Perf case: | Not Reported |
| Use: | UNU - Unused | | |
| Use year: | Not Reported | | |
| Init head: | 1.1 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 932 | | |
| Test date: | Not Reported | Test gpm: | 375 |
| Test ddown: | 1 | Test chlor: | 958 |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | QLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | -28 |
| Bot solid: | 20 | Bot perf: | Not Reported |
| Spec capac: | 375 | | |

| | | | |
|---|---|---|---|
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | (1) 9-1-032:001 |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 01-JAN-57 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000635 |

---

**G21**
**SW**
**1/2 - 1 Mile**
**Lower**

**FED USGS** **USGS40000269750**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211859158052701 | | |
| Monloc name: | 3-1805-01 T81 BAR PT | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3132311 |
| Longitude: | -158.0880889 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 22.00 |
| Vert measure units: | feet | Vertacc measure val: | 5 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |
| Aquifer type: | Not Reported | | |
| Construction date: | 19571105 | Welldepth: | 50 |
| Welldepth units: | ft | Wellholedepth: | Not Reported |
| Wellholedepth units: | Not Reported | | |

Ground-water levels, Number of Measurements: 0

---

**G22**
**SW**
**1/2 - 1 Mile**
**Lower**

**HI WELLS** **HI9000000000650**

| | | | |
|---|---|---|---|
| Wid: | 3-1805-016 | Island: | Oahu |
| Well name: | VIP Sanitation | Old name: | Not Reported |
| Yr drilled: | 2006 | | |
| Driller: | Tracy Runnells (Tracy Runnells Well Service Inc.) | | |
| Quad map: | 6 | | |
| Long83dd: | -158.089194 | | |
| Lat83dd: | 21.313667 | | |
| Gps: | -1 | Utm: | 0 |
| Owner user: | Bert Ito (VIP Sanitation, Inc.) | | |
| Land owner: | Department of Hawaiian Home Lands, Oahu (Main), DHHL | | |

| | | | |
|---|---|---|---|
| Pump insta: | Tracy Runnells (Tracy Runnells Well Service Inc.) | | |
| Old number: | Not Reported | Well type: | PER |
| Casing dia: | 10 | Ground el: | Not Reported |
| Well depth: | 25 | | |
| Solid case: | 18 | Perf case: | 25 |
| Use: | IND - Industrial Other | | |
| Use year: | Not Reported | | |
| Init head: | Not Reported | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 194 | | |
| Test date: | Not Reported | Test gpm: | Not Reported |
| Test ddown: | Not Reported | Test chlor: | Not Reported |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 15 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | QLS | | |
| Pump yr: | 2008 | | |
| Draft yr: | Not Reported | Bot hole: | Not Reported |
| Bot solid: | Not Reported | Bot perf: | Not Reported |
| Spec capac: | Not Reported | | |
| Pump mgd: | .021 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | 23 | Tmk: | (1) 9-1-013:009 |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 30-DEC-99 |
| Pir: | 5/30/2008 | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000650 |

---

**H23**
**WNW**
**1/2 - 1 Mile**
**Higher**

**FED USGS** **USGS40000269839**

| | | | |
|---|---|---|---|
| Org. Identifier: | USGS-HI | | |
| Formal name: | USGS Hawaii Water Science Center | | |
| Monloc Identifier: | USGS-211944158054501 | | |
| Monloc name: | 3-1905-02 T84 BRB PT | | |
| Monloc type: | Well | | |
| Monloc desc: | Not Reported | | |
| Huc code: | 20060000 | Drainagearea value: | Not Reported |
| Drainagearea Units: | Not Reported | Contrib drainagearea: | Not Reported |
| Contrib drainagearea units: | Not Reported | Latitude: | 21.3257307 |
| Longitude: | -158.0930885 | Sourcemap scale: | 24000 |
| Horiz Acc measure: | 1 | Horiz Acc measure units: | seconds |
| Horiz Collection method: | Interpolated from map | | |
| Horiz coord refsys: | NAD83 | Vert measure val: | 62.00 |
| Vert measure units: | feet | Vertacc measure val: | 5 |
| Vert accmeasure units: | feet | | |
| Vertcollection method: | Interpolated from topographic map | | |
| Vert coord refsys: | HILOCAL | Countrycode: | US |
| Aquifername: | Not Reported | | |
| Formation type: | Not Reported | | |

| | | | |
|---|---|---|---|
| Aquifer type: | Not Reported | | |
| Construction date: | 19571125 | Welldepth: | 90 |
| Welldepth units: | ft | Wellholedepth: | Not Reported |
| Wellholedepth units: | Not Reported | | |

Ground-water levels, Number of Measurements: 0

---

**H24**
**WNW**
**1/2 - 1 Mile**
**Higher**

**HI WELLS** **HI9000000000866**

| | | | |
|---|---|---|---|
| Wid: | 3-1905-002 | Island: | Oahu |
| Well name: | Campbell Ind Pk | Old name: | Not Reported |
| Yr drilled: | 1957 | | |
| Driller: | Samson/Smock | | |
| Quad map: | 6 | | |
| Long83dd: | -158.093056 | | |
| Lat83dd: | 21.325833 | | |
| Gps: | 0 | Utm: | -1 |
| Owner user: | James Campbell Company LLC | | |
| Land owner: | Not Reported | | |
| Pump insta: | Not Reported | | |
| Old number: | T84- | Well type: | Not Reported |
| Casing dia: | 10 | Ground el: | 62 |
| Well depth: | 90 | | |
| Solid case: | 3 | Perf case: | Not Reported |
| Use: | Other | | |
| Use year: | Not Reported | | |
| Init head: | 2.1 | Init head2: | Not Reported |
| Init head3: | Not Reported | | |
| Init cl: | 795 | | |
| Test date: | Not Reported | Test gpm: | Not Reported |
| Test ddown: | Not Reported | Test chlor: | Not Reported |
| Test temp: | Not Reported | Test unit: | Not Reported |
| Pump gpm: | 0 | | |
| Draft mgy: | Not Reported | Head feet: | Not Reported |
| Max chlor: | Not Reported | Min chlor: | Not Reported |
| Geology: | PLS | | |
| Pump yr: | 0 | | |
| Draft yr: | Not Reported | Bot hole: | -28 |
| Bot solid: | 59 | Bot perf: | Not Reported |
| Spec capac: | Not Reported | | |
| Pump mgd: | 0 | | |
| Draft mgd: | Not Reported | Pump elev: | Not Reported |
| Pump depth: | Not Reported | Tmk: | Not Reported |
| Aqui code: | 30207 | | |
| Latest hd: | Not Reported | Wcr: | 01-JAN-57 |
| Pir: | Not Reported | | |
| Surveyor: | Not Reported | | |
| T: | Not Reported | Site id: | HI9000000000866 |

**AREA RADON INFORMATION**

Federal EPA Radon Zone for HONOLULU County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

---

Federal Area Radon Information for Zip Code: 96707

Number of sites tested: 7

| Area | Average Activity | % <4 pCi/L | % 4-20 pCi/L | % >20 pCi/L |
|---|---|---|---|---|
| Living Area - 1st Floor | 0.143 pCi/L | 100% | 0% | 0% |
| Living Area - 2nd Floor | Not Reported | Not Reported | Not Reported | Not Reported |
| Basement | Not Reported | Not Reported | Not Reported | Not Reported |

# PHYSICAL SETTING SOURCE RECORDS SEARCHED

**TOPOGRAPHIC INFORMATION**

USGS 7.5’ Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5’ Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

**HYDROLOGIC INFORMATION**

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Office of Planning
Telephone: 808-587-2895

**HYDROGEOLOGIC INFORMATION**

AQUIFLOW$^R$ Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

**GEOLOGIC INFORMATION**

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture’s (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

# PHYSICAL SETTING SOURCE RECORDS SEARCHED

**LOCAL / REGIONAL WATER AGENCY RECORDS**

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Well Index Database
Source: Commission on Water Resource Management
Telephone: 808-587-0214
CWRM maintains a Well Index Database to track specific information pertaining to the construction and installation of production wells in Hawaii

**OTHER STATE DATABASE INFORMATION**

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR’s Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

# PHYSICAL SETTING SOURCE RECORDS SEARCHED

**STREET AND ADDRESS INFORMATION**

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**DLA DISPOSITION SERVICES**
BLDG. 140 MIDWAY STREET (KALAELOA)
KAPOLEI, HI 96707

Inquiry Number:
December 4, 2017

# EDR Site Report™

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Shelton, CT 06484
Toll Free: 800.352.0050
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# TABLE OF CONTENTS

The EDR-Site Report™ is a comprehensive presentation of government filings on a facility identified in a search of federal, state and local environmental databases. The report is divided into three sections:



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# SECTION 1: FACILITY SUMMARY

| FACILITY<br><br>AREA | FACILITY 1<br>**DLA DISPOSITION SERVICES**<br>BLDG. 140 MIDWAY STREET (KALAELOA)<br>KAPOLEI, HI 96707<br>EDR ID #1001112113<br>EPA #HIR000000851 |
|---|---|
| **WASTE MANAGEMENT**<br>Facility generates hazardous waste (RCRA) | **YES - p4** |
| Facility treats, stores, or disposes of hazardous waste on-site (RCRA/TSDF) | NO |
| Facility has received Notices of Violations (RCRA/VIOL) | **YES - p8** |
| Facility has been subject to RCRA administrative actions (RAATS) | NO |
| Facility has been subject to corrective actions (CORRACTS) | NO |
| Facility handles PCBs (PADS) | NO |
| Facility uses radioactive materials (MLTS) | NO |
| Facility is a FUSRAP Site | NO |
| Facility is a UXO Site | NO |
| Facility is a FUELS Site | NO |
| Facility is an DockHWC/ECHO Site | NO |
| Facility manages registered aboveground storage tanks (AST) | NO |
| Facility manages registered underground storage tanks (UST) | NO |
| Facility has reported leaking underground storage tank incidents (LUST) | NO |
| Facility has reported emergency releases to the soil (ERNS) | NO |
| Facility has reported hazardous material incidents to DOT (HMIRS) | NO |
| **WASTE DISPOSAL**<br>Facility is a Superfund Site (NPL) | NO |
| Facility has a known or suspect abandoned, inactive or uncontrolled hazardous waste site (SEMS) | **YES - p9 (ARCHIVE)** |
| Facility has a reported Superfund Lien on it (LIENS) | NO |
| Facility is listed as a state hazardous waste site (SHWS) | NO |
| Facility has disposed of solid waste on-site (SWF/LF) | NO |
| **MULTIMEDIA**<br>Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313 (TRIS) | NO |
| Facility produces pesticides and has notified EPA under Section 7 of FIFRA (SSTS) | NO |
| Facility manufactures or imports toxic chemicals on the TSCA list (TSCA) | NO |
| Facility has inspections under FIFRA, TSCA or EPCRA (FTTS) | NO |
| Facility is listed in EPA's index system (FINDS) | NO |
| Facility is listed in other database records (OTHER) | NO |
| **POTENTIAL SUPERFUND LIABILITY**<br>Facility has a list of potentially responsible parties PRP | NO |
| **TOTAL (YES)** | 3 |

# SECTION 2: FACILITY DETAIL REPORTS

## WASTE MANAGEMENT

### Facility generates hazardous waste

### DATABASE: Resource Conservation and Recovery Information (RCRAInfo)

DLA DISPOSITION SERVICES
BLDG. 140 MIDWAY STREET (KALAELOA)
KAPOLEI, HI 96707
EDR ID #1001112113

RCRA NonGen / NLR:

| | |
|---|---|
| Date form received by agency: | 02/08/2016 |
| Facility name: | DRMO KALAELOA |
| Facility address: | MIDWAY STREET<br>KAPOLEI, HI 96707 |
| EPA ID: | HIR000000851 |
| Mailing address: | 1025 QUINCY AVE SUITE 2000<br>JOINT BASE PEARL HARBOR H, HI 96860 |
| Contact: | KIRK BUCKNER |
| Contact address: | 1025 QUINCY AVE SUITE 2000<br>JOINT BASE PEARL HARBOR H, HI 96860 |
| Contact country: | US |
| Contact telephone: | 808-473-9535 |
| Contact email: | KIRK.BUCKNER@DLA.MIL |
| EPA Region: | 09 |
| Land type: | Federal |
| Classification: | Non-Generator |
| Description: | Handler: Non-Generators do not presently generate hazardous waste |

Owner/Operator Summary:

| | |
|---|---|
| Owner/operator name: | DRMO KALAELOA |
| Owner/operator address: | P.O. BOX 75298<br>KAPOLEI, HI 96707 |
| Owner/operator country: | US |
| Owner/operator telephone: | Not reported |
| Owner/operator email: | Not reported |
| Owner/operator fax: | Not reported |
| Owner/operator extension: | Not reported |
| Legal status: | Federal |
| Owner/Operator Type: | Operator |
| Owner/Op start date: | 07/02/1999 |
| Owner/Op end date: | Not reported |

| | |
|---|---|
| Owner/operator name: | NAVY REGION HAWAII |
| Owner/operator address: | 400 MARSHALL ROAD<br>PEARL HARBOR, HI 96860 |
| Owner/operator country: | US |
| Owner/operator telephone: | Not reported |
| Owner/operator email: | Not reported |
| Owner/operator fax: | Not reported |
| Owner/operator extension: | Not reported |
| Legal status: | Federal |
| Owner/Operator Type: | Owner |
| Owner/Op start date: | 07/02/1999 |
| Owner/Op end date: | Not reported |

| | |
|---|---|
| Owner/operator name: | NAVY REGION HAWAII |
| Owner/operator address: | COMMANDER NAVY REGION HAWAII 850 TICONDEROGA STREET, SUITE<br>PEARL HARBOR ( ENV. DEPT), HI 96860 |
| Owner/operator country: | US |
| Owner/operator telephone: | 808-471-1171 |
| Owner/operator email: | Not reported |
| Owner/operator fax: | Not reported |
| Owner/operator extension: | Not reported |
| Legal status: | Federal |
| Owner/Operator Type: | Owner |
| Owner/Op start date: | 07/02/1999 |
| Owner/Op end date: | Not reported |

| | |
|---|---|
| Owner/operator name: | DRMO KALAELOA |
| Owner/operator address: | Not reported<br>Not reported |
| Owner/operator country: | US |
| Owner/operator telephone: | Not reported |
| Owner/operator email: | Not reported |
| Owner/operator fax: | Not reported |
| Owner/operator extension: | Not reported |
| Legal status: | Federal |
| Owner/Operator Type: | Operator |

Owner/Op start date: 07/02/1999
Owner/Op end date: Not reported

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 03/29/2010
Site name: DRMO KALAELOA
Classification: Large Quantity Generator

. Waste code: D005
. Waste name: BARIUM

. Waste code: D008
. Waste name: LEAD

Date form received by agency: 12/18/2007
Site name: US NAVY DRMO HAWAII KALAELOA
Classification: Large Quantity Generator

. Waste code: D005
. Waste name: BARIUM

Date form received by agency: 02/22/2002
Site name: USNAVY DRMO HAWAII KALAELOA
Classification: Large Quantity Generator

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: D002
. Waste name: CORROSIVE WASTE

. Waste code: D003
. Waste name: REACTIVE WASTE

. Waste code: D005
. Waste name: BARIUM

. Waste code: D007
. Waste name: CHROMIUM

. Waste code: D008
. Waste name: LEAD

. Waste code: D009
. Waste name: MERCURY

. Waste code: D018
. Waste name: BENZENE

. Waste code: D021
. Waste name: CHLOROBENZENE

. Waste code: D023
. Waste name: O-CRESOL

. Waste code: D035
. Waste name: METHYL ETHYL KETONE

. Waste code: D039
. Waste name: TETRACHLOROETHYLENE

. Waste code: D040
. Waste name: TRICHLORETHYLENE

. Waste code: U151
. Waste name: MERCURY

Date form received by agency: 05/15/1996
Site name: USNAVY DRMO HAWAII
Classification: Large Quantity Generator

Facility Has Received Notices of Violations:
Regulation violated: FR - 262.30-34.C
Area of violation: Generators - General
Date violation determined: 12/27/1996
Date achieved compliance: 01/24/1997
Violation lead agency: EPA
Enforcement action: Not reported
Enforcement action date: 12/27/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: EPA
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Regulation violated: FR - 262.20-23.B
Area of violation: Generators - General
Date violation determined: 12/27/1996
Date achieved compliance: 01/24/1997
Violation lead agency: EPA
Enforcement action: Not reported
Enforcement action date: 12/27/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: EPA
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Regulation violated: FR - 268.7
Area of violation: LDR - General
Date violation determined: 12/27/1996
Date achieved compliance: 01/24/1997
Violation lead agency: EPA
Enforcement action: Not reported
Enforcement action date: 12/27/1996
Enf. disposition status: Not reported
Enf. disp. status date: Not reported
Enforcement lead agency: EPA
Proposed penalty amount: Not reported
Final penalty amount: Not reported
Paid penalty amount: Not reported

Evaluation Action Summary:
Evaluation date: 09/16/2015
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 12/15/2010
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 11/06/2003
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 10/05/1998
Evaluation: COMPLIANCE EVALUATION INSPECTION ON-SITE
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: State

Evaluation date: 01/24/1997
Evaluation: NOT A SIGNIFICANT NON-COMPLIER
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: EPA

Evaluation date: 12/27/1996
Evaluation: SIGNIFICANT NON-COMPLIER
Area of violation: Not reported
Date achieved compliance: Not reported
Evaluation lead agency: EPA

| | |
|---|---|
| Evaluation date: | 10/24/1996 |
| Evaluation: | COMPLIANCE EVALUATION INSPECTION ON-SITE |
| Area of violation: | LDR - General |
| Date achieved compliance: | 01/24/1997 |
| Evaluation lead agency: | EPA |

| | |
|---|---|
| Evaluation date: | 10/24/1996 |
| Evaluation: | COMPLIANCE EVALUATION INSPECTION ON-SITE |
| Area of violation: | Generators - General |
| Date achieved compliance: | 01/24/1997 |
| Evaluation lead agency: | EPA |

## SECTION 2: FACILITY DETAIL REPORTS

...Continued...

### WASTE MANAGEMENT

### Facility Has Received Notices of Violations

### DATABASE: Resource Conservation and Recovery Information (RCRAInfo)

DLA DISPOSITION SERVICES
BLDG. 140 MIDWAY STREET (KALAELOA)
KAPOLEI, HI 96707
EDR ID #1001112113

| | |
|---|---|
| Regulation Violated: | FR - 262.30-34.C |
| Area of Violation: | Generators - General |
| Date Violation Determined: | 12/27/1996 |
| Actual Date Achieved Compliance: | 01/24/1997 |
| Enforcement Action: | Not reported |
| Enforcement Action Date: | 12/27/1996 |
| Regulation Violated: | FR - 262.20-23.B |
| Area of Violation: | Generators - General |
| Date Violation Determined: | 12/27/1996 |
| Actual Date Achieved Compliance: | 01/24/1997 |
| Enforcement Action: | Not reported |
| Enforcement Action Date: | 12/27/1996 |
| Regulation Violated: | FR - 268.7 |
| Area of Violation: | LDR - General |
| Date Violation Determined: | 12/27/1996 |
| Actual Date Achieved Compliance: | 01/24/1997 |
| Enforcement Action: | Not reported |
| Enforcement Action Date: | 12/27/1996 |

## WASTE DISPOSAL

### DATABASE: Superfund Enterprise Management System Archive (SEMS-ARCHIVE)

DLA DISPOSITION SERVICES
BLDG. 140 MIDWAY STREET (KALAELOA)
KAPOLEI, HI 96707
EDR ID #1001112113

SEMS-ARCHIVE:

| | |
|---|---|
| Site ID: | 900294 |
| EPA ID: | HIR000000851 |
| Federal Facility: | Y |
| NPL: | Not on the NPL |
| Non NPL Status: | NFRAP-Site does not qualify for the NPL based on existing information |

# SECTION 3: DATABASES AND UPDATE DATES

To maintain currency of the following federal, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

**Elapsed ASTM days:** Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

## DATABASES FOUND IN THIS REPORT

**SEMS-ARCHIVE: Superfund Enterprise Management System Archive**
Source: EPA
Telephone: 800-424-9346

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 07/11/2017
Database Release Frequency: Quarterly
Date of Last EDR Contact: 11/03/2017
Date of Next Scheduled Update: 01/29/2018

**RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated**
Source: Environmental Protection Agency
Telephone: 703-308-8895

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 09/13/2017
Database Release Frequency: Quarterly
Date of Last EDR Contact: 09/26/2017
Date of Next Scheduled Update: 01/08/2018

**BARBER'S POINT ELEMENTARY SCHOOL**
3001 BOXER ROAD
KAPOLEI, HI 96707

Inquiry Number:
December 4, 2017

# EDR Site Report™

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Shelton, CT 06484
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# TABLE OF CONTENTS

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# SECTION 1: FACILITY SUMMARY

| FACILITY<br><br>AREA | **FACILITY 1**<br>**BARBER'S POINT ELEMENTARY SCHOOL**<br>3001 BOXER ROAD<br>KAPOLEI, HI 96707<br>EDR ID #1009737248<br>EPA #110026427356 |
|---|---|
| **WASTE MANAGEMENT**<br>Facility generates hazardous waste (RCRA) | NO |
| Facility treats, stores, or disposes of hazardous waste on-site (RCRA/TSDF) | NO |
| Facility has received Notices of Violations (RCRA/VIOL) | NO |
| Facility has been subject to RCRA administrative actions (RAATS) | NO |
| Facility has been subject to corrective actions (CORRACTS) | NO |
| Facility handles PCBs (PADS) | NO |
| Facility uses radioactive materials (MLTS) | NO |
| Facility is a FUSRAP Site | NO |
| Facility is a UXO Site | NO |
| Facility is a FUELS Site | NO |
| Facility is an DockHWC/ECHO Site | NO |
| Facility manages registered aboveground storage tanks (AST) | NO |
| Facility manages registered underground storage tanks (UST) | NO |
| Facility has reported leaking underground storage tank incidents (LUST) | NO |
| Facility has reported emergency releases to the soil (ERNS) | NO |
| Facility has reported hazardous material incidents to DOT (HMIRS) | NO |
| **WASTE DISPOSAL**<br>Facility is a Superfund Site (NPL) | NO |
| Facility has a known or suspect abandoned, inactive or uncontrolled hazardous waste site (SEMS) | NO |
| Facility has a reported Superfund Lien on it (LIENS) | NO |
| Facility is listed as a state hazardous waste site (SHWS) | NO |
| Facility has disposed of solid waste on-site (SWF/LF) | NO |
| **MULTIMEDIA**<br>Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313 (TRIS) | NO |
| Facility produces pesticides and has notified EPA under Section 7 of FIFRA (SSTS) | NO |
| Facility manufactures or imports toxic chemicals on the TSCA list (TSCA) | NO |
| Facility has inspections under FIFRA, TSCA or EPCRA (FTTS) | NO |
| Facility is listed in EPA's index system (FINDS) | **YES - p4** |
| Facility is listed in other database records (OTHER) | NO |
| **POTENTIAL SUPERFUND LIABILITY**<br>Facility has a list of potentially responsible parties PRP | NO |
| **TOTAL (YES)** | 1 |

# SECTION 2: FACILITY DETAIL REPORTS

### MULTIMEDIA

### Facility is listed in EPA's index system

### DATABASE: Facility Index System (FINDS)

BARBER'S POINT ELEMENTARY SCHOOL
3001 BOXER ROAD
KAPOLEI, HI 96707
EDR ID #1009737248

This site is listed in the Federal FINDS database. The FINDS database may contain references to records from government databases included elsewhere in the report.
Please note: the FINDS database may also contain references to out of date records formerly associated with the site.

| | |
|---|---|
| Registry ID: | 110026427356 |
| Facility Name: | BARBER'S POINT ELEMENTARY SCHOOL |
| Facility Address: | 3001 BOXER ROAD<br>KAPOLEI, HI 96707 |
| Facility URL: | http://ofmpub.epa.gov/enviro/fii_query_detail.disp_program_facility?p_registry_id=110026427356 |
| FIPS: | Not reported |
| Fed Facility: | Not reported |
| Tribal Land: | Not reported |
| Tribal Name: | Not reported |
| Congressional District: | 02 |
| Hydrologic Unit Code: | 20060000 |
| EPA Region: | 09 |
| Site Type: | STATIONARY |
| Date Created: | 23-OCT-2006 22:22:28 |
| Date Updated: | 03-MAY-2015 09:49:10 |
| U.S-Mexico Border: | Not reported |
| Latitude: | 21.32128 |
| Longitude: | -158.08305 |
| Horizontal Collection: | ADDRESS MATCHING-HOUSE NUMBER |
| Horizontal Accuracy: | 50 |
| Reference Point: | ENTRANCE POINT OF A FACILITY OR STATION |
| Horizontal Datum: | NAD83 |
| Coordinates Source: | Not reported |

Environmental Interest/Information System

ICIS (Integrated Compliance Information System) is the Integrated Compliance Information System and provides a database that, when complete, will contain integrated Enforcement and Compliance information across most of EPA's programs. The vision for ICIS is to replace EPA's independent databases that contain Enforcement data with a single repository for that information. Currently, ICIS contains all Federal Administrative and Judicial enforcement actions. This information is maintained in ICIS by EPA in the Regional offices and it Headquarters. A future release of ICIS will replace the Permit Compliance System (PCS) which supports the NPDES and will integrate that information with Federal actions already in the system. ICIS also has the capability to track other activities occurring in the Region that support Compliance and Enforcement programs. These include; Incident Tracking, Compliance Assistance, and Compliance Monitoring.

| | |
|---|---|
| Program System ID: | 600033710 |
| Program Sys. Name: | ICIS |
| Env. Interest Type: | ENFORCEMENT/COMPLIANCE ACTIVITY |
| Env. Interest Start Dt.: | 05-SEP-2007 00:00:00 |
| Start Date Qualifier: | ACTUAL ACTIVITY DATE |
| Env. Interest End Dt.: | Not reported |
| End Date Qualifier: | Not reported |
| Data Source: | ICIS |
| Active Code: | Not reported |

Alternative Name: BARBER'S POINT ELEMENTARY SCHOOL

# SECTION 3: DATABASES AND UPDATE DATES

To maintain currency of the following federal, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

**Elapsed ASTM days:** Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

## DATABASES FOUND IN THIS REPORT

**FINDS: Facility Index System/Facility Registry System**
Source: EPA
Telephone: Not reported
Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 07/23/2017
Database Release Frequency: Quarterly
Date of Last EDR Contact: 09/06/2017
Date of Next Scheduled Update: 12/18/2017

**PUMP 15 STATION, FORMER OAHU SUG**
OLD FARRINGTON HWY
KAPOLEI, HI 96707

Inquiry Number:
December 4, 2017

# EDR Site Report™

6 Armstrong Road, 4th floor
Shelton, CT 06484
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# SECTION 1: FACILITY SUMMARY

| FACILITY<br><br>AREA | FACILITY 1<br>**PUMP 15 STATION, FORMER OAHU SUGAR COMPAI**<br>OLD FARRINGTON HWY<br>KAPOLEI, HI 96707<br>EDR ID #S106820144 |
|---|---|
| **WASTE MANAGEMENT**<br>Facility generates hazardous waste (RCRA) | NO |
| Facility treats, stores, or disposes of hazardous waste on-site (RCRA/TSDF) | NO |
| Facility has received Notices of Violations (RCRA/VIOL) | NO |
| Facility has been subject to RCRA administrative actions (RAATS) | NO |
| Facility has been subject to corrective actions (CORRACTS) | NO |
| Facility handles PCBs (PADS) | NO |
| Facility uses radioactive materials (MLTS) | NO |
| Facility is a FUSRAP Site | NO |
| Facility is a UXO Site | NO |
| Facility is a FUELS Site | NO |
| Facility is an DockHWC/ECHO Site | NO |
| Facility manages registered aboveground storage tanks (AST) | NO |
| Facility manages registered underground storage tanks (UST) | NO |
| Facility has reported leaking underground storage tank incidents (LUST) | NO |
| Facility has reported emergency releases to the soil (ERNS) | NO |
| Facility has reported hazardous material incidents to DOT (HMIRS) | NO |
| **WASTE DISPOSAL**<br>Facility is a Superfund Site (NPL) | NO |
| Facility has a known or suspect abandoned, inactive or uncontrolled hazardous waste site (SEMS) | NO |
| Facility has a reported Superfund Lien on it (LIENS) | NO |
| Facility is listed as a state hazardous waste site (SHWS) | **YES - p4** |
| Facility has disposed of solid waste on-site (SWF/LF) | NO |
| **MULTIMEDIA**<br>Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313 (TRIS) | NO |
| Facility produces pesticides and has notified EPA under Section 7 of FIFRA (SSTS) | NO |
| Facility manufactures or imports toxic chemicals on the TSCA list (TSCA) | NO |
| Facility has inspections under FIFRA, TSCA or EPCRA (FTTS) | NO |
| Facility is listed in EPA's index system (FINDS) | NO |
| Facility is listed in other database records (OTHER) | NO |
| **POTENTIAL SUPERFUND LIABILITY**<br>Facility has a list of potentially responsible parties PRP | NO |
| **TOTAL (YES)** | 1 |

# SECTION 2: FACILITY DETAIL REPORTS

## WASTE DISPOSAL

### Facility is listed as a state hazardous waste site

### DATABASE: State Hazardous Waste Sites (SHWS)

PUMP 15 STATION, FORMER OAHU SUGAR COMPANY
OLD FARRINGTON HWY
KAPOLEI, HI 96707
EDR ID #S106820144

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Pump 15 Station, Former Oahu Sugar Company |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | Not reported |
| Program: | State |
| Project Manager: | Unassigned |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | Hazard Undetermined |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Pump 15 Station, Former Oahu Sugar Company |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | Not reported |
| Potential Hazard And Controls: | Hazard Undetermined |
| Priority: | NFA |
| Assessment: | Assessment Ongoing |
| Response: | Not reported |
| Nature of Contamination: | Not reported |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | Undetermined |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No Further Action - Type Undetermined |
| Document Date: | 02/22/2001 |
| Document Number: | Not reported |
| Document Subject: | Not reported |
| Project Manager: | Unassigned |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

# SECTION 3: DATABASES AND UPDATE DATES

To maintain currency of the following federal, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

**Elapsed ASTM days:** Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

## DATABASES FOUND IN THIS REPORT

**HI HWS: Sites List**
Source: Department of Health
Telephone: 808-586-4249
Facilities, sites or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

Date of Government Version: 03/16/2017
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/22/2017
Date of Next Scheduled Update: 03/05/2018

**BARBERS POINT NAS STATION P**
MISSION ST
BARBERS POINT NAS, HI 96707

Inquiry Number:
December 4, 2017

# EDR Site Report™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# TABLE OF CONTENTS

The EDR-Site Report™ is a comprehensive presentation of government filings on a facility identified in a search of federal, state and local environmental databases. The report is divided into three sections:



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with any questions or comments.


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# SECTION 1: FACILITY SUMMARY

| FACILITY<br>AREA | FACILITY 1<br>**BARBERS POINT NAS STATION P**<br>MISSION ST<br>BARBERS POINT NAS, HI 96707<br>EDR ID #S111704672 |
|---|---|
| **WASTE MANAGEMENT**<br>Facility generates hazardous waste (RCRA) | NO |
| Facility treats, stores, or disposes of hazardous waste on-site (RCRA/TSDF) | NO |
| Facility has received Notices of Violations (RCRA/VIOL) | NO |
| Facility has been subject to RCRA administrative actions (RAATS) | NO |
| Facility has been subject to corrective actions (CORRACTS) | NO |
| Facility handles PCBs (PADS) | NO |
| Facility uses radioactive materials (MLTS) | NO |
| Facility is a FUSRAP Site | NO |
| Facility is a UXO Site | NO |
| Facility is a FUELS Site | NO |
| Facility is an DockHWC/ECHO Site | NO |
| Facility manages registered aboveground storage tanks (AST) | NO |
| Facility manages registered underground storage tanks (UST) | NO |
| Facility has reported leaking underground storage tank incidents (LUST) | NO |
| Facility has reported emergency releases to the soil (ERNS) | NO |
| Facility has reported hazardous material incidents to DOT (HMIRS) | NO |
| **WASTE DISPOSAL**<br>Facility is a Superfund Site (NPL) | NO |
| Facility has a known or suspect abandoned, inactive or uncontrolled hazardous waste site (SEMS) | NO |
| Facility has a reported Superfund Lien on it (LIENS) | NO |
| Facility is listed as a state hazardous waste site (SHWS) | **YES - p4** |
| Facility has disposed of solid waste on-site (SWF/LF) | NO |
| **MULTIMEDIA**<br>Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313 (TRIS) | NO |
| Facility produces pesticides and has notified EPA under Section 7 of FIFRA (SSTS) | NO |
| Facility manufactures or imports toxic chemicals on the TSCA list (TSCA) | NO |
| Facility has inspections under FIFRA, TSCA or EPCRA (FTTS) | NO |
| Facility is listed in EPA's index system (FINDS) | NO |
| Facility is listed in other database records (OTHER) | NO |
| **POTENTIAL SUPERFUND LIABILITY**<br>Facility has a list of potentially responsible parties PRP | NO |
| **TOTAL (YES)** | 1 |

# SECTION 2: FACILITY DETAIL REPORTS

## WASTE DISPOSAL

### Facility is listed as a state hazardous waste site

### DATABASE: State Hazardous Waste Sites (SHWS)

BARBERS POINT NAS STATION P
MISSION ST
BARBERS POINT NAS, HI 96707
EDR ID #S111704672

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Barbers Point NAS Station P |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Program: | Installation Restoration Program |
| Project Manager: | Eric Sadoyama |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | No Hazard |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Barbers Point NAS Station P |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | No Hazard |
| Priority: | NFA |
| Assessment: | Response Necessary |
| Response: | Response Complete |
| Nature of Contamination: | Found: PCB in soil |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | No Hazard Present For Unrestricted Residential Use |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Not reported |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No Further Action Letter - Unrestricted Residential Use |
| Document Date: | 11/19/2014 |
| Document Number: | 2014-577-ES |
| Document Subject: | No Further Action Determination for Barbers Point NAS Station P based on review of Final Removal Verification Report, Removal Action at Station P (Oct 2014) |
| Project Manager: | Eric Sadoyama |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

# SECTION 3: DATABASES AND UPDATE DATES

To maintain currency of the following federal, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

**Elapsed ASTM days:** Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

## DATABASES FOUND IN THIS REPORT

**HI HWS: Sites List**
Source: Department of Health
Telephone: 808-586-4249
Facilities, sites or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

Date of Government Version: 03/16/2017
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/22/2017
Date of Next Scheduled Update: 03/05/2018

**HAWAII ARMY NATIONAL GUARD AT KA**
MIDWAY STREET
KAPOLEI, HI

Inquiry Number:
December 4, 2017

# EDR Site Report™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# TABLE OF CONTENTS

The EDR-Site Report™ is a comprehensive presentation of government filings on a facility identified in a search of federal, state and local environmental databases. The report is divided into three sections:



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# SECTION 1: FACILITY SUMMARY

| FACILITY<br><br>AREA | FACILITY 1<br>**HAWAII ARMY NATIONAL GUARD AT KALAELOA AI**<br>MIDWAY STREET<br>KAPOLEI, HI<br>EDR ID #S118422808 |
|---|---|
| **WASTE MANAGEMENT**<br>Facility generates hazardous waste (RCRA) | NO |
| Facility treats, stores, or disposes of hazardous waste on-site (RCRA/TSDF) | NO |
| Facility has received Notices of Violations (RCRA/VIOL) | NO |
| Facility has been subject to RCRA administrative actions (RAATS) | NO |
| Facility has been subject to corrective actions (CORRACTS) | NO |
| Facility handles PCBs (PADS) | NO |
| Facility uses radioactive materials (MLTS) | NO |
| Facility is a FUSRAP Site | NO |
| Facility is a UXO Site | NO |
| Facility is a FUELS Site | NO |
| Facility is an DockHWC/ECHO Site | NO |
| Facility manages registered aboveground storage tanks (AST) | NO |
| Facility manages registered underground storage tanks (UST) | NO |
| Facility has reported leaking underground storage tank incidents (LUST) | NO |
| Facility has reported emergency releases to the soil (ERNS) | NO |
| Facility has reported hazardous material incidents to DOT (HMIRS) | NO |
| **WASTE DISPOSAL**<br>Facility is a Superfund Site (NPL) | NO |
| Facility has a known or suspect abandoned, inactive or uncontrolled hazardous waste site (SEMS) | NO |
| Facility has a reported Superfund Lien on it (LIENS) | NO |
| Facility is listed as a state hazardous waste site (SHWS) | **YES - p4** |
| Facility has disposed of solid waste on-site (SWF/LF) | NO |
| **MULTIMEDIA**<br>Facility uses toxic chemicals and has notified EPA under SARA Title III, Section 313 (TRIS) | NO |
| Facility produces pesticides and has notified EPA under Section 7 of FIFRA (SSTS) | NO |
| Facility manufactures or imports toxic chemicals on the TSCA list (TSCA) | NO |
| Facility has inspections under FIFRA, TSCA or EPCRA (FTTS) | NO |
| Facility is listed in EPA's index system (FINDS) | NO |
| Facility is listed in other database records (OTHER) | **YES - p5** |
| **POTENTIAL SUPERFUND LIABILITY**<br>Facility has a list of potentially responsible parties PRP | NO |
| **TOTAL (YES)** | 2 |

# SECTION 2: FACILITY DETAIL REPORTS

## WASTE DISPOSAL

### Facility is listed as a state hazardous waste site

### DATABASE: State Hazardous Waste Sites (SHWS)

HAWAII ARMY NATIONAL GUARD AT KALAELOA AIRPORT ABANDON PIPEL
MIDWAY STREET
KAPOLEI, HI
EDR ID #S118422808

SHWS:

| | |
|---|---|
| Organization: | Not reported |
| Supplemental Location: | Not reported |
| Island: | Oahu |
| Environmental Interest: | Hawaii Army National Guard at Kalaeloa Airport abandon pipeline incident |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Program: | State |
| Project Manager: | Jordan Nakayama |
| Hazard Priority: | NFA |
| Potential Hazards And Controls: | Hazard Managed With Controls |
| Island: | Oahu |
| SDAR Environmental Interest Name: | Hawaii Army National Guard at Kalaeloa Airport abandon pipeline incident |
| HID Number: | Not reported |
| Facility Registry Identifier: | Not reported |
| Lead Agency: | HEER |
| Potential Hazard And Controls: | Hazard Managed With Controls |
| Priority: | NFA |
| Assessment: | Response Necessary |
| Response: | Response Complete |
| Nature of Contamination: | Found: petroleum in soil from historic pieline |
| Nature of Residual Contamination: | Not reported |
| Use Restrictions: | Controls Required to Manage Contamination |
| Engineering Control: | Not reported |
| Description of Restrictions: | Not reported |
| Institutional Control: | Government - Hawaii Dept. of Health Letter Issued |
| Within Designated Areawide Contamination: | Not reported |
| Site Closure Type: | No Further Action Letter - Restricted Use |
| Document Date: | 08/26/2015 |
| Document Number: | 2015-513-JQN |
| Document Subject: | No Further Action determination for the above mentioned Site based on review of: Release Investigation Follow Up Reporting on Hawaii Army National Guard (HIARNG) Sewer Replacement Project, Kalaeloa, Oahu |
| Project Manager: | Jordan Nakayama |
| Contact Information: | (808) 586-4249 919 Ala Moana Blvd, Honolulu, HI 96814 |

### MULTIMEDIA

### Facility is listed in other database records

### DATABASE: Other Database Records (OTHER)

HAWAII ARMY NATIONAL GUARD AT KALAELOA AIRPORT ABANDON PIPEL
MIDWAY STREET
KAPOLEI, HI
EDR ID #S118422808

INST CONTROL:

| | |
|---|---|
| Potential hazards and controls: | Hazard Managed With Controls |
| Supplemental Location: | Not reported |
| Zip Suffix: | Not reported |
| Island: | Oahu |
| Institutional Control: | Government - Hawaii Dept. of Health Letter Issued |

# SECTION 3: DATABASES AND UPDATE DATES

To maintain currency of the following federal, state and local databases, EDR contacts the appropriate government agency on a monthly or quarterly basis as required.

**Elapsed ASTM days:** Provides confirmation that this report meets or exceeds the 90-day updating requirement of the ASTM standard.

## DATABASES FOUND IN THIS REPORT

**HI HWS: Sites List**
Source: Department of Health
Telephone: 808-586-4249
Facilities, sites or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

Date of Government Version: 03/16/2017
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/22/2017
Date of Next Scheduled Update: 03/05/2018

**HI INST CONTROL: Sites with Institutional Controls**
Source: Department of Health
Telephone: 808-586-4249
Voluntary Remediation Program and Brownfields sites with institutional controls in place.

Date of Government Version: 03/16/2017
Database Release Frequency: Varies
Date of Last EDR Contact: 11/22/2017
Date of Next Scheduled Update: 03/05/2018

# EDR Environmental Lien and AUL Search

**PARCELS 1, 2, AND 3**
FRANKLIN D ROOSEVELT AVE
KAPOLEI, HI 96707

Inquiry Number: 5070053.7S
OCTOBER 17, 2017

# EDR Environmental Lien and AUL Search

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# EDR Environmental Lien and AUL Search

The EDR Environmental Lien Search Report provides results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers, following established procedures, uses client supplied address information to:

- search for parcel information and/or legal description;
- search for ownership information;
- research official land title documents recorded at jurisdictional agencies such as recorders' offices, registries of deeds, county clerks' offices, etc.;
- access a copy of the deed;
- search for environmental encumbering instrument(s) associated with the deed;
- provide a copy of any environmental encumbrance(s) based upon a review of key words in the instrument(s) (title, parties involved, and description); and
- provide a copy of the deed or cite documents reviewed.

**Thank you for your business.**
Please contact EDR at 1-800-352-0050
with any questions or comments.

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# EDR Environmental Lien and AUL Search

## TARGET PROPERTY INFORMATION

## ADDRESS

PARCELS 1, 2, AND 3
FRANKLIN D ROOSEVELT AVE
KAPOLEI, HI 96707

## RESEARCH SOURCE

Source 1: HONOLULU COUNTY RECORDER OF DEEDS

Source 2: HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES

Source 3: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

## PROPERTY INFORMATION

**Deed 1**

| | |
|---|---|
| Type of Deed: | QUITCLAIM DEED |
| Title is vested in: | KALAELOA VENTURES LLC |
| Title received from: | HUNT COMMUNITIES HAWAII LLC |
| Date Executed: | 02/02/2017 |
| Date Recorded: | 02/07/2017 |
| Book: | NA |
| Page: | NA |
| Volume: | NA |
| Instrument#: | NA |
| Docket: | NA |
| Land Record Comments: | NA |
| Miscellaneous Comments: | NA |

**Legal Description:** LOT 13049

**Current Owner:** KALAELOA VENTURES LLC

**Property Identifiers:** 1-9-1-013-004-0000

**Comments:** NA

## ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

If Found:

| | |
|---|---|
| 1st Party: | NA |
| 2nd Party: | NA |
| Dated: | NA |
| Recorded: | NA |
| Book: | NA |
| Page: | NA |
| Docket: | NA |

Volume: NA
Instrument #: NA
Comments:
Miscellaneous:

**OTHER ACTIVITY AND USE LIMITATIONS (AULS)**

Other AUL's: Found [ ] Not Found [X]

If Found:

1st Party: NA
2nd Party: NA
Dated: NA
Recorded: NA
Book: NA
Page: NA
Docket: NA
Volume: NA
Instrument #: NA
Comments:
Miscellaneous:

1st Party: NA
2nd Party: NA
Dated:
Recorded: NA
Book: NA
Page: NA
Docket: NA
Volume: NA
Instrument #: NA
Comments:
Miscellaneous:

**MISCELLANEOUS**

Type of Instrument: NONE IDENTIFIED

1st Party:

2nd Party:

Date Recorded:

Instrument #:

Book:

Page:

Comments:

# DEED EXHIBIT

.76AL
C

STATE OF HAWAII
OFFICE OF ASSISTANT REGISTRAR
RECORDED

February 07, 2017 3:29 PM

Doc No(s) T-9899274
on Cert(s) 529664
Issuance of Cert(s)

/s/ LESLIE T. KOBATA
ASSISTANT REGISTRAR

1 2/2 ZMA Conveyance Tax: $1.00

B-32944837

| LAND COURT | REGULAR SYSTEM |
|---|---|

AFTER RECORDATION, RETURN BY: Mail ( X ) Pickup ( )

Kalaeloa Ventures, LLC
737 Bishop Street, Suite 2750
Honolulu, HI 96813
Attn.: Steve Colón

This document contains 7 pages

1

## QUITCLAIM RECONVEYANCE OF INTERESTS

THIS Quitclaim Reconveyance of Interests is made this 2nd day of February, 2017, by HUNT COMMUNITIES HAWAII, LLC, a Hawaii limited liability company, whose address is 737 Bishop Street, Suite 2750, Honolulu, Hawaii 96813 ("**Grantor**"), in favor of KALAELOA VENTURES LLC, a Delaware limited liability company, whose address is 737 Bishop Street, Suite 2750, Honolulu, Hawaii 96813 ("**Grantee**").

L695

W I T N E S S E T H:

By that certain Limited Warranty Deed dated November 2, 2016, filed in the Office of the Assistant Registrar of the Land Court of Hawaii as Document No. T-9807136 and noted on Transfer Certificate of Title No. 529664 ("Deed"), Grantee conveyed to Grantor its leasehold interest in that certain real property described in Exhibit A to the Deed and also as described in Exhibit "A" attached hereto and expressly made a part hereof (the "Property").

The Property is a portion of property subject to that certain Real Estate Ground Lease dated October 6, 2008, as amended, a Memorandum of which is recorded as Land Court Document No. 3841817.

Grantor, for and in consideration of the sum of TEN AND NO/100 DOLLARS ($10.00) and other good and valuable consideration paid by Grantee to Grantor, hereby remises, quitclaims, and reconveys all of its interests in the Property unto Grantee;

And the reversions, remainders, rents, issues, and profits thereof and all of the estate, right, title, and interest of Grantor, both at law and in equity, therein and thereto;

The terms "**Grantor**" and "**Grantee**", as used herein, or any pronouns used in place thereof, mean the masculine or feminine, the singular or plural number, individuals, associations, trustees, partnerships, limited liability companies, or corporations, and each of their respective successors in interest, heirs, personal representatives, and permitted assigns, according to the context thereof.

This Quitclaim Reconveyance of Interests may be executed in counterparts, each of which shall be deemed an original, and said counterparts shall together constitute one and the same agreement, binding all of the parties hereto notwithstanding all of the parties are not signatories to the original or same counterparts. For all purposes, including, without limitation, recordation, filing and delivery of this instrument, duplicate unexecuted pages of the counterparts may be discarded and the remaining pages assembled as one document.

***[THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]***

***[SIGNATURE PAGE FOLLOWS]***

IN WITNESS WHEREOF, Grantor and Grantee have executed this instrument effective as of the day and year first above written.

HUNT COMMUNITIES HAWAII LLC,
a Hawaii limited liability company,

By: Hunt Communities Development Co., LLC,
a Texas limited liability company, Member

By: Hunt Communities Group, Inc.,
a Texas corporation, Member

By: ____________________
Name: JUSTIN H. CHAPMAN
Title: President

"Grantor"

KALAELOA VENTURES LLC,
a Delaware limited liability company,

By: Hawaii Renaissance Builders, LLC,
Its Sole Member

By: ____________________
Steven W. Colón
Its: Senior Vice President

"Grantee"

IN WITNESS WHEREOF, Grantor and Grantee have executed this instrument effective as of the day and year first above written.

HUNT COMMUNITIES HAWAII LLC,
a Hawaii limited liability company,

By: Hunt Communities Development Co., LLC,
a Texas limited liability company, Member

By: Hunt Communities Group, Inc.,
a Texas corporation, Member

By:____________________________
Name:__________________________
Title:__________________________

"Grantor"

KALAELOA VENTURES LLC,
a Delaware limited liability company,

By: Hawaii Renaissance Builders, LLC,
Its Sole Member

By:____________________________
Steven W. Colón
Its: Senior Vice President

"Grantee"

STATE OF TEXAS )
)
COUNTY OF EL PASO )

This instrument was acknowledged before me on February 2nd, 2017, by Justin Chapman, President of Hunt Communities Group, Inc., a Texas corporation, Member of Hunt Communities Development Co., LLC, A Texas limited liability company, Member of Hunt Communities Hawaii, LLC, a Hawaii limited liability company, on behalf of said limited liability company.

NELDA RODRIGUEZ
NOTARY PUBLIC
In and for the State of Texas
My commission expires
December 16, 2020

Nelda Rodriguez
Notary Public

STATE OF HAWAII )
) SS.
CITY AND COUNTY OF HONOLULU )

On this 2nd day of February, 2017, before me appeared STEVEN W. COLÓN, as Senior Vice President of Hawaii Renaissance Builders, LLC, a Delaware limited liability company, as sole Member of Kalaeloa Ventures, LLC, to me personally known, who being by me duly sworn or affirmed, did say that such person executed the foregoing instrument as the free act and deed of such person, and if applicable in the capacities shown, having been duly authorized to executed such instrument in such capacities.

L.S.

Emily Davids
Print name: Emily Davids
Notary Public, State of Hawaii
My commission expires: 11/15/19

| | | | |
|---|---|---|---|
| Date of Doc: | undated | # Pages: | 7 |
| Name of Notary: | Emily Davids | Notes: | |
| Doc. Description: | Quitclaim Reconveyance of Interests | | (stamp or seal) |
| Emily Davids Notary Signature | 2/2/17 Date | | L.S. |
| First Circuit, State of Hawaii | | | |
| **NOTARY CERTIFICATION** | | | |

# EXHIBIT A

Leasehold interest, a Memorandum of which is recorded as Document No. 3841817, in and to that certain real property described as follows:

Parcel 1; Land Ct Lot 13047: Lot 13047, consisting of an area of 49.679 acres, more or less, shown on Map 957, as set forth in Land Court Order No. 134783, filed in the Office of the Assistant Registrar of the Land Court of the State of Hawaii with Land Court Application 1069, covered by Transfer Certificate of Title No. 529,664, issued to the United States of America.

Parcel 2; TMK (1) 9-1-013-004; Land Ct Lot 13049: Lot 13049, consisting of an area of 30.941 acres, more or less, shown on Map 957, as set forth in Land Court Order No. 134783, filed in the Office of the Assistant Registrar of the Land Court of the State of Hawaii with Land Court Application 1069, covered by Transfer Certificate of Title No. 529,664, issued to the United States of America.

Parcel 3; TMK (1) 9-1-013-0128; Land Ct Lot 13051-A-1;
TMK (1) 9-1-013-0130; Land Ct Lot 13051-A-3: Lot 13051-A-1, consisting of an area of 20.597 acres, more or less, and Lot 13051-A-3, consisting of an area of .053 acre, more or less, shown on Map 1609, as set forth in Order of Subdivision, dated April 28, 2014, filed in said Office as Document No. T-8932121 and noted on Transfer Certificate of Title No. 529,664.

SUBJECT HOWEVER TO all encumbrances of record.

**END OF EXHIBIT A**

# The EDR Aerial Photo Decade Package

Parcels 1, 2, and 3
Franklin D Roosevelt Ave
Kapolei, HI 96707

Inquiry Number: 5070053.12
October 06, 2017

# The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# EDR Aerial Photo Decade Package

10/06/17

**Site Name:**

Parcels 1, 2, and 3
Franklin D Roosevelt Ave
Kapolei, HI 96707
EDR Inquiry # 5070053.12

**Client Name:**

Element Environmental , LLC
98-030 Hekaha Street
Aiea, HI 96701-0000
Contact: Angie Peltier

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

***Search Results:***

| ***Year*** | ***Scale*** | ***Details*** | ***Source*** |
|---|---|---|---|
| 2008 | 1"=625' | Flight Date: April 08, 2008 | USGS |
| 2001 | 1"=625' | Acquisition Date: February 22, 2001 | USGS/DOQQ |
| 1992 | 1"=625' | Flight Date: September 25, 1992 | USGS |
| 1985 | 1"=625' | Flight Date: May 02, 1985 | USGS |
| 1977 | 1"=625' | Flight Date: February 12, 1977 | USGS |
| 1968 | 1"=625' | Flight Date: February 06, 1968 | USGS |
| 1951 | 1"=625' | Flight Date: May 14, 1951 | USGS |

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INQUIRY #: 5070053.12
YEAR: 2008
= 625'
N
EDR

INQUIRY #: 5070053.12

YEAR: 2001

= 625'

N

EDR

INQUIRY #: 5070053.12

YEAR: 1992

= 625'

N

EDR

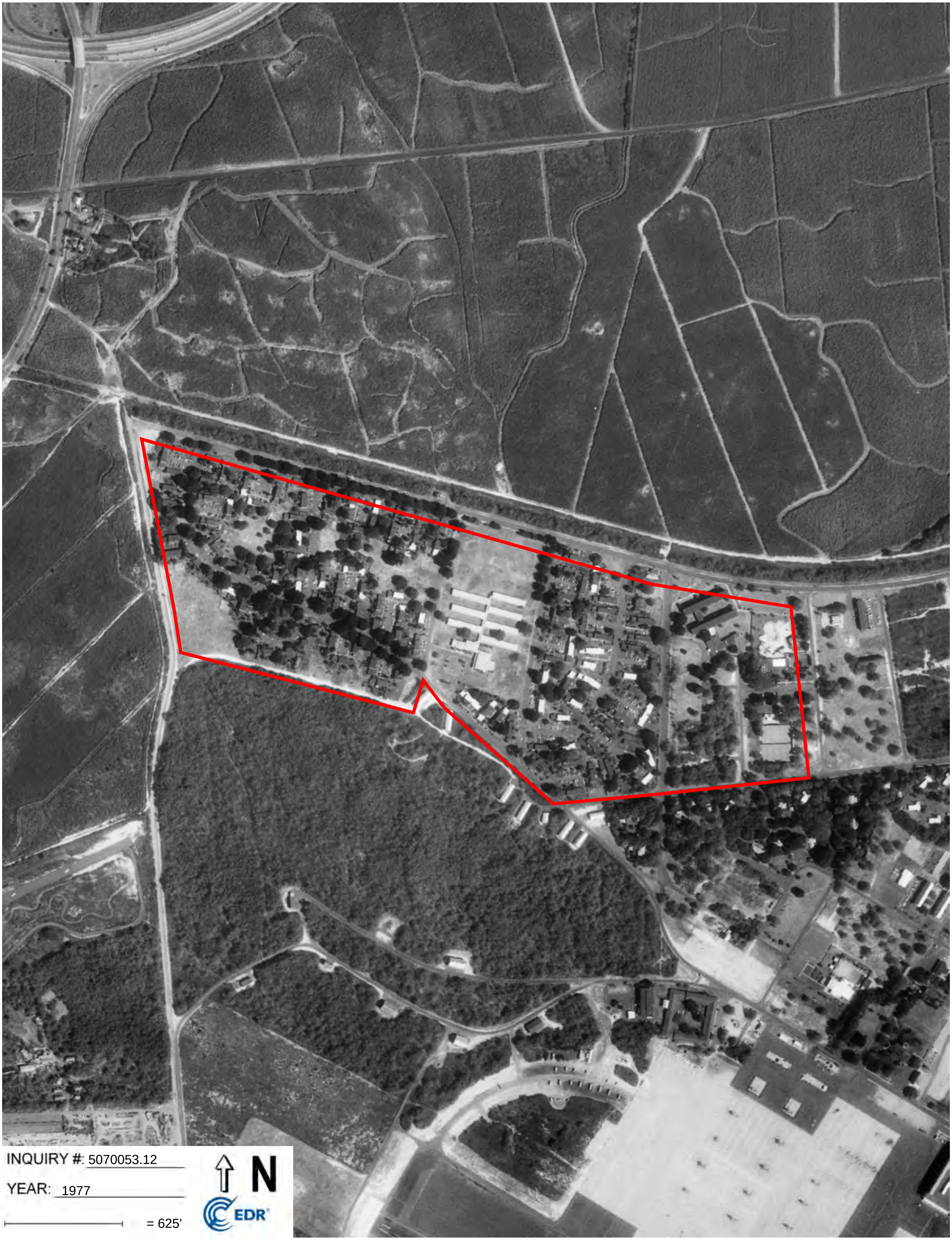
INQUIRY #: 5070053.12

YEAR: 1985

= 625'

N

EDR


INQUIRY #: 5070053.12
YEAR: 1977
= 625'
N
EDR

INQUIRY #: 5070053.12

YEAR: 1968

= 625'

N


INQUIRY #: 5070053.12
YEAR: 1951
= 625'
N
EDR

**EDR Certified Sanborn Map Report**

Parcels 1, 2, and 3

Franklin D Roosevelt Ave

Kapolei, HI 96707

Inquiry Number: 5070053.3

October 05, 2017

# Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# Certified Sanborn® Map Report

10/05/17

**Site Name:**

Parcels 1, 2, and 3
Franklin D Roosevelt Ave
Kapolei, HI 96707
EDR Inquiry # 5070053.3

**Client Name:**

Element Environmental , LLC
98-030 Hekaha Street
Aiea, HI 96701-0000
Contact: Angie Peltier

The Sanborn Library has been searched by EDR and maps covering the target property location as provided by Element Environmental , LLC were identified for the years listed below. The Sanborn Library is the largest, most complete collection of fire insurance maps. The collection includes maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow, and others. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by the Sanborn Library LLC, the copyright holder for the collection. Results can be authenticated by visiting www.edrnet.com/sanborn.

The Sanborn Library is continually enhanced with newly identified map archives. This report accesses all maps in the collection as of the day this report was generated.

## *Certified Sanborn Results:*

**Certification #** 5E82-4DD9-87AF

**PO #** 170063

**Project** Hunt Phase I ESAs

### UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results

Certification #: 5E82-4DD9-87AF

The Sanborn Library includes more than 1.2 million fire insurance maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow and others which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ✔ Library of Congress
- ✔ University Publications of America
- ✔ EDR Private Collection

*The Sanborn Library LLC Since 1866™*

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**EDR Historical Topo Map Report with QuadMatch™**

Parcels 1, 2, and 3
Franklin D Roosevelt Ave
Kapolei, HI 96707

Inquiry Number: 5070053.4
October 05, 2017

# EDR Historical Topo Map Report
## with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

# EDR Historical Topo Map Report

10/05/17

| Site Name: | Client Name: |
|---|---|
| Parcels 1, 2, and 3 | Element Environmental , LLC |
| Franklin D Roosevelt Ave | 98-030 Hekaha Street |
| Kapolei, HI 96707 | Aiea, HI 96701-0000 |
| EDR Inquiry # 5070053.4 | Contact: Angie Peltier |

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by Element Environmental , LLC were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

| ***Search Results:*** | | ***Coordinates:*** | |
|---|---|---|---|
| **P.O.#** | 170063 | **Latitude:** | 21.321929 21° 19' 19" North |
| **Project:** | Hunt Phase I ESAs | **Longitude:** | -158.080198 -158° 4' 49" West |
| | | **UTM Zone:** | Zone 4 North |
| | | **UTM X Meters:** | 595390.49 |
| | | **UTM Y Meters:** | 2358055.50 |
| | | **Elevation:** | 52.00' above sea level |

**Maps Provided:**

2013
1998
1983
1970
1968
1962
1953
1928

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## *Topo Sheet Key*

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

### 2013 Source Sheets

Ewa
2013
7.5-minute, 24000

### 1998 Source Sheets

Ewa
1998
7.5-minute, 24000
Aerial Photo Revised 1998

### 1983 Source Sheets

Ewa
1983
7.5-minute, 24000
Aerial Photo Revised 1977

### 1970 Source Sheets

OAHU
1970
15-minute, 62500

## *Topo Sheet Key*

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

### 1968 Source Sheets

Ewa
1968
7.5-minute, 24000
Aerial Photo Revised 1968

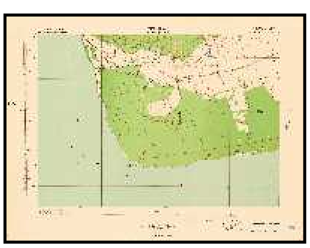
### 1962 Source Sheets

Ewa
1962
7.5-minute, 24000
Aerial Photo Revised 1952

### 1953 Source Sheets

Ewa
1953
7.5-minute, 24000
Aerial Photo Revised 1952

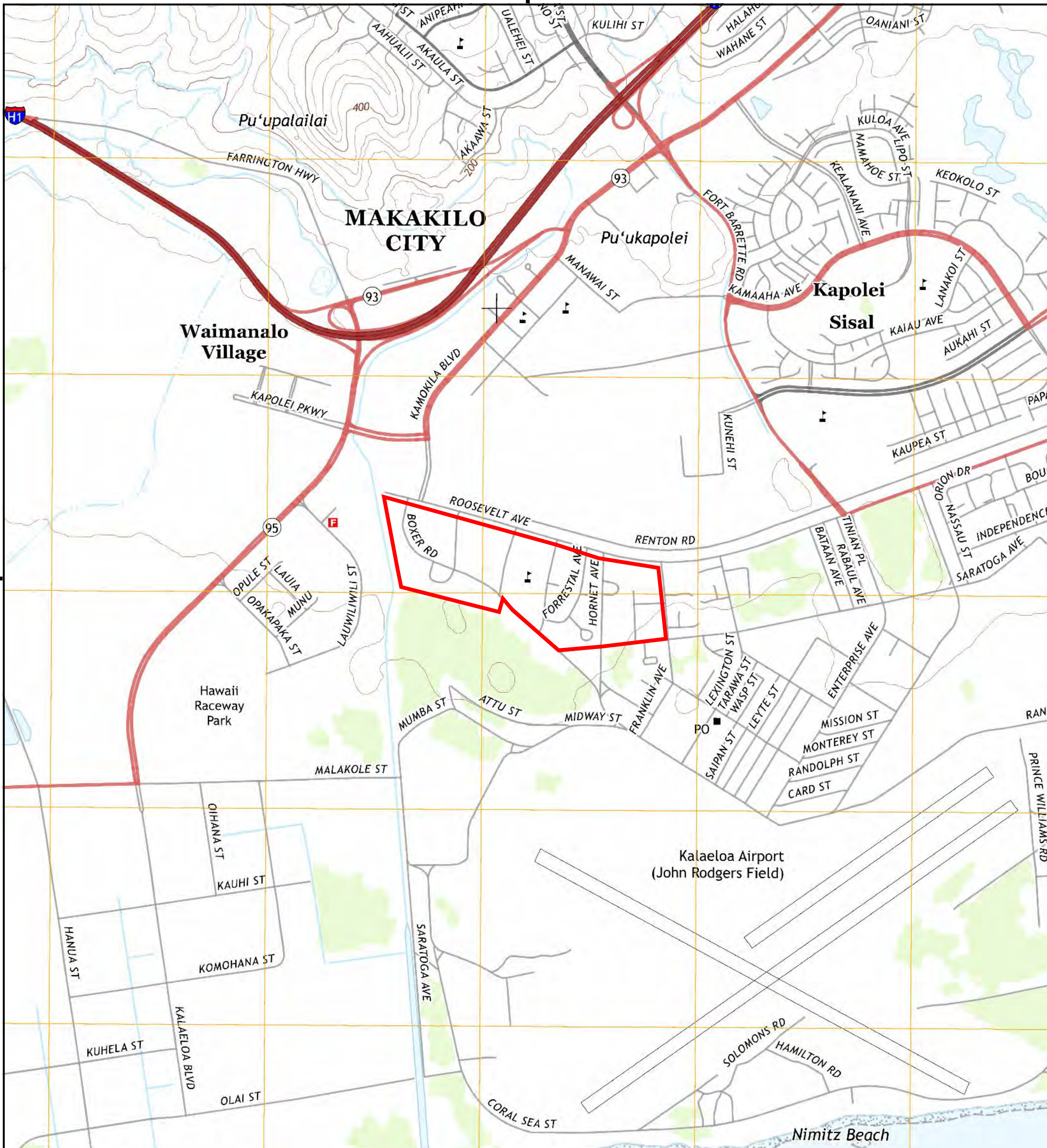
### 1928 Source Sheets



BARBERSPOINT
1928
7.5-minute, 20000

# Historical Topo Map

2013




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

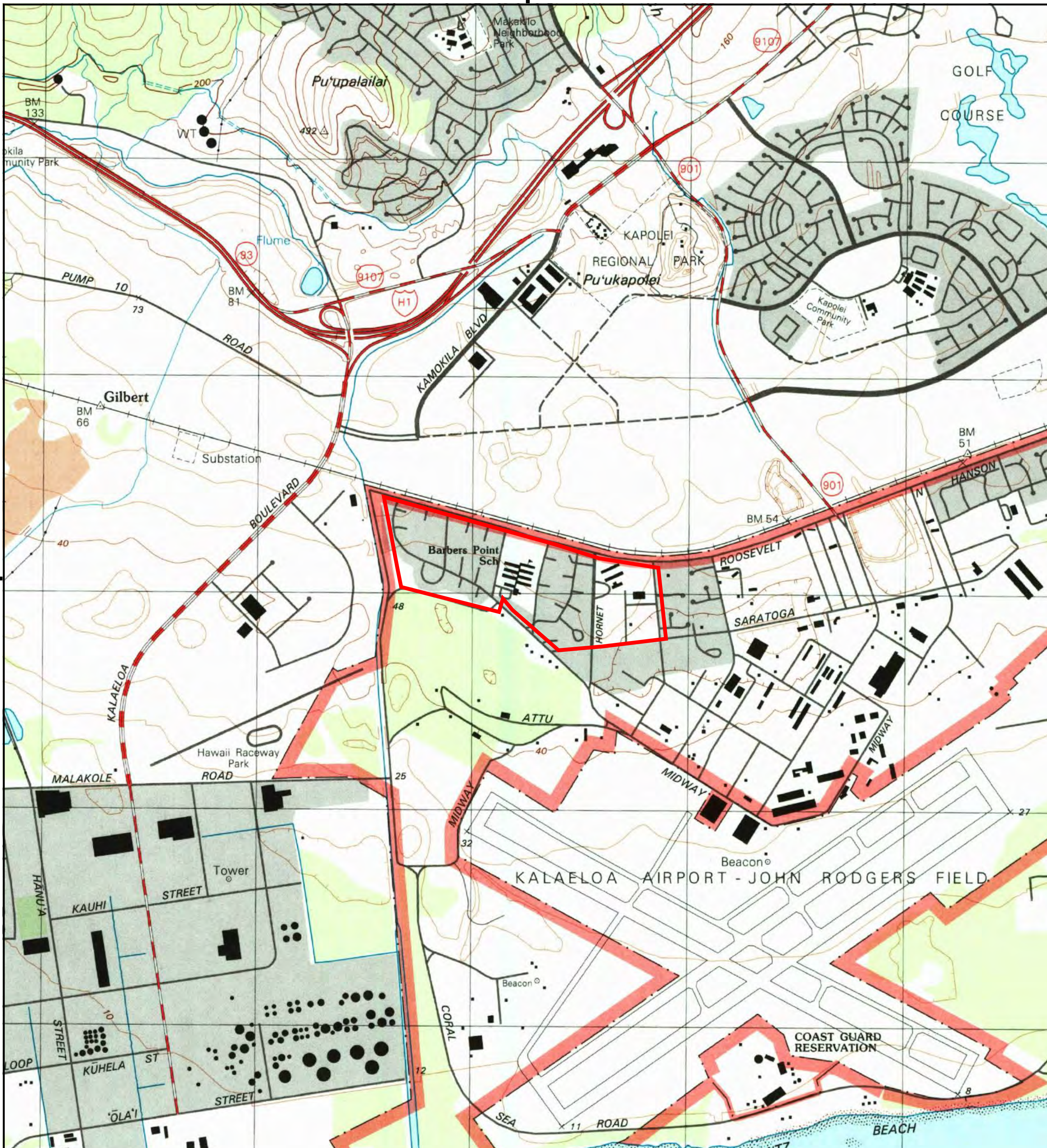
TP, Ewa, 2013, 7.5-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

N

# Historical Topo Map

1998




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

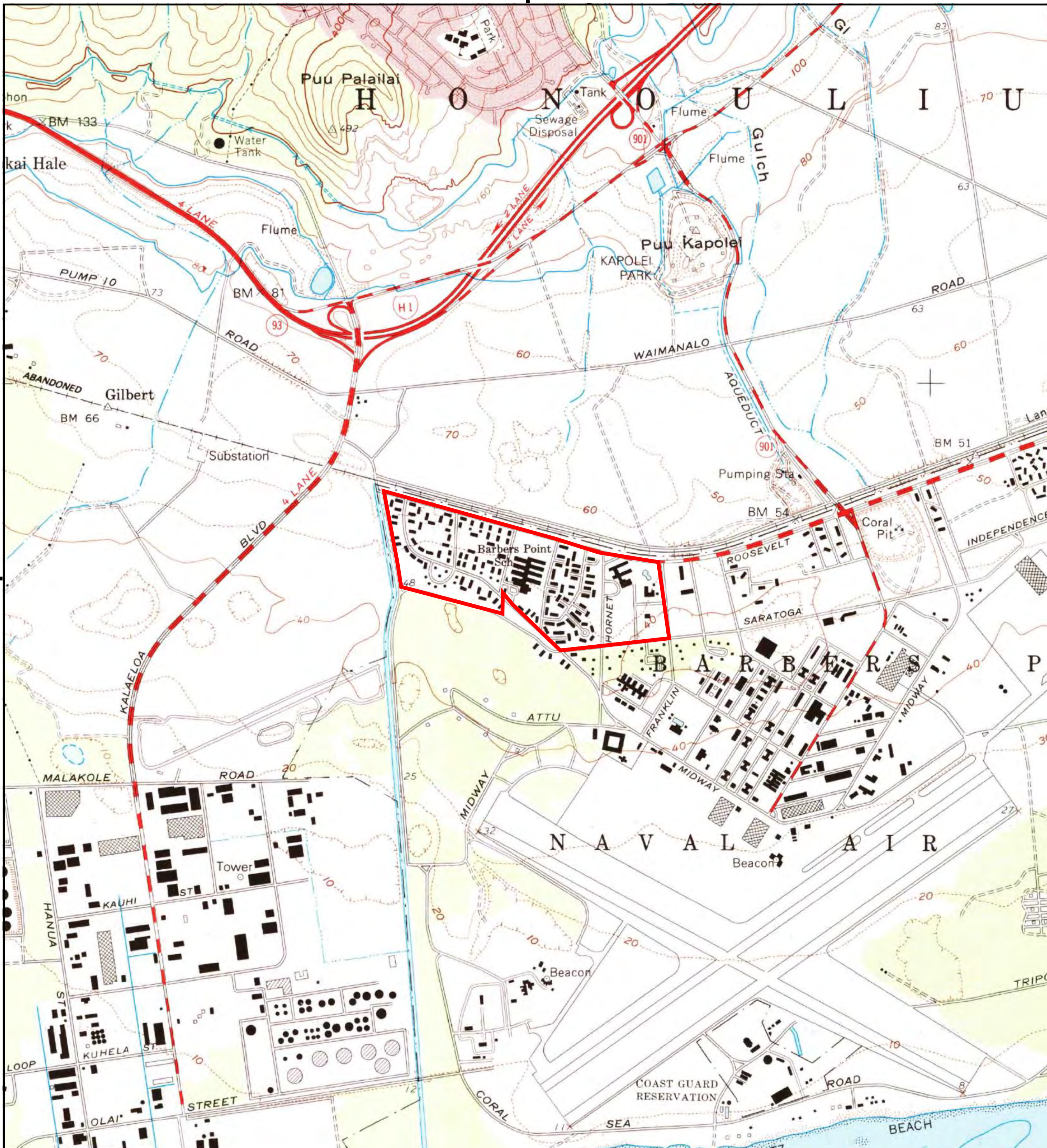
NW N NE W E SW S SE

TP, Ewa, 1998, 7.5-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

# Historical Topo Map

1983




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

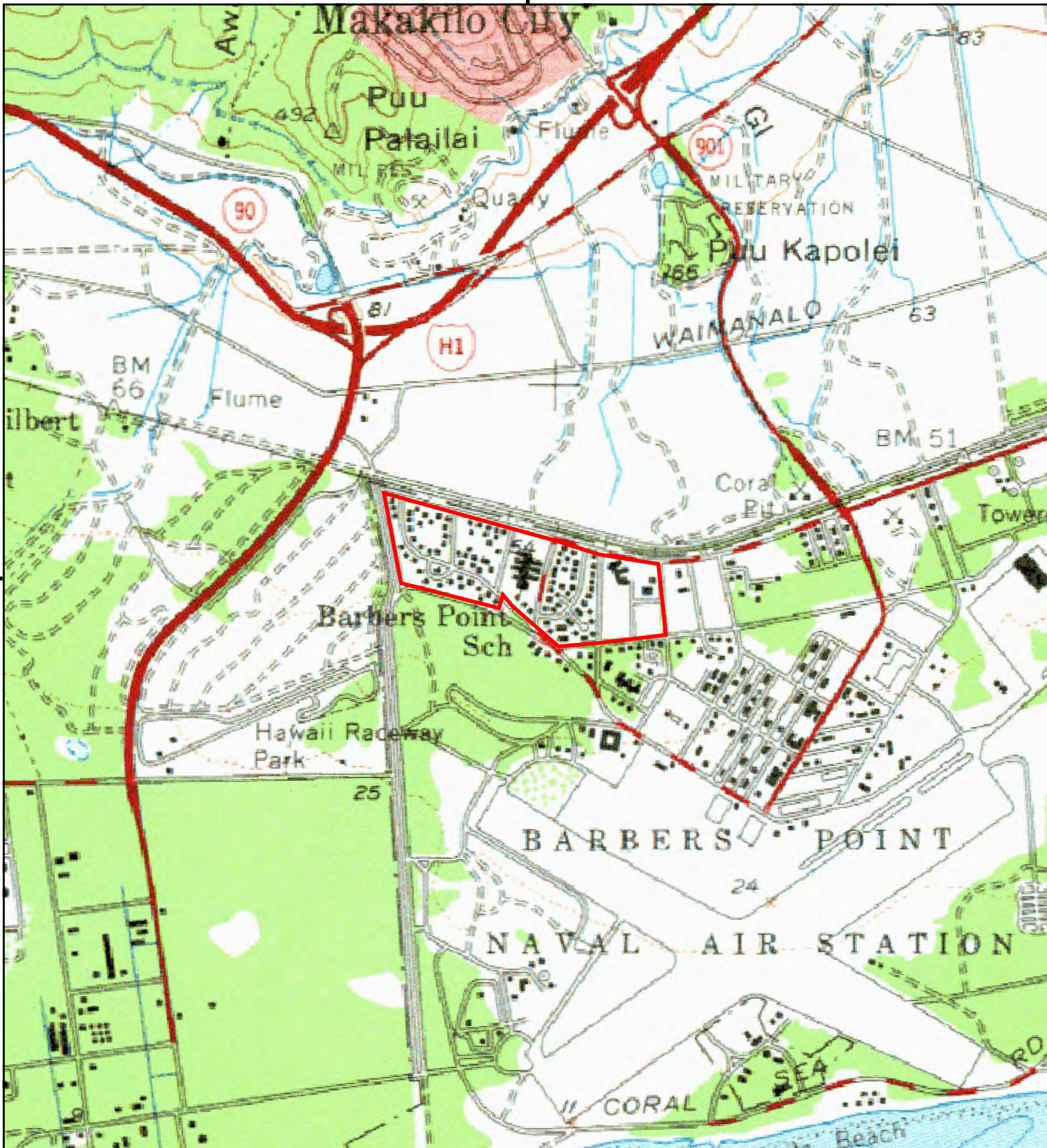
TP, Ewa, 1983, 7.5-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

N

# Historical Topo Map

1970




0 Miles 0.25 0.5 1 1.5

This report includes information from the following map sheet(s).

NW N NE
W E
SW S SE

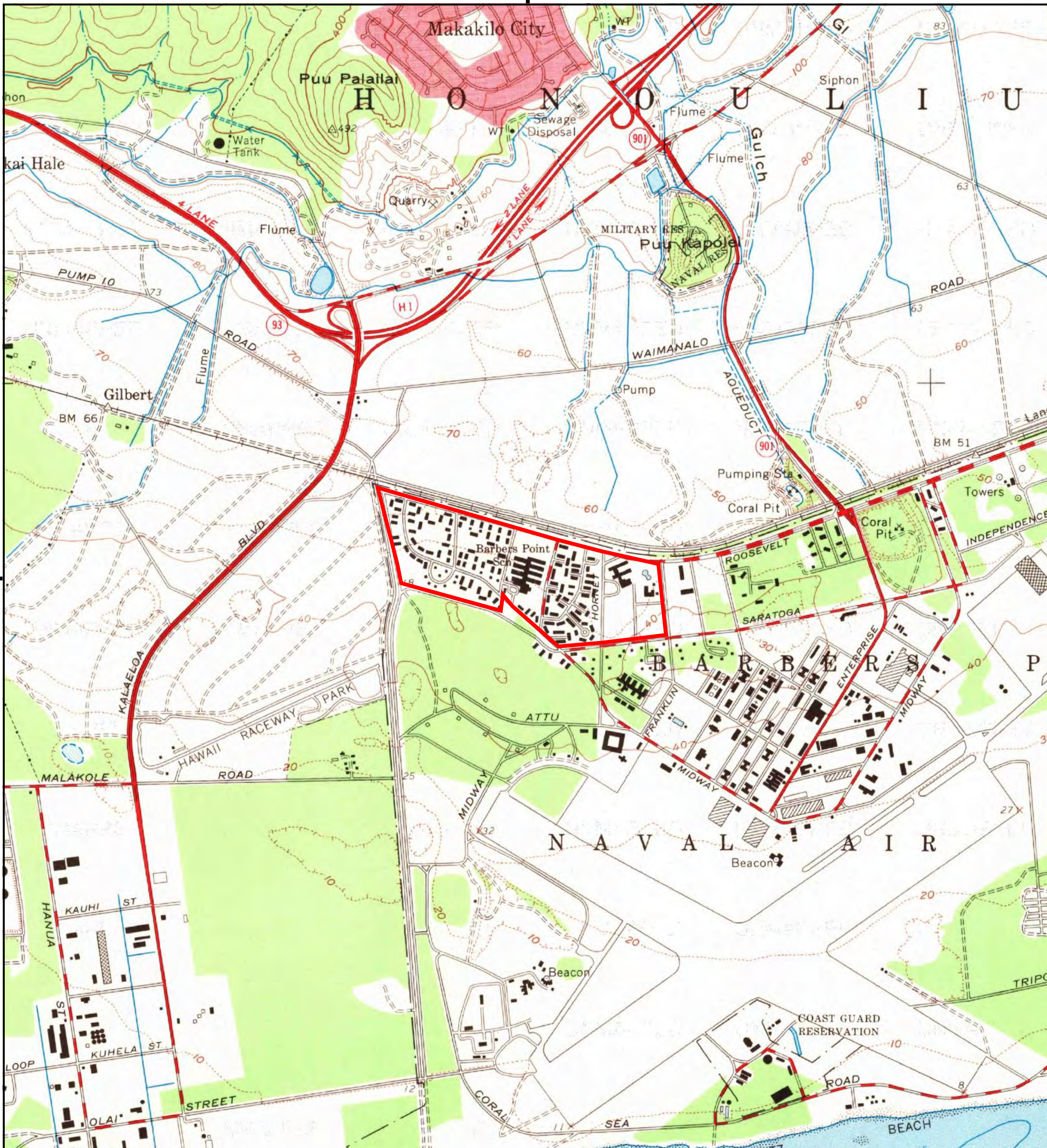
TP, OAHU, 1970, 15-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

N

# Historical Topo Map

1968




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

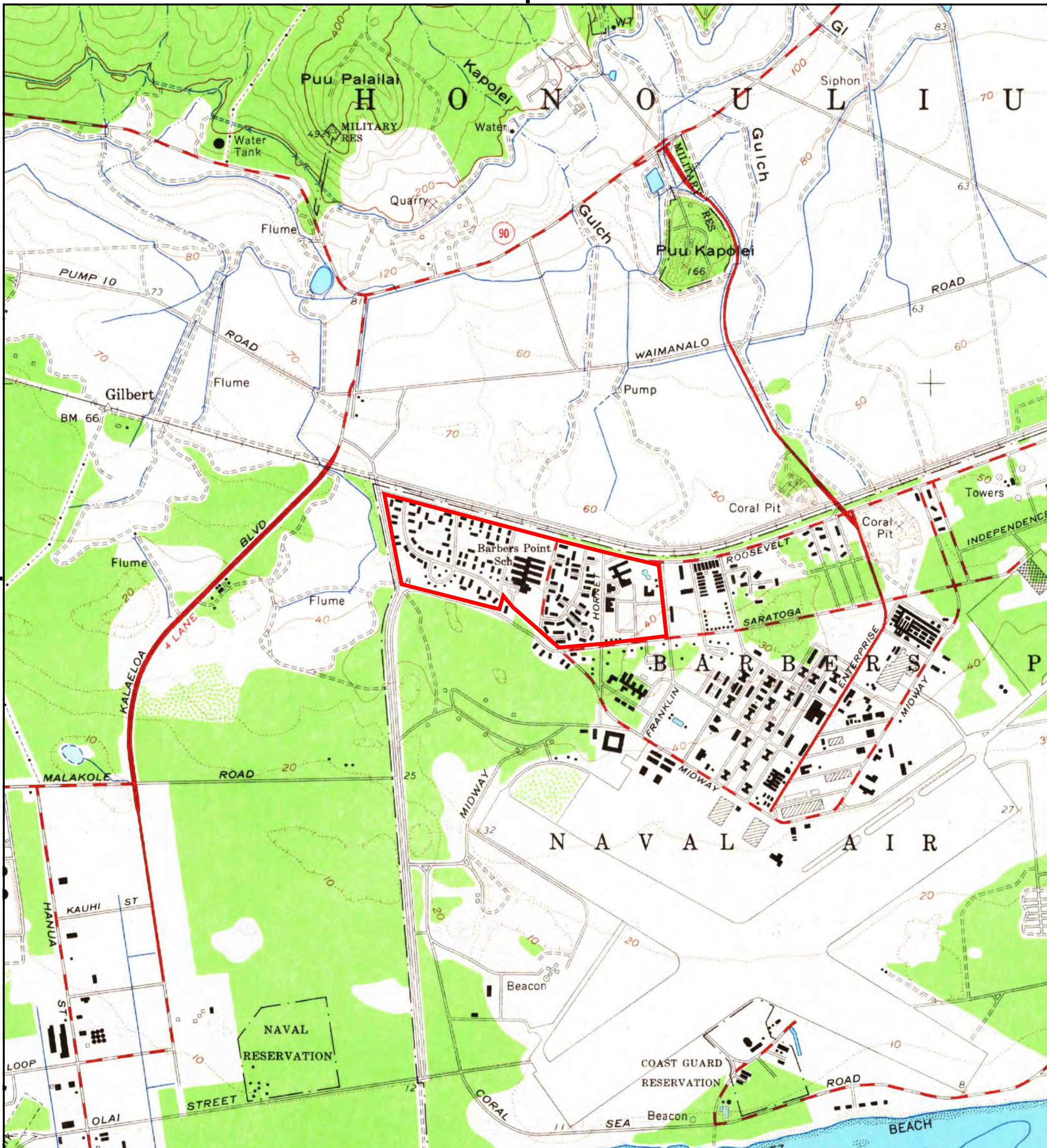
NW N NE
W E
SW S SE

TP, Ewa, 1968, 7.5-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

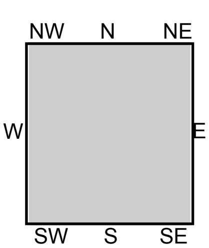
# Historical Topo Map

1962




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5




TP, Ewa, 1962, 7.5-minute

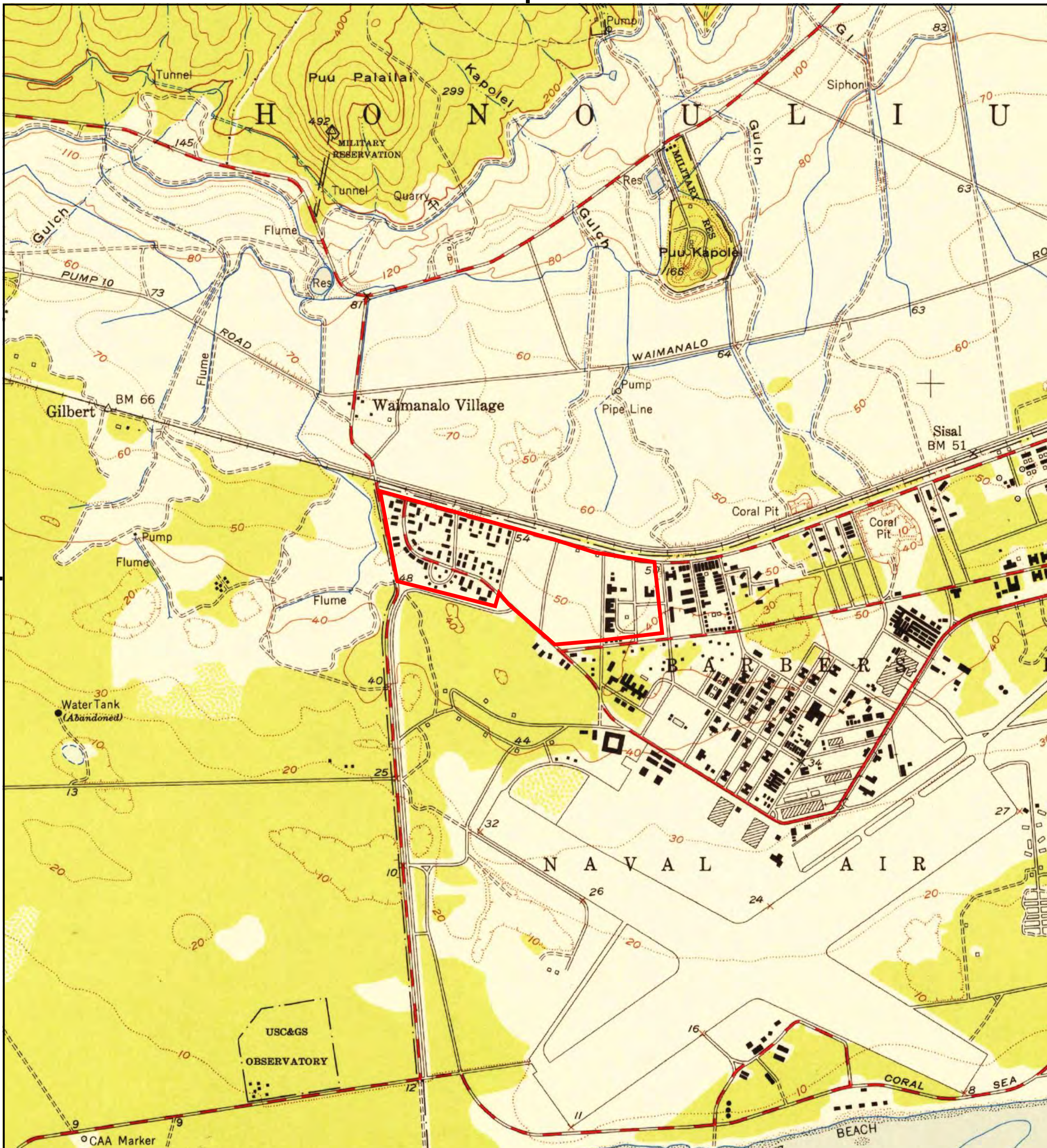
SITE NAME: Parcels 1, 2, and 3

ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707

CLIENT: Element Environmental , LLC

# Historical Topo Map

1953




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

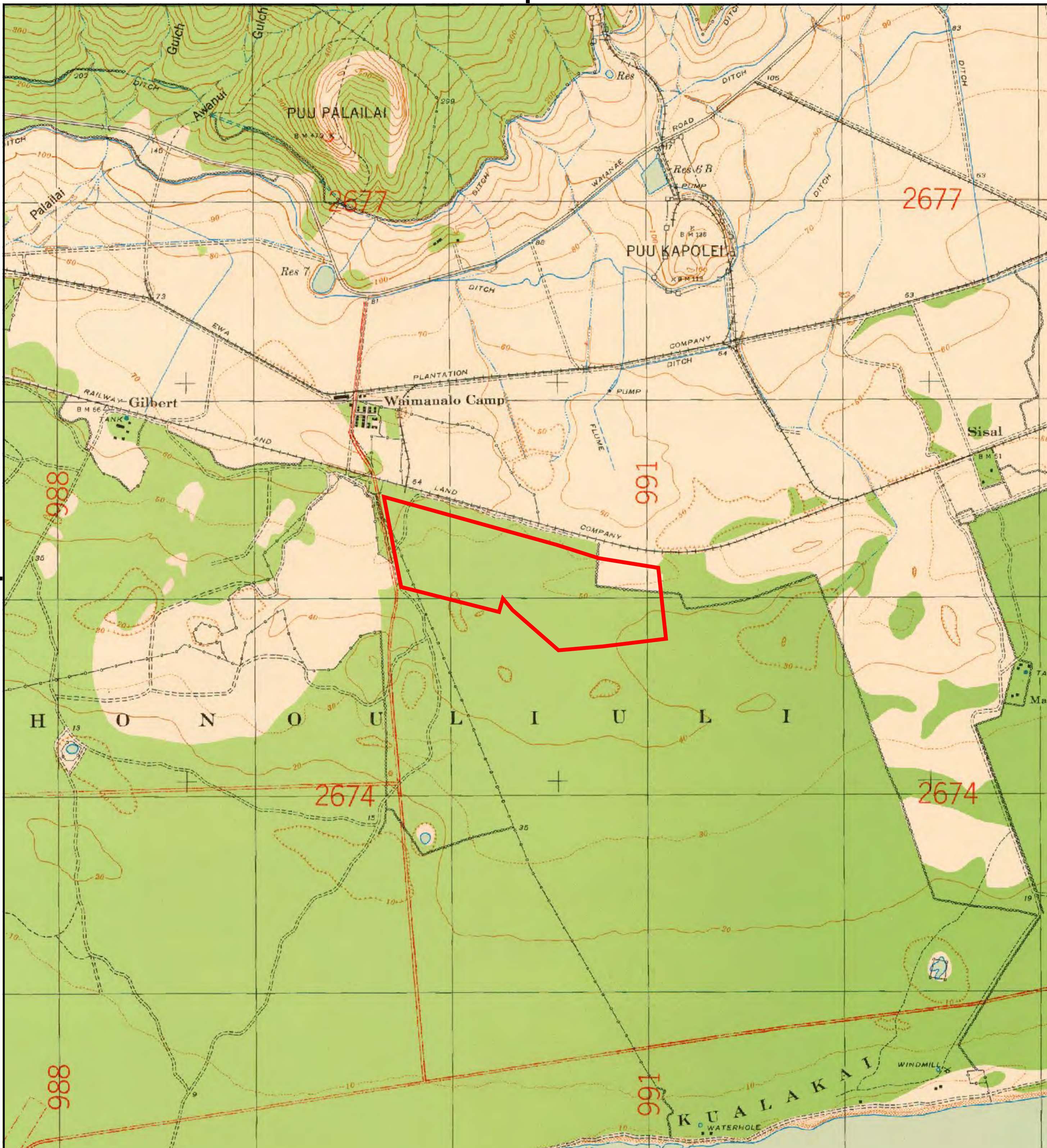
TP, Ewa, 1953, 7.5-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

N

# Historical Topo Map

1928




This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, BARBERSPOINT, 1928, 7.5-minute

SITE NAME: Parcels 1, 2, and 3
ADDRESS: Franklin D Roosevelt Ave
Kapolei, HI 96707
CLIENT: Element Environmental , LLC

# The EDR-City Directory Image Report

**Parcels 1, 2, and 3**
Franklin D Roosevelt Ave
Kapolei, HI 96707

Inquiry Number: 5070053.5
October 06, 2017

# The EDR-City Directory Image Report

EDR® Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

# TABLE OF CONTENTS

## SECTION



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# EXECUTIVE SUMMARY

## DESCRIPTION

Environmental Data Resources, Inc.’s (EDR) City Directory Report is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR’s City Directory Report includes a search of available city directory data at 5 year intervals.

## RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. A check mark indicates where information was identified in the source and provided in this report.

| ***Year*** | ***Target Street*** | ***Cross Street*** | ***Source*** |
|---|---|---|---|
| 2013 | ☐ | ☑ | Cole Information Services |
| 2008 | ☑ | ☑ | Cole Information Services |
| 2003 | ☑ | ☑ | Cole Information Services |
| 1999 | ☑ | ☐ | Cole Information Services |
| 1995 | ☑ | ☐ | Cole Information Services |
| 1992 | ☐ | ☐ | Cole Information Services |

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# FINDINGS

## TARGET PROPERTY STREET

Franklin D Roosevelt Ave
Kapolei, HI 96707

| ***Year*** | ***CD Image*** | ***Source*** | |
|---|---|---|---|
| **FRANKLIN D ROOSEVELT AVE** | | | |
| 2013 | - | Cole Information Services | Target and Adjoining not listed in Source |
| 2008 | - | Cole Information Services | Target and Adjoining not listed in Source |
| 2003 | - | Cole Information Services | Target and Adjoining not listed in Source |
| 1999 | - | Cole Information Services | Target and Adjoining not listed in Source |
| 1995 | - | Cole Information Services | Target and Adjoining not listed in Source |
| 1992 | - | Cole Information Services | Street not listed in Source |
| **ROOSEVELT AVE** | | | |
| 2013 | - | Cole Information Services | Target and Adjoining not listed in Source |
| 2008 | pg A4 | Cole Information Services | |
| 2003 | pg A6 | Cole Information Services | |
| 1999 | pg A7 | Cole Information Services | |
| 1995 | pg A8 | Cole Information Services | |
| 1992 | - | Cole Information Services | Street not listed in Source |

# FINDINGS

## CROSS STREETS

| Year | CD Image | Source | |
|---|---|---|---|

### LAUWILIWILI ST

| | | | |
|---|---|---|---|
| 2013 | pg. A2 | Cole Information Services | |
| 2008 | pg. A3 | Cole Information Services | |
| 2003 | pg. A5 | Cole Information Services | |
| 1999 | - | Cole Information Services | Street not listed in Source |
| 1995 | - | Cole Information Services | Street not listed in Source |
| 1992 | - | Cole Information Services | Street not listed in Source |

**City Directory Images**

# LAUWILIWILI ST 2013

| | |
|---|---|
| 2009 | STORQUEST SELF STORAGE |
| 2029 | H & W FOODS |
| | PALAMA MEAT COMPANY |
| 2045 | A & B PARTY RENTALS |
| | GLOBAL PROFESSIONAL SERVICE LLC |
| | OLA PROPERTIES INC |
| 2060 | CARRIER HAWAII |
| 2074 | THE CHURCH OF JESUS CHRIST OF LATTER |
| 2106 | FASTENAL |
| 2110 | ALARM HAWAII |
| | CRAIGS AIR CONDITIONING |
| 2112 | CARWASH WERKS |
| | LIQUID ALOHA EXPRESS WASH |
| | PACIFIC ISLAND SECURITY |
| 2114 | SHERWINWILLIAMS PAINT STORE |
| 2116 | HAWAII SOLAR & ELECTRIC |
| | HERMANN HUBERT |
| | LIFELINE FIRE & SECURITY |
| | MICROCOM |
| 2118 | TESTRON INTERNATIONAL |
| 2120 | LUXUS |
| 2130 | HENKELS & MCCOY |
| 2149 | FOPCO |
| | SALVATION ARMY KROC CENTER HAWAII TH |
| 2159 | SCREEN PRODUCTS INC |
| 2176 | AUTO CHEM SYSTEMS |
| | SMAC HAWAII INC |

# LAUWILIWILI ST 2008

| | |
| --- | --- |
| 2009 | ALOHA ISLAND SELF STORAGE INC |
| 2029 | H & W FOODS PAL |
| | MAYS |
| 2112 | TRISTAR HAWAII CORP |
| 2116 | R SAPLA |
| 2149 | FOPCO INC |
| 2159 | ALII GLASS & METAL INC |
| | SCREEN PRODUCTS INC |

| Target Street | Cross Street | Source |
|---|---|---|
| ✓ | - | Cole Information Services |

# ROOSEVELT AVE 2008

| | |
|---|---|
| 2015 | SHERIE BREAUX |

## LAUWILIWILI ST 2003

2029 ERIC CHING
H & W FOODS
H & W FOODS ACQUISITION CORP
PALAMA MEAT CO

# ROOSEVELT AVE 2003

2005 TIMOTHY TOWER

| Target Street | Cross Street | Source |
|---|---|---|
| ✓ | - | Cole Information Services |

# ROOSEVELT AVE 1999

| | |
|---|---|
| 2005 | TIMOTHY TOWER |
| 2007 | JODI BUSH |
| 2011 | C BUSH |
| | JIM WEATHERBEE |
| 2017 | OCCUPANT UNKNOWN |
| 2019 | K BOWMAN |
| 2021 | NANCY MACESICH |
| | REX LACEBY |
| 2023 | T KOZUBER |
| 2037 | BOBBI MAXWELL |
| | DEBORAH CAVENEE |
| | PATRICK DAVIS |
| 2041 | ERIC WEBB |
| 2121 | TRACY PETERSON |
| 3051 | JOHN SHARLOCK |
| | TARA GRAHAM |

# ROOSEVELT AVE 1995

| | |
| --- | --- |
| 2005 | MARINO, DAVID |
| 2007 | MCGETTIGAN, TRACI |
| | MILINDER, V B |
| | SCARBOROUGH, JIMMMY |
| | WOOD, KIM |
| 2009 | ASHLEY, DAVID |
| | HUGHES, ROBERT A |
| | MCCORD, JESSE |
| 2011 | BROWNING, ROBERT |
| | GUENTZ, DANIEL T |
| | MCGEE, HARRY E |
| 2013 | URENDA, DAVID |
| 2014 | MORALES, H |
| 2015 | HOBBA, ROBERT L |
| | SMITH, WENDELL |
| 2019 | POE, JAY D |
| 2021 | TUCKER, KURT |
| 2023 | BRINK, CONNIE |
| | HEIMEYER, LYNETTE |
| | KISS, LYNETTE |
| 2037 | DAVIS, DAVID |
| | DELEON, LORAINE |
| 2039 | GIPSON, WILLIAM |
| | NEWMAN, STEVEN |
| 2041 | BONILLA, LEO P |
| | STOLEN, ERIC E |
| 3051 | WETZSTEIN, ANGELA |

# EDR Building Permit Report

**Parcels 1, 2, and 3**
Franklin D Roosevelt Ave
Kapolei, HI 96707

Inquiry Number: 5070053.8
October 05, 2017

# EDR Building Permit Report

## Target Property and Adjoining Properties


Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

# EDR Building Permit Report: Search Documentation

10/05/17

| **Site Name:** | **Client Name:** |
|---|---|
| Parcels 1, 2, and 3 | Element Environmental , LLC |
| Franklin D | 98-030 Hekaha Street |
| Kapolei, HI 96707 | Aiea, HI 96701-0000 |
| EDR Inquiry # 5070053.8 | Contact: Angie Peltier |

***Search Documentation***

**DATA GAP**

**The complete collection of Building Permit data available to EDR has been searched, and as of 10/05/17, EDR does not have access to building permits in the city where your target property is located (Kapolei, HI).**

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# EDR BUILDING PERMIT REPORT

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The EDR Building Permit Report provides a practical and efficient method to search building department records for indications of environmental conditions. Generated via a search of municipal building permit records gathered from more than 1,600 cities nationwide, this report will assist you in meeting the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

Building permit data can be used to identify current and/or former operations and structures/features of environmental concern. The data can provide information on a target property and adjoining properties such as the presence of underground storage tanks, pump islands, sumps, drywells, etc., as well as information regarding water, sewer, natural gas, electrical connection dates, and current/former septic tanks.

## ASTM and EPA Requirements

ASTM E 1527-13 lists building department records as a "standard historical source," as detailed in § 8.3.4.7: "Building Department Records - The term building department records means those records of the local government in which the property is located indicating permission of the local government to construct, alter, or demolish improvements on the property." ASTM also states that "Uses in the area surrounding the property shall be identified in the report, but this task is required only to the extent that this information is revealed in the course of researching the property itself."

EPA's Standards and Practices for All Appropriate Inquires (AAI) states: "§312.24: Reviews of historical sources of information. (a) Historical documents and records must be reviewed for the purposes of achieving the objectives and performance factors of §312.20(e) and (f). Historical documents and records may include, but are not limited to, aerial photographs, fire insurance maps, building department records, chain of title documents, and land use records."

## Methodology

EDR has developed the EDR Building Permit Report through our partnership with BuildFax, the nation's largest repository of building department records. BuildFax collects, updates, and manages building department records from local municipal governments. The database now includes 30 million permits, on more than 10 million properties across 1,600 cities in the United States.

The EDR Building Permit Report comprises local municipal building permit records, gathered directly from local jurisdictions, including both target property and adjoining properties. Years of coverage vary by municipality. Data reported includes (where available): date of permit, permit type, permit number, status, valuation, contractor company, contractor name, and description.

Incoming permit data is checked at seven stages in a regimented quality control process, from initial data source interview, to data preparation, through final auditing. To ensure the building department is accurate, each of the seven quality control stages contains, on average, 15 additional quality checks, resulting in a process of approximately 105 quality control "touch points."

For more information about the EDR Building Permit Report, please contact your EDR Account Executive at (800) 352-0050.

EDR® Environmental Data Resources Inc

BUILD FAX® PROPERTY HISTORY

# The EDR Property Tax Report

**Parcels 1, 2, and 3**
Franklin D Roosevelt Ave
Kapolei, HI 96707

Inquiry Number: 5070053.8
October 05, 2017

# EDR Building Permit Report

## Target Property and Adjoining Properties


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# EDR Building Permit Report: Search Documentation

10/05/17

| **Site Name:** | **Client Name:** |
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| Parcels 1, 2, and 3 | Element Environmental , LLC |
| Franklin D | 98-030 Hekaha Street |
| Kapolei, HI 96707 | Aiea, HI 96701-0000 |
| EDR Inquiry # 5070053.8 | Contact: Angie Peltier |

***Search Documentation***

**DATA GAP**

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Building permit data can be used to identify current and/or former operations and structures/features of environmental concern. The data can provide information on a target property and adjoining properties such as the presence of underground storage tanks, pump islands, sumps, drywells, etc., as well as information regarding water, sewer, natural gas, electrical connection dates, and current/former septic tanks.

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EDR® Environmental Data Resources Inc

BUILD FAX® PROPERTY HISTORY

# APPENDIX C

## Qualifications of Environmental Professionals

Arlene Campbell, Licensed Geologist

**Arlene H. Campbell, L.G.**
Associate
Senior Geologist

## EDUCATION:

**Graduate Work in Geology -** Vanderbilt University, 1988 - 1989
**B.A., Geology (minor in Hydrology) -** Austin Peay State University, 1988

## PROFESSIONAL REGISTRATIONS:

Licensed Geologist, Washington State, No. 1664, 2002

## SPECIALIZED TRAINING:

OSHA 40-hour Initial HAZWOPER Training and Current 8-hour Refresher
Hazardous Waste Site Supervisor Training

## SUMMARY OF EXPERIENCE:

Ms. Campbell is an Associate and Senior Geologist at Element Environmental LLC (E2). Ms. Campbell joined E2 on July 1, 2006, when E2 merged with Mountain Edge Environmental, Inc. She has 17 years of experience in Hawaii in the environmental consulting field. Her specific expertise includes site assessment, characterization, and remediation. Ms. Campbell has assisted with several state level task forces to assess environmental risk and address petroleum contaminated soils.

Ms. Campbell has managed many environmental projects involving Phase I Environmental Site Assessments (ESAs), preliminary assessments, emergency spill response, subsurface investigation, groundwater monitoring, assessment of fate and transport of surface and groundwater contaminants, soil and groundwater remediation, and risk assessment. She has also managed numerous underground storage tank (UST) removal projects which included preparation of plans and specifications for UST removal, UST removal monitoring, release response activities such as over-excavation, installation of soil borings and groundwater monitoring wells, long term remediation design and implementation, and report preparation.

Ms. Campbell has also managed a number of complex hazardous and biological waste removal and site closure projects which involved geophysical surveys, preparation of plans and specifications, waste characterization, and removal and disposal activities. She has performed Phase I ESAs and has assisted with the preparation and review of environmental impact statements. She has also performed environmental and hydrogeological investigations and has conducted remediation activities for several illegal landfill sites. Noteworthy projects Ms. Campbell has managed included several large emergency response site investigations and remediation projects involving the release of petroleum and PCBs. One of these projects included an emergency response to a major gasoline spill on Kauai that impacted air, soil, surface water, and groundwater. For this project, Ms. Campbell coordinated with the U.S. Coast Guard, county fire and police departments, EPA Region 9, Hawaii DOH, responsible parties, property owners, tenants, and the community. She monitored explosivity and contaminant migration in the subsurface, underground structures/utilities, buildings, a private sewage pumping station, an adjacent stream and the Pacific Ocean; coordinated emergency medical treatment and medical monitoring of affected spill response personnel and civilians; monitored installation of soil vapor points, soil borings, and groundwater monitoring wells; collected soil vapor, soil, groundwater, and stream water samples; prepared release response report; and provided technical support to legal team.

Ms. Campbell has been the principal investigator for several water quality related projects, including preparation of National Pollutant Discharge Elimination System (NPDES) permit applications for an auto recycling facility, an aquarium, a well drilling operation, a cemetery, and a museum; preparation of Storm Water Pollution Control Plans for an auto recycling facility and a solid waste transfer station; storm water and industrial discharge monitoring at various sites; and assisting clients in addressing NPDES compliance issues.

Angela Peltier, Geologist

element environmental llc
environmental · engineering · water resources

**Angela K. Peltier**
Geologist

## EDUCATION:

**B.S., Geology and Geophysics** – University of Hawaii, 2004

## SPECIALIZED TRAINING:

OSHA 40-hour Initial HAZWOPER Training

## SUMMARY OF EXPERIENCE:

Ms. Peltier is a Geologist at Element Environmental LLC (E2). Ms. Peltier joined E2 on July 1, 2006, when E2 merged with Mountain Edge Environmental, Inc. She has 9 years of experience in Hawaii in the environmental consulting field. Her specific expertise includes site assessment, characterization, and remediation.

Ms. Peltier has assisted in many environmental projects involving Phase I Environmental Site Assessments (ESAs), preliminary assessments, emergency spill response, subsurface investigation, groundwater monitoring, assessment of fate and transport of surface and groundwater contaminants, soil and groundwater remediation, risk assessment, groundwater monitoring, and explosive gas monitoring. She has also assisted in underground storage tank (UST) removal projects which included preparation of plans and specifications for UST removal, UST removal monitoring, release response activities such as over-excavation, installation of soil borings and groundwater monitoring wells, long term remediation design and implementation, and report preparation.

Ms. Peltier has also performed Phase I ESAs and has assisted with the preparation of environmental impact statements. She has also performed environmental and hydrogeological investigations and has conducted remediation activities for several illegal landfill sites.

Ms. Peltier has been involved in several water quality related projects, including preparation of National Pollutant Discharge Elimination System (NPDES) permit applications for an auto recycling facility, an aquarium, and a well drilling operation, preparation of Storm Water Pollution Control Plans for an auto recycling facility and a solid waste transfer station; storm water and industrial discharge monitoring at various sites.

## *Appendix C*

*Biological surveys for proposed road improvements at Kalaeloa, Kapolei, O‘ahu, AECOS, Inc., January 2018*

# Biological surveys for proposed road improvements at Kalaeloa, Kapolei, Oʻahu

Januarry 5, 2018 | **DRAFT** | *AECOS* No. 1529

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

## Introduction

The Kalaeloa Community Development District (Kalaeloa) encompasses approximately 3,695 acres of land within the former Barbers Point Naval Air Station (BPNAS) in Leeward Oahu (see Figure 1). The lands within Kalaeloa are presently owned by various federal, state, and county agencies. In 2002, Hawaiʻi Senate Bill 2702 was enacted into law (becoming Act 184), transferring responsibility of the Kalaeloa Community Development District (Kalaeloa) to the Hawaii Community Development Authority (HCDA). In May 2005, the Authority formally adopted the Kalaeloa Strategic Plan that envisioned Kalaeloa as a "Center for Excellence" or *Wahi Hoʻokela* within the Ewa District of Oahu. The redevelopment of Kalaeloa is a complex undertaking that will occur over the course of a generation or more, but is now underway (HCDA, 2018). Hunt Kalaeloa, in cooperation with the HCDA and various state and county agencies, proposes to alter and/or improve roadways in the central (former main base) area as an implementation of a site master plan and to better integrate the area with the adjacent Kapolei roadway layout.

Surveys conducted and reported on in this document cover natural resources along proposed roadway alignments (Figure 2). *AECOS*, Inc. was contracted by R. M. Towill to conduct the surveys for inclusion in an Environmental Assessment for the Project. The proposed improvements will involve an area of approximately 40 ac (16.2 ha). When completed the project will support the future development of public, residential and commercial uses within Kalaeloa. The proposed project involves modifications (e.g., widening, utilities, turn lanes) to a number of streets, particularly Saratoga and Roosevelt Avenues. In addition, significant road reconfiguration is indicated for the new southern extension of Kamōkila Boulevard, between Saratoga and Roosevelt Avenues, as well as alterations to Bennington Street between Hornet and Franklin streets (Cultural Surveys Hawaiʻi, 2017).

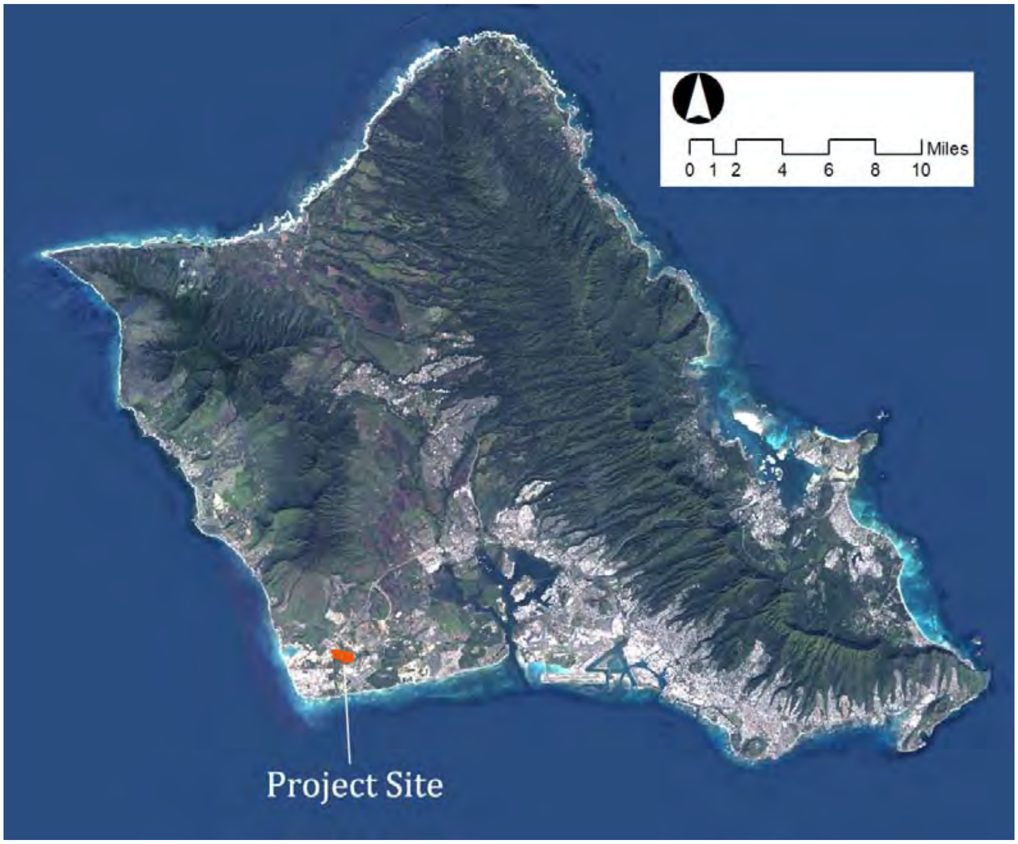


Figure 1. Project location (in red) on Island of Oʻahu.

Previously, *AECOS* completed covering the rehabilitation of the Navy Bachelor Officers Quarters (Bldg. 77; TMK: 9-1-013: 011) into an apartment complex, located along Roosevelt Ave between Hornet Ave. and Franklin Ave. (AECOS, 2014).

# Methods

## Flora Survey

Biological surveys of the site were conducted on December 8, 2017 by the authors. Our survey methodology entailed walking multiple "transects" along


Figure 2. Survey area (outlined in red)
showing avian point-count stations in light blue.

the existing and proposed roadways to achieve coverage sufficient to discover the presence of any biological resources of interest or concern. Plant names follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants and *A Tropical Garden Flora* (Staples & Herbst, 2005) for crop and ornamental plants. More recent name changes for naturalized plants follow Imada (2012).

## Avifauna Survey

The avian survey utilized nine point-count stations, distributed over the site and at representative environments within the survey area in order to maximize the likelihood of observing a broad range of bird species. Avian counts were conducted after sunrise and before noon, when birds are likely to be most active. The location of each station is provided in Fig. 2. All birds observed and/or heard during a six-minute period at each point-count station were identified to species and counted. Bird species not observed during stationary point-counts but observed at other times of the survey were noted as incidental observations.

Avian species identifications were verified with: *A Photographic Guide to the Birds of Hawaii: the Main Islands and Offshore Waters* (Denny, 2009). Taxonomy follows the Checklist of North and Middle American Birds by American Ornithologists' Union (AOU, 2017).

### Terrestrial Mammals Survey

A list of mammal species observed in the project area was recorded as biologists conducted botanical and avian surveys. Visual observation for tracks, scat, and other signs of mammalian use of the Project area were noted during the survey.

## Results

### Vegetation

The project location is within the central former residential and administrative parts of the former BPNAS and all of the area of proposed new or improved roadways is over highly disturbed ground. Only the extreme southwest corner (extension of Saatoga Avenue and new intersection with Kamōkila Blvd.) is an area lacking former development (roads and building structures and appurtenances). Consequently, the vegetation comprises level ground covered by weedy growth (grass and shrubland) with much unattended remnant landscape shrubs and trees. A few areas are grassy fields (see Figures 3 and 4).

### Flora

Table 1 is a listing of all the vascular plants observed in the survey area. A relative abundance code is presented for each. A total of 119 species is included in the list. Seven (7 or 6%) of the listed species are native (indigenous) plant species. Another 5 (4%) are early Polynesian introductions. Twenty-six (26) species (22%) are either ornamental plants or naturalized species used as ornamentals that were used as landscaping when the base was an active one.

Figure . 3. Saratoga Avenue is typical of the survey area roads that are in generally good condition and regularly utilized.

Figure 4. Southwest corner of the Project area (here at avian point-count Sta. 5) is a mixture of scrub and grassland with coral roads.

Table 1. Listing of plants (flora) for proposed roadway areas at Kalaeloa, west Oʻahu, Hawaiʻi.

| Family<br>Species | Common name | Status | Abundance | Notes |
|---|---|---|---|---|
| *GYMNOSPERMS* | | | | |
| CONIFERS AND CYCADS | | | | |
| ARAUCARIACEAE | | | | |
| *Araucaria columnaris* (G. Forster) J.D. Hook. | Cook Island pine | Nat | R | |
| FLOWERING PLANTS | | | | |
| DICOTYLEDONES | | | | |
| ACANTHACEAE | | | | |
| *Asystasia gangetica* (L.) T. Anderson | Chinese violet | Nat | A | |
| *Graptophyllum pictum* (L.) Griff. | caricature plant | Nat | R | <1> |
| AMARANTHACEAE | | | | |
| *Achyranthes aspera* L. | --- | Nat | R | |
| *Alternanthera pungens* Kunth | khaki weed | Nat | Oa | |
| *Amaranthus viridis* L. | slender amaranth | Nat | R | |
| ANACARDIACEAE | | | | |
| *Mangifera indica* L. | mango | Nat | R | <1> |
| *Schinus terebinthefolius* Raddi | Christmas berry | Nat | R | |
| APOCYNACEAE | | | | |
| *Nerium oleander* L. | oleander | Orn | Uu | |
| *Plumeria obtusa* L. | Singapore plumeria | Orn | R | |
| *Plumeria rubra* L. | graveyard flower | Orn | R | |
| *Thevetia peruviana* (Pers.) K. Schum. | be-still tree | Nat | R | <1> |
| ARALIACEAE | | | | |
| *Schefflera actinophylla* (Endl.) Harms | octopus tree | Nat | R | |
| ASCLEPIADACEAE | | | | |
| *Stapelia gigantea* N. E. Brown | giant toad plant | Nat | Uc | |
| ASTERACEAE (COMPOSITAE) | | | | |
| *Bidens alba L.* | beggartick | Nat | | |
| *Calyptocarpus vialis* Less. | --- | Nat | A | <2> |
| *Dyssodia tenuiloba* (Cand.) Robinson | | Nat | Ua | |
| *Eclipta alba* (L.) Hassk. | false daisy | Nat | R | |
| *Emilia fosbergii* Nicolson | Flora's paintbrush, *pualele* | Nat | U | <3> |
| *Pluchia carolinensis* (Jacq.) G. Don | sourbush | Nat | O | |
| *Sonchus oleraceus* L. | sow thistle | Nat | Rc | |
| *Synedrella nodiflora* (L.) Gaertn. | nodeweed | Nat | | |
| *Tridax procumbens L.* | coat buttons | Nat | O | |

Table 1 (continued).

| Family<br>Species | Common name | Status | Abundance | Notes |
|---|---|---|---|---|
| ASTERACEAE (continued) | | | | |
| *Verbesina enceliodes* (Cav.) Benth. & Hook. | golden crown-beard | Nat | U | |
| *Xanthium strumarium* L. | cocklebur, *kīkānia* | Nat | R | <3> |
| *Youngia japonica* (L.) DC. | Oriental hawksbeard | Nat | U | |
| BIGNONIACEAE | | | | |
| ? *Tabebuia* sp. | --- | Orn | Uc | <3> |
| *Tabebuia heterophylla* (A. P. de Candolle) Britt. | pink tecoma | Orn | R | |
| BORAGINACEAE | | | | |
| *Cordia sebestena* L. | geiger tree | Orn | R | |
| *Cordia subcordata* Lam. | *kou* | **Ind** | R | <3> |
| *Heliotropum procumbens* Mill. | --- | Nat | Oc | |
| CHENOPODIACEAE | | | | |
| *Atriplex suberecta Verd.* | --- | Nat | R | |
| *Chenopodium ambrosioides* L. | Mexican tea | Nat | R | |
| *Salsola kali* L. | Russian thistle | Nat | R | |
| CLUSIACEAE | | | | |
| *Calophyllum inophyllum* L. | *kamani* | **Pol** | R | |
| CONVOLVULACEAE | | | | |
| *Ipomoea cairica* (L.) Sweet | *koali ʻai* | **Ind** | R | |
| *Ipomoea obscura* (L.) Ker-Gawl. | --- | Nat | U | |
| *Ipomoea triloba* L. | little bell | Nat | U | |
| *Merremia aegyptica* (L.) Urb. | hairy merremia | Nat | U | |
| CUCURBITACEAE | | | | |
| *Cucumus sp.* | indet. melon | Orn | R | <3> |
| *Momordica charantia* L. | wild bitter melolon | Nat | U | |
| EUPHORBIACEAE | | | | |
| *Euphorbia hirta* L. | garden spurge | Nat | Oc | |
| *Euphorbia hypericifolia* L. | graceful spurge | Nat | R | |
| *Euphorbia prostrata* Aiton | prostrate spurge | Nat | Oc | |
| FABACEAE | | | | |
| *Acacia farnesiana* (L.) Willd. | *klu* | Nat | R | |
| *Albizia saman F. Muell.* | monkeypod | Nat | C | |
| *Cassia* xnealiae H.S. Irwin & Barneby | rainbow shower | Orn | R | <3> |
| *Chamaecrista nictitans* (L.) Moench | partridge pea | Nat | Uc | |
| *Desmanthus virgatus* (L.) Willd. | virgate mimosa | Nat | O | |
| *Enterolobium cyclocarpum* (N. Jacq.) Grisb. | earpod | Orn | U | <1> |
| *Leucaena leucocephala* (Lam.) deWit | *koa haole* | Nat | Oc | |
| *Indigofera hendecaphyla* Jacq. | creeping indigo | Nat | R | |

Table 1 (continued).

| Family<br>Species | Common name | Status | Abundance | Notes |
|---|---|---|---|---|
| FABACEAE (continued) | | | | |
| *Indigofera suffruticosa* Mill. | indigo | Nat | R | |
| *Macroptilium atropurpureum* (DC.) Urb. | --- | Nat | U | |
| *Macroptilium lathyroides* (L.) Urb. | wild bean, cow pea | Nat | R | |
| *Neonotonia wightii* (Wight & Arnott) Lackey | glycine | Nat | R | |
| *Pithecelobium dulce* (Roxb.) Benth. | *ʻopiuma* | Nat | C | |
| *Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth | *kiawe* | Nat | C | |
| *Senna surattensis* (L. Burm.) H. Irwin & Barneby | *kolomona* | Nat | R | <3> |
| *Senna* sp. | | Nat | R | <3> |
| LAMIACEAE | | | | |
| *Leonotis nepetifolia* (L.) R. Br. | lion's ear | Nat | U | |
| *Ocimum basilicum* L. | common basil | Nat | R | |
| LAURACEAE | | | | |
| *Cassytha filiformis* L. | *kaunaʻoa pehu* | **Ind** | R | <3> |
| MALVACEAE | | | | |
| *Abutilon grandifolium* (Wild.) Sweet | hairy abutilon | Nat | R | |
| *Abutilon incanum (Link) Sweet* | *koʻoloa keokeo* | **Ind** | R | |
| *Alysicarpus vaginalis* (L.) DC. | Alyce clover | Nat | R | |
| *Hibiscus rosa-sinensis* L. | Chinese hibiscus | Orn | Ru | |
| *Malva parviflora L.* | cheese weed | Nat | Oc | |
| *Malvastrum coromandelianum* (L.) Garck | false mallow | Nat | U | |
| *Sida ciliaris* L. | --- | Nat | AA | |
| *Sida fallax* Walp. | *ʻilima* | **Ind** | Oc | |
| *Waltheria indica* L. | *ʻuhaloa* | Nat | Oa | |
| MELASTOMATACEAE | | | | |
| *Dissotis rotundifolia* (Sm.) Triana | --- | Nat | Ru | |
| MORACEAE | | | | |
| *Artocarpus altilis* (Z.) Fosb. | *ʻulu*, breadfruit | **Pol** | R | |
| *Ficus lyrata* Warburg | fiddle-leaf fig | Orn | Ru | |
| *Ficus microcarpa* L. fil. | Chinese banyan | Nat | O | |
| MORINGACEAE | | | | |
| *Moringa oleifera* Lam. | horseradish tree | Nat | R | |
| NYCTAGINACEAE | | | | |
| *Boerhavia coccinea* Mill. | false *alena* | Nat | A | |
| *Bougainvillea spectabilis* Wild. | bougainvillea | Orn | U | |

Table 1 (continued).

| Family<br>Species | Common name | Status | Abundance | Notes |
|---|---|---|---|---|
| OXALIDACEAE | | | | |
| *Oxalis corniculatum* L. | *ihi'ai* | **Pol** | R | |
| PASSIFLORACEAE | | | | |
| *Passiflora foetida* L. | running pop | Nat | O | |
| MORACEAE | | | | |
| *Artocarpus altilis* (Z.) Fosb. | *'ulu*, breadfruit | **Pol** | R | |
| PLANTAGINACEAE | | | | |
| *Plantago lanceolata* L. | nrw-lvd plantain | Nat | R | |
| POLYGONACEAE | | | | |
| *Antigonon leptopus* Hook. & Arnott | Mexican creeper | Nat | R | |
| PORTULACACEAE | | | | |
| *Portulaca oleracea* L. | pigweed | Nat | R | |
| *Portulaca pilosa* L. | --- | Nat | Uc | |
| RUBIACEAE | | | | |
| *Spermacoce assurgens* Rius & Pav.. | buttonweed | Nat | R | |
| RUTACEAE | | | | |
| *Murraya paniculata* (L.) W. Jack | mock orange | Nat | R | |
| SAPINDACEAE | | | | |
| *Filicium decipiens* Thwaites ex. J.D. Hook. | fern tree | Nat | R | |
| SCROPHULARIACEAE | | | | |
| *Bacopa monnieri* (L.) Pennell | *'ae'ae* | **Ind** | R | |
| SOLANACEAE | | | | |
| *Solanum lycopersicum* var. *cerasiforme* (Dunal) Spooner, G. Anderson, & Jansen | wild cherry tomato | Nat | R | |
| *Solanum seaforthianum* Andr. | --- | Nat | R | |
| VERBENACEAE | | | | |
| *Stachytarpheta australus* Moldenke | --- | Nat | R | |
| *Vitex trifolia* var. *subtrisecta* (Kuntze.) Mold. | *polinalina,* vitex | Nat | Uc | |
| ZYGOPHYLLACEAE | | | | |
| *Guaiacum officinale* L. | lignum-vitae | Orn | R | <3> |
| MONOCOTYLEDONES | | | | |
| AGAVACEAE | | | | |
| *Agave attenuata* Salm-Dyck | swan's-neck agave | Orn | R | |
| *Agave sisalina* Perrine | sisal | Nat | R | |
| *Sanseviera trifasciata* Prain | bowstring-hemp | Orn | R | |
| ALOACEAE | | | | |
| *Aloë vera* (L.) N.L. Burm. | aloë | Orn | R | |

Table 1 (continued).

| Family<br>Species | Common name | Status | Abundance | Notes |
|---|---|---|---|---|
| ARACEAE | | | | |
| *Epipremnum pinnatum* (L.) Engler | golden pothos | Nat | R | |
| ARECACEAE | | | | |
| *Cocos nucifera* L. | coconut palm | **Pol** | Uc | <1> |
| *Pritchardia* sp. | *loulu* palm | ?Orn | R | |
| *Veitchia merrilli* (Becarri) H. E. Moore | Manila palm | Orn | R | |
| COMMELINACEAE | | | | |
| *Commelina benghalensis* L. | hairy *honohono* | Nat | R | |
| *Tradescantia spathacea* Swartz | oyster plant | Orn | R | |
| CYPERACEAE | | | | |
| *Cyperus gracilis* R. Br. | McCoy grass | Nat | Ru | |
| *Cyperus rotundus* L. | nut grass | Nat | Uu | |
| *Kylinga nemoralis* (J. R. Forster & G. Forster) Dandy ex Hutchinson & Dalziel | *kili'o'opu* | Nat | U | |
| LILIACEAE | | | | |
| *Crinum asiaticum* L. | giant lily | Nat | R | <1,3> |
| PANDANACEAE | | | | |
| *Pandanus tectorius* S. Parkinson x Z. | *hala* | **Ind** | R | |
| POACEAE | | | | |
| *Axonopus compressus* (Swartz) P. Beauv. | brd-lv carpet grass | Nat | Oa | <2> |
| *Bothriochloa pertusa* (L.) Camus | pitted beardgrass | Nat | Ca | <2> |
| *Cenchrus ciliaris* L. | buffelgrass | Nat | AA | |
| *Cenchrus echinatus L.* | common sandbur | Nat | U | |
| *Chloris barbata* (L.) Sw. | swollen fingergrass | Nat | O | |
| *Cynodon dactylon* (L.) Pers. | Bermuda grass | Nat | AA | |
| *Eleusine indica* (L.) Gaertn. | wiregrass | Nat | O | |
| *Eragrostis pectinacea* (Michx.) Nees | Carolina lovegrass | Nat | O | |
| *Eremochloa ophiuroides* Büse | centipede grass | Orn | Ua | <2> |
| *Megathyrsus maximus* (Jacq.) B.K. Simon & W.L. Jacobs | Guinea grass | Nat | AA | |
| *Melinus repens* (Willd.) Zizka | Natal redtop | Nat | O | |
| *Urochloa distachya* (L.) T.Q. Nguyen | --- | Nat | U | |

**Legend to Table 1.**

STATUS = distributional status for the Hawaiian Islands:

**Ind** = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.

Table 1 (continued).

Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
Orn = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).
**Pol** = Polynesian introduction before 1778 (none in the list).

ABUNDANCE = occurrence ratings for plants by area:
R – Rare seen in only one or perhaps two locations.
U - Uncommon- seen at most in several locations
O - Occasional seen with some regularity
C - Common observed numerous times during the survey
A - Abundant found in large numbers; may be locally dominant.
AA - Very abundant; abundant and dominant; defining vegetation type.
Lowercase letters following an occurrence rating indicate clusters within the survey area. The ratings above provide an estimate of the likelihood of encountering a species within the specified survey area; numbers modify this where abundance, where encountered, tends to be greater than the occurrence rating:
u = several plants present ; with C or A = in one area only.
c = many plants present ; with C or A = in a few areas.
a = locally abundant; with C or A = in several to many areas but still limited.

NOTES:
<1> - Naturalized, but planted here as a landscape plant (used as an ornamental).
<2> - In maintained lawns.
<3> – Plant observed was lacking fruit or flowers; identification uncertain.

## Avian Survey

A total of 247 birds representing 22 species was observed during the avian survey (Table 2). The fauna listing includes one endemic and two indigenous migratory species, as well as 19 species alien to the Hawaiian Islands.

Three individuals of the endemic Hawaiian Black-necked Stilt or *ʻaeʻo* (*Himantopus mexicanus knudseni*) were observed foraging on the lawn of Barber's Point Elementary School at Station 8, before being flushed by the school children coming out to recess. A single Wandering Tattler or *ʻūlili* (*Tringa incana*), an indigenous migrant shorebird, was incidentally observed in-flight, transitioning through the Project area in a west-bound direction near Boxer Road. A total of 17 Pacific Golden Plover or *kolea* (*Pluvialis fulva*), another indigenous migratory species, were observed at five of the nine point-count stations and commonly found on lawns and other open grassy areas throughout the Project. The presence of both the Wandering Tattler and

Hawaiian Black-necked Stilts may be partly attributed to the drainage canal to the west of the Project, as the riparian and estuarine habitats in the canal are attractants for the two species.

The avian diversity and density at the Project was fairly typical of highly-disturbed dry lowlands and urbanized developments on the ʻEwa Plain of Oʻahu. Of the total individual birds observed, approximately 92% are non-native alien species. The species most observed were Common Waxbill (*Estrilda astrild*), Common Mynah (*Acridotheres tristis*), Zebra Dove (*Geopelia striata*), and Spotted Dove (*Streptopelia chinensis*). Combined, these four species constituted 55% of the total birds observed during the survey, and each species was counted at seven or more of the nine point-count stations.

### Terrestrial Mammals

Feral and domestic (pet) cats (*Felis catus*) were observed occasionally throughout the survey area, but were most frequently observed in the scrub-shrub outlying residential areas adjacent to the survey area. One domestic (pet) dog (*Cannis l. familiaris*) was being walked along Franklin Street. Other mammals likely to frequent the area include the small Asian mongoose (*Herpestes javanicus*) and various introduced rodent species.

## Discussion

### Flora

No plants species of any particular concern were noted during the survey and, given the highly disturbed nature of most of the area, none is expected to be present. No plants listed as endangered or threatened under the federal Endangered Species Act of 1973 (ESA) as amended, or the State of Hawaiʻi endangered species statute, Hawaiʻi Revised Statutes (HRS) 195D (USFWS, 2014; DLNR, 1998) were observed

Botanical resources of interest or potential concern from a conservation perspective are valuable landscape trees, exceptional trees (protected by County ordnance), and rare native species. Only very rare natives would be candidates for listing as threatened or endangered under the Endangered Species Act (ESA), and these would very likely be endemics (plants uniquely native to the Hawaiian Islands). ESA listed species known from the ʻEwa Plain include *koʻoloaʻula* (*Abutilon menziesii*), *Achyranthes splendens* var. *rotundata*, and an *ʻakoko* (*Euphorbia skottsbergii* var. *skottsbergii*). Not listed, but

Table 2. Avian point-count stations and incidental sighting results.

| Common Name | Scientific Name | ST | Station 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | IS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GALLIFORMES** | | | | | | | | | | | | |
| PHASIANIDAE - Pheasants & Partridges | | | | | | | | | | | | |
| Grey Francolin | *Francolinus pondicerianus* | A | -- | -- | -- | -- | 2 | -- | -- | -- | -- | |
| Domestic chicken | *Gallus* sp. | D | -- | -- | 1 | 1 | -- | -- | -- | -- | -- | |
| **PELECANIFORMES** | | | | | | | | | | | | |
| ARDEIDAE - Herons, Bitterns & Allies | | | | | | | | | | | | |
| Cattle Egret* | *Bubulcus ibis* | A | -- | 1 | 1 | -- | -- | -- | -- | -- | -- | |
| **CHARADRIIFORMES** | | | | | | | | | | | | |
| RECURVIROSTRIDAE – Stilts & Avocets | | | | | | | | | | | | |
| *aʻeo*, Hawaiian Black-necked Stilt* | *Himantopus mexicanus knudseni* | **EE** | -- | -- | -- | -- | -- | -- | -- | 3 | -- | |
| CHARADRIIDAE - Lapwings & Plovers | | | | | | | | | | | | |
| *kōlea*, Pacific Golden-Plover* | *Pluvialis fulva* | **IM** | 1 | 6 | 1 | -- | -- | -- | -- | 5 | 4 | |
| SCOLOPACIDAE - Sandpipers | | | | | | | | | | | | |
| *ʻūlili*, Wandering Tattler* | *Tringa incana* | **IM** | -- | -- | -- | -- | -- | -- | -- | -- | -- | ✓ |
| **COLUMBIFORMES** | | | | | | | | | | | | |
| COLUMBIDAE - Pigeons & Doves | | | | | | | | | | | | |
| Spotted Dove | *Streptopelia chinensis* | A | 4 | 8 | 3 | 2 | -- | 1 | 2 | 2 | 2 | |
| Zebra Dove | *Geopelia striata* | A | 1 | 7 | 3 | -- | 4 | 3 | 1 | 10 | 6 | |
| **PASSERIFORMES** | | | | | | | | | | | | |
| PYCNONOTIDAE - Bulbuls | | | | | | | | | | | | |
| Red-vented Bulbul | *Pycnonotus cafer* | A | 2 | 4 | 1 | 6 | 3 | -- | -- | 3 | -- | |
| Red-whiskered Bulbul | *Pycnonotus jocosus* | A | -- | -- | -- | -- | -- | -- | -- | -- | -- | ✓ |
| ZOSTEROPIDAE - White-eyes | | | | | | | | | | | | |
| Japanese White-eye | *Zosterops japonicus* | A | 4 | 2 | 1 | 2 | 2 | 3 | 3 | -- | 3 | |
| MIMIDAE - Mimids | | | | | | | | | | | | |
| Northern Mockingbird* | *Mimus polyglottos* | A | -- | 1 | -- | -- | -- | 1 | -- | -- | -- | |

Table 2 (continued).

| Common Name | Scientific Name | ST | Station 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | IS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STURNIDAE - Starlings | | | | | | | | | | | | |
| Common Myna | *Acridotheres tristis* | A | 4 | 10 | 5 | 2 | 4 | -- | 1 | 7 | 3 | |
| CARDINALIDAE - Cardinals, Saltators & Allies | | | | | | | | | | | | |
| Northern Cardinal* | *Cardinalis cardinalis* | A | 2 | 1 | -- | -- | -- | 2 | 5 | -- | -- | |
| PASSERIDAE - Old World Sparrows | | | | | | | | | | | | |
| House Sparrow | *Passer domesticus* | A | 1 | -- | 1 | -- | 1 | -- | 1 | -- | 4 | |
| FRINGILLIDAE - Fringilline & Carduline Finches & Allies | | | | | | | | | | | | |
| House Finch* | *Haemorhous mexicanus* | A | -- | 1 | -- | 2 | 2 | -- | 2 | -- | -- | |
| THRAUPIDAE - Tanagers | | | | | | | | | | | | |
| Red-crested Cardinal | *Paroaria coronata* | A | 1 | -- | 1 | -- | 1 | -- | 2 | -- | -- | |
| Saffron Finch | *Sicalis flaveola* | A | -- | -- | 5 | -- | -- | -- | -- | -- | 2 | |
| ESTRILDIDAE - Estrildid Finches | | | | | | | | | | | | |
| African Silverbill | *Euodice cantans* | A | -- | -- | -- | -- | 4 | -- | -- | -- | -- | |
| Common Waxbill | *Estrilda astrild* | A | 5 | 3 | 14 | -- | 4 | 2 | - | 3 | 10 | |
| Java Sparrow | *Lonchura oryzivora* | A | -- | -- | 1 | -- | -- | -- | -- | -- | -- | |
| Chestnut Munia | *Lonchura atricapilla* | A | -- | -- | 1 | -- | -- | -- | -- | 1 | -- | |

## Key to Table 2

**ST** Status

- D Domestic – Domesticated species not considered established in the wild on O‘ahu.
- A Alien – Introduced to the Hawaiian Islands by humans.
- IM Indigenous Migratory – A native migratory species, but not unique to the Hawaiian Islands.
- EE Endangered Endemic – Endemic and Endangered species, unique to the Hawaiian Islands.
- *RA* Relative Abundance – Number of birds detected divided by the number of count stations (9).

* Species protected by MBTA.

***IS*** Incidental observation.

considered rare and potentially threatened, especially within its range on Oʻahu, is *maiapilo* (*Capparis sandwichiana*). None of these plants occur within the survey area.

Although 7 of the observed plant species are native (indigenous) plants, only *koʻoloa keokeo* (*Abutilon incanum*) can be described as uncommon in most lowland dry areas on Oʻahu, but is not so rare outside of urban settings. Various planted trees are scattered across the site, some of considerable age (for examples, mango, monkeypod, earpod, and *ʻopiuma*, trees). These may have considerable landscape value, but none is protected or, for that matter, likely to be disturbed by the roadway improvements plans. However, no trees listed by the City and County of Honolulu, Exceptional Trees Program occur here (C&C, 2017).

An area south of Boxer Road just outside the survey area is designated Critical Habitat for selected plants listed on Oʻahu (Lowland dry habitat Unit 10). The endangered *ʻakoko* (*Euphorbia skottsbergii* var. *skottsbergii*) is known to occur in this designated area (USFWS, 2011).

## Fauna

<u>Avian Resources</u> - The avian survey revealed a total of 22 avian species, including one endemic and two indigenous migratory species. The other 19 species are alien (not native) to the Hawaiian Islands. Of the bird species observed, only the Hawaiian Black-necked Stilt is listed as an endangered species under both the federal Endangered Species Act of 1973 and the State of Hawaiʻi endangered species statutes (USFWS, 2014; DLNR, 2015). Project activities are not anticipated to directly impact foraging habitat for this species; indeed the birds were observed on a playground field at Barber's Point Elementary School, a location unlikely to be disturbed by Project activities. Construction-related noise may be an indirect impact influencing foraging behavior, an impact already occurring when students play on the field. Suitable alternative foraging habitat is abundant in nearby areas, and no long-term impacts to the species are anticipated. This species does not actively nest in the area due to a lack of suitable nesting habitat.

Of the 22 bird species observed, seven are protected by the Migratory Bird Treaty Act of 1918 (MBTA): Black-necked Stilt; Wandering Tattler; Northern Mockingbird (*Mimus polyglottos*); Cattle Egret (*Bubulcus ibis*); House Finch (*Carpodacus mexicanus*); Northern Cardinal (*Cardinalis cardinalis*); and Pacific Golden Plover (USFWS, 2013). It is unlawful to pursue, hunt, take, capture, kill, or sell birds species protected under the MBTA without a permit. The statute also protects bird parts, including feathers, eggs, and nests.

The *pueo* or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) is a state-listed endemic sub-species (on Oʻahu only) and has been recorded on undeveloped lands *mauka* (inland) of Kapolei. While not observed during this survey (these birds are crepuscular, active mostly in the evening and early morning hours), it is possible that this owl may hunt over grassy fields in the the Project area. With the exception of "new" roadways proposed for the far western end, *Pueo* feeding and ground-nest sites would be unlikely due to the extensive development and regularly disturbing activities.

No seabirds were observed during the survey, and no evidence of seabird nesting colonies were discovered, nor are any such colonies currently known in this area. However, seabirds may overfly the site on occasion. Therefore, the only likely impact to seabirds would be the installation of outdoor lights. Night lights can disorient nocturnally-flying seabirds, particularly fledglings, resulting in their potential downing and harm from collision with objects and/or predation by feral dogs and cats if downed.

- During construction, the presence of any ESA-listed species within 50 m (164 ft) of the project work area would necessitate halting of work until the animal voluntarily leaves the work area.

- Immediately prior to the start of grading at the far western end of the site, a survey for *Pueo* ground-nesting activity should be undertaken. If a nest is discovered, DLNR must be notified before proceeding with grading or grubbing that could disturb the nesting activity.

- If night-time construction activity and/or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

- If streetlights or exterior facility lighting are installed in conjunction with the project, it is recommended that the lights be shielded to reduce the potential for interactions between nocturnally flying seabirds and external lights and/or man-made structures (Reed et al., 1985; Telfer et al., 1987).

<u>Mammalian Resources</u> - The findings of mammals at the survey are consistent with the location of the survey area and habitats present. Both dog and cat are alien to the Hawaiian Islands. Other mammal species not observed during the survey but likely to occur in the area include the small Asian mongoose and various rodent species, of which all are considered alien to the Hawaiian

Islands, as well as deleterious to the native ecosystems and native faunal species.

The Hawaiian hoary bat or *ʻōpeʻapeʻa* (*Lasiurus cinereus semotus*) is the only ESA listed terrestrial mammal in Hawaiʻi. Surveys for the bat were not included in the scope of this survey, as detection for the species requires specialized acoustic equipment deployed over multiple nights. Given the scarcity of records of this species from the ʻEwa Plain, it is unlikely that bats use resources in the project vicinity. Numerous potential roosting trees (trees in excess of 4.6 m [15 ft]) are present on the property.

- To avoid potential deleterious impacts to roosting bats with pups, it is recommended that no woody vegetation taller than 4.6 m (15 ft) be removed during the pupping season, from June 1 to September 15.

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# *Appendix D*

*Archaeological Literature Review and Field Inspection,*
*Cultural Surveys Hawai'i, Inc., December 2017*

# Draft
# Archaeological Literature Review and Field Inspection Report for the Kalaeloa Access Roadways Project, Honouliuli Ahupuaʻa, ʻEwa District, Oʻahu
# TMK: [1] 9-1-013 and 160

**Prepared for**
**R.M. Towill Corporation**
**on behalf of**
**Hunt Kalaeloa**


**Prepared by**
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**Kailua, Hawaiʻi**
**(Job Code: HONOULIULI 138)**



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# Management Summary

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| **Reference** | Archaeological Literature Review and Field Inspection Report for the Kalaeloa Access Roadways Project, Honouliuli Ahupuaʻa, ʻEwa District, Oʻahu, TMK: [1] 9-1-013 and 160 (Harrington et al. 2017) |
| **Date** | December 2017 |
| **Project Number(s)** | Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: HONOULIULI 138 |
| **Investigation Permit Number** | CSH completed the fieldwork component of this study under archaeological fieldwork permit number 17-08, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-282. |
| **Agencies** | SHPD |
| **Land Jurisdiction** | United States of America; State of Hawaiʻi; City & County of Honolulu |
| **Project Proponent** | Hunt Kalaeloa |
| **Project Funding** | R.M. Towill Corporation |
| **Project Location** | The project area includes various streets, intersections, and cross-country segments in the area of Barbers Point in Honouliuli Ahupuaʻa, ʻEwa District, Oʻahu, TMK Plats: [1] 9-1-013 and 160. The intersections include those of Kapolei Parkway and Kalaeloa Boulevard, Kapolei Parkway and Kamōkila Boulevard, Roosevelt Avenue and Kamōkila Boulevard, Kapolei Parkway and Wākea Street, Fort Barrette Road and Kapolei Parkway, and Fort Barrette Road and Kamaʻaha Avenue. The street segments include a northwestern portion of Saratoga Avenue, a southern extension of Kamōkila Boulevard, a West Perimeter Road, Copahee Avenue, a northern portion of Hornet Street, a southern extension of Wākea Street, a northern portion of Franklin street, and a western portion of Roosevelt Avenue. The cross-country segment is Road A. It is depicted on a portion of the 1998 Ewa U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle. |
| **Project Description** | The proposed project involves modifications (e.g., widening, utilities, turn lanes) to a number of streets, particularly Saratoga and Roosevelt Avenues. In addition, significant road reconfiguration is indicated for a new southern extension of Kamōkila Boulevard between Saratoga and Roosevelt Avenues, as well as new alterations to Bennington Street between Hornet and Franklin Streets. |
| **Project Acreage** | 40 acres (16.2 hectares) |

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| **Document Purpose** | This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations. This document is intended to facilitate the project's planning and support the project's historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey investigation, per HAR §13-276. |
| **Fieldwork Effort** | The fieldwork component of this field inspection was completed 17 and 18 October 2017, and 15 November 2017 by CSH archaeologists under the general supervision of Principal Investigator David Shideler, M.A. This work required approximately 5-person days to complete. A 100%-coverage pedestrian inspection of the project area and GPS data collection was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished through systematic sweeps spaced 5 m apart. |
| **Results Summary** | Background research and review of previous archaeological studies has identified the area as not having been heavily used in the pre-Contact and post-Contact periods for habitation. In pre-Contact periods, the area is associated with various gods. The Puʻu o Kapolei Heiau is located to the northeast of the project area. In the post-Contact period, the area was used for domestic animal husbandry and was later heavily utilized for military purposes, including Barbers Point military complex.<br><br>During the field inspection, several remnants of historic foundations were documented and designated as CSH 1. These features correspond with the historic military buildings built in the 1940s to 1950s. A filled-in well (CSH 2) of indeterminate age was documented along Roosevelt Avenue. A former road (CSH 3) was also documented along Saratoga Avenue near the area of CSH 1. CSH 3 corresponds with a road seen on historic maps. Consultation with SHPD is recommended regarding formal historic property designation for CSH 2 due to the historic nature of artesian well drilling in the area. |

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| **Recommendations** | While the features of CSH 1 are older than 50 years of age, they appear to lack integrity due to the buildings and foundations having been removed and only remnants of base course and debris remaining. Consultation with SHPD is recommended regarding formal historic property designations for these remnant foundations and the former road (CSH 3). CSH's informed opinion is that the CSH 1 features do not fulfill the criteria pursuant to HAR §13-275-6. Consultation with SHPD is recommended regarding formal historic property designation for the filled-in well (CSH 2) due to the historic nature of artesian well drilling in the area.<br><br>Based on the results of this study, early consultation with SHPD is recommended to determine what (if any) further archaeological study is indicated. CSH recommends a combination of on-site and on-call monitoring with on-site monitoring limited to the southern extension of Kamōkila Boulevard, the Wākea Street Extension, and "Road A" and on-call monitoring for all other areas of the project that are current roadways. Reasoning for this recommended monitoring plan is due to the potential for historic surface and subsurface sites to be encountered within the areas previously utilized by the Barbers Point Naval Air Station. Due to the heavily disturbed nature at the intersections, it is unlikely that historic properties would be encountered. |

# Table of Contents

# List of Figures

# List of Tables

# Section 1 Introduction

## 1.1 Project Background

At the request of R.M. Towill Corporation on the behalf of Hunt Kalaeloa, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this literature review and field inspection report (LRFI) for the Kalaeloa Access Roadways project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-1-013, various parcels and roads. The 40 acre (16.2 hectares) project area, owned by the United States of America; State of Hawai‘i; and the City and County of Honolulu, is depicted on a portion of the 1998 Ewa U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plats (Figure 2 and Figure 3), and a 2013 aerial photograph (Figure 4).

The proposed project involves modifications (e.g., widening, utilities, turn lanes) to a number of streets, particularly Saratoga and Roosevelt Avenues. In addition, significant road reconfiguration is indicated for the new southern extension of Kamōkila Boulevard, between Saratoga and Roosevelt Avenues, as well as new alterations to Bennington Street between Hornet and Franklin streets. The study area includes the following:

- The proposed intersection improvements at:
  - The intersection of Kapolei Parkway and Kalaeloa Boulevard,
  - The intersection of Kapolei Parkway and Kamōkila Boulevard,
  - The intersection of Roosevelt Avenue and Kamōkila Boulevard,
  - The intersection of Kapolei Parkway and Wākea Street,
  - The intersection of Fort Barrette Road and Kapolei Parkway,
  - The intersection of Fort Barrette Road and Kama‘aha Avenue,
- A northwestern portion of Saratoga Avenue including a yet-to-be created segment,
- A southern extension of Kamōkila Boulevard,
- A West Perimeter Road,
- Copahee Avenue,
- A northern portion of Hornet Street,
- A southern extension of Wākea Street,
- A northern portion of Franklin Street,
- A to be created Road A, and
- A western portion of Roosevelt Avenue.

## 1.2 Document Purpose

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

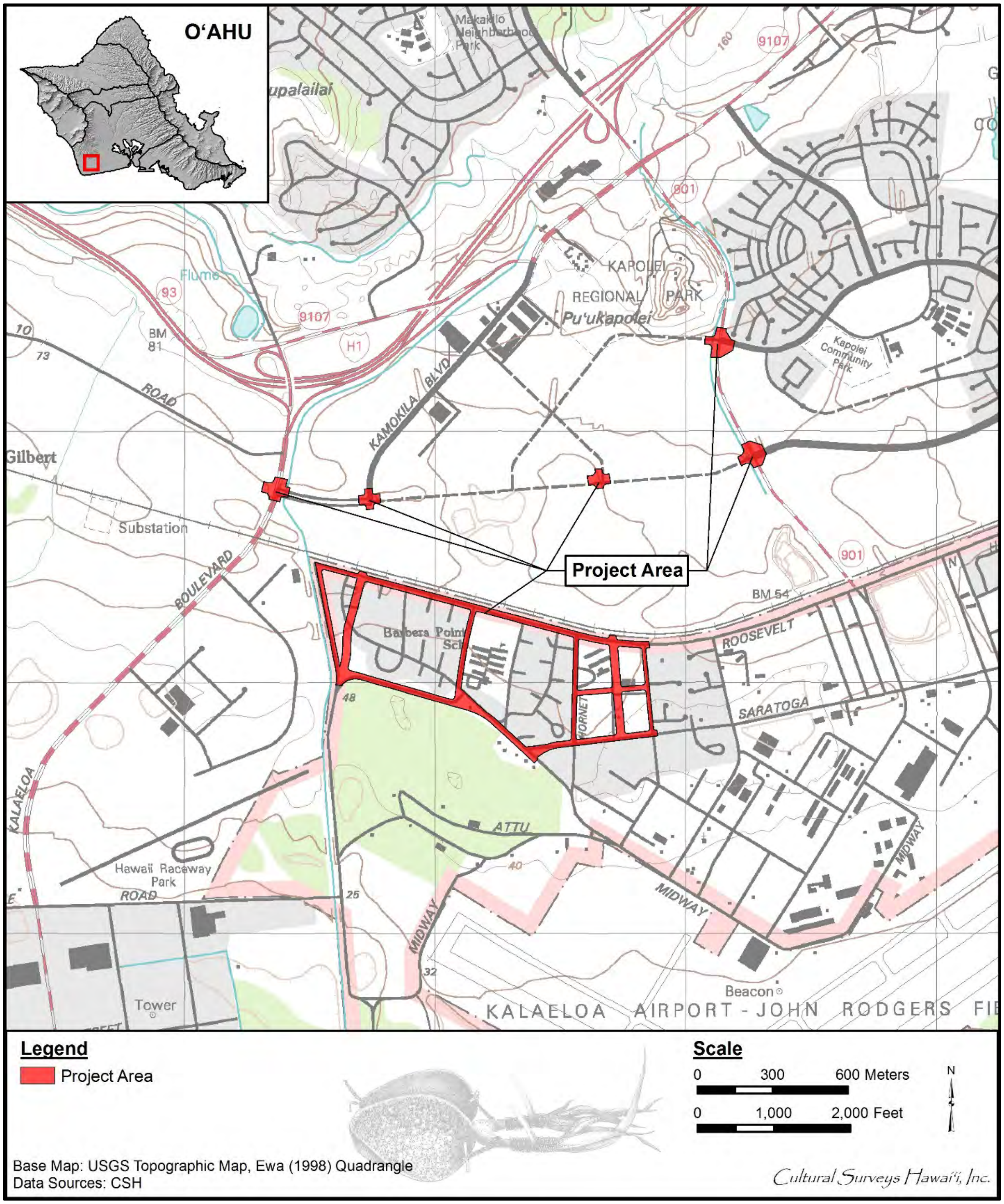


Figure 1. Portion of the 1998 Ewa USGS 7.5-minute topographic quadrangle showing the project area

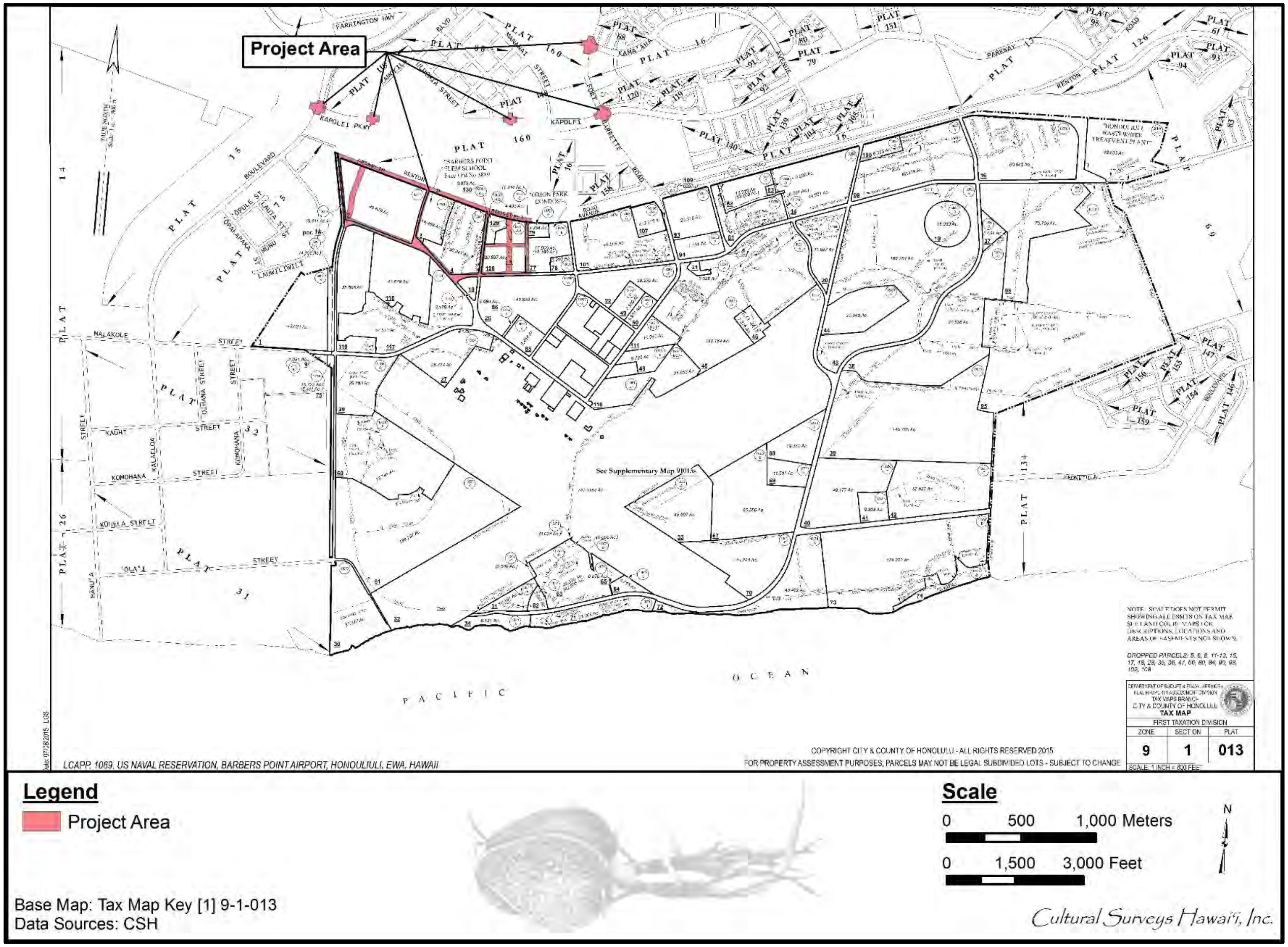


Figure 2. Tax Map Key (TMK) [1] 9-1-013 showing the project area (Hawai‘i TMK Service 2014)

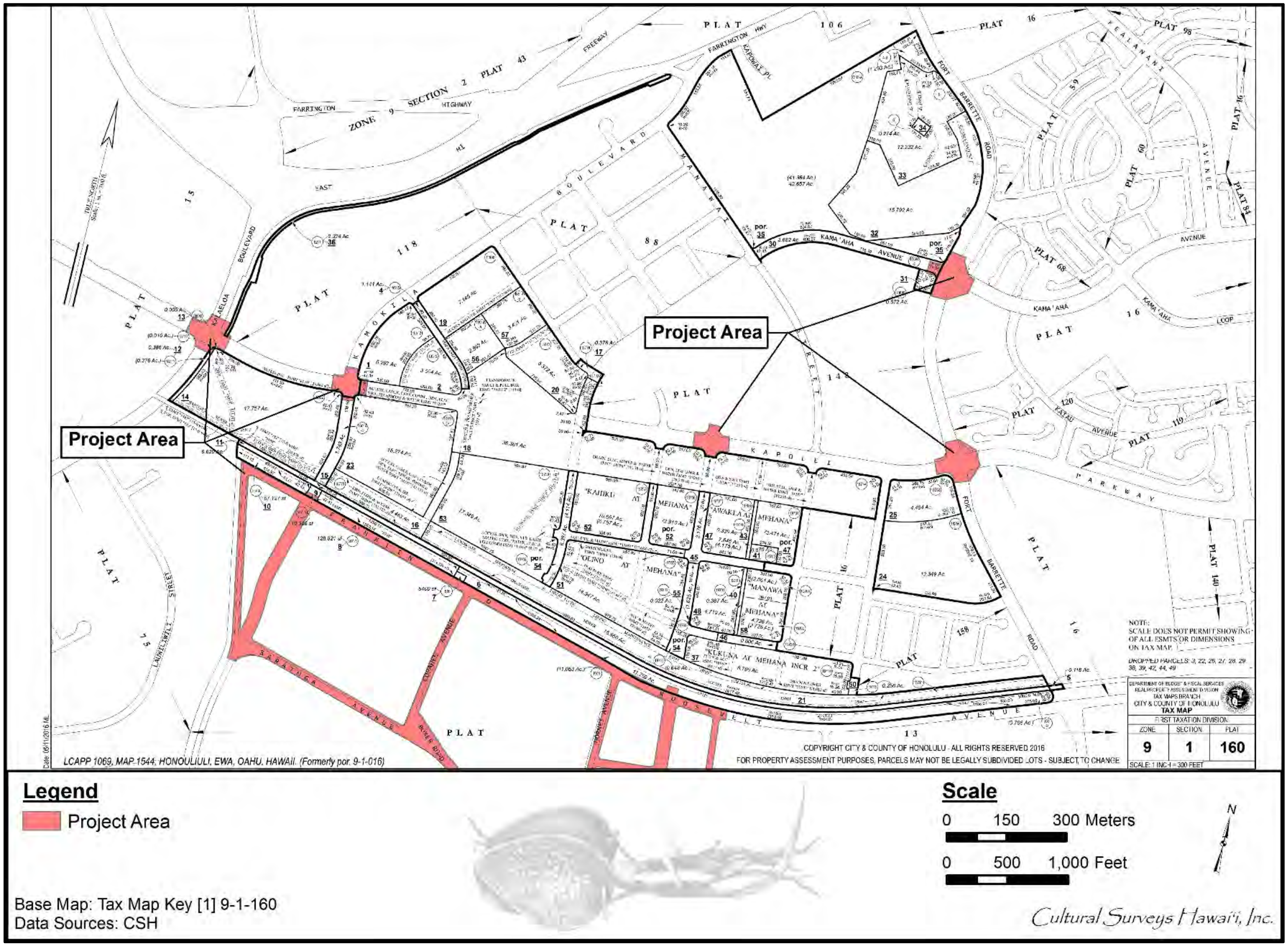


Figure 3. TMK: [1] 9-1-160 showing the project area (Hawaiʻi TMK Service 2014)

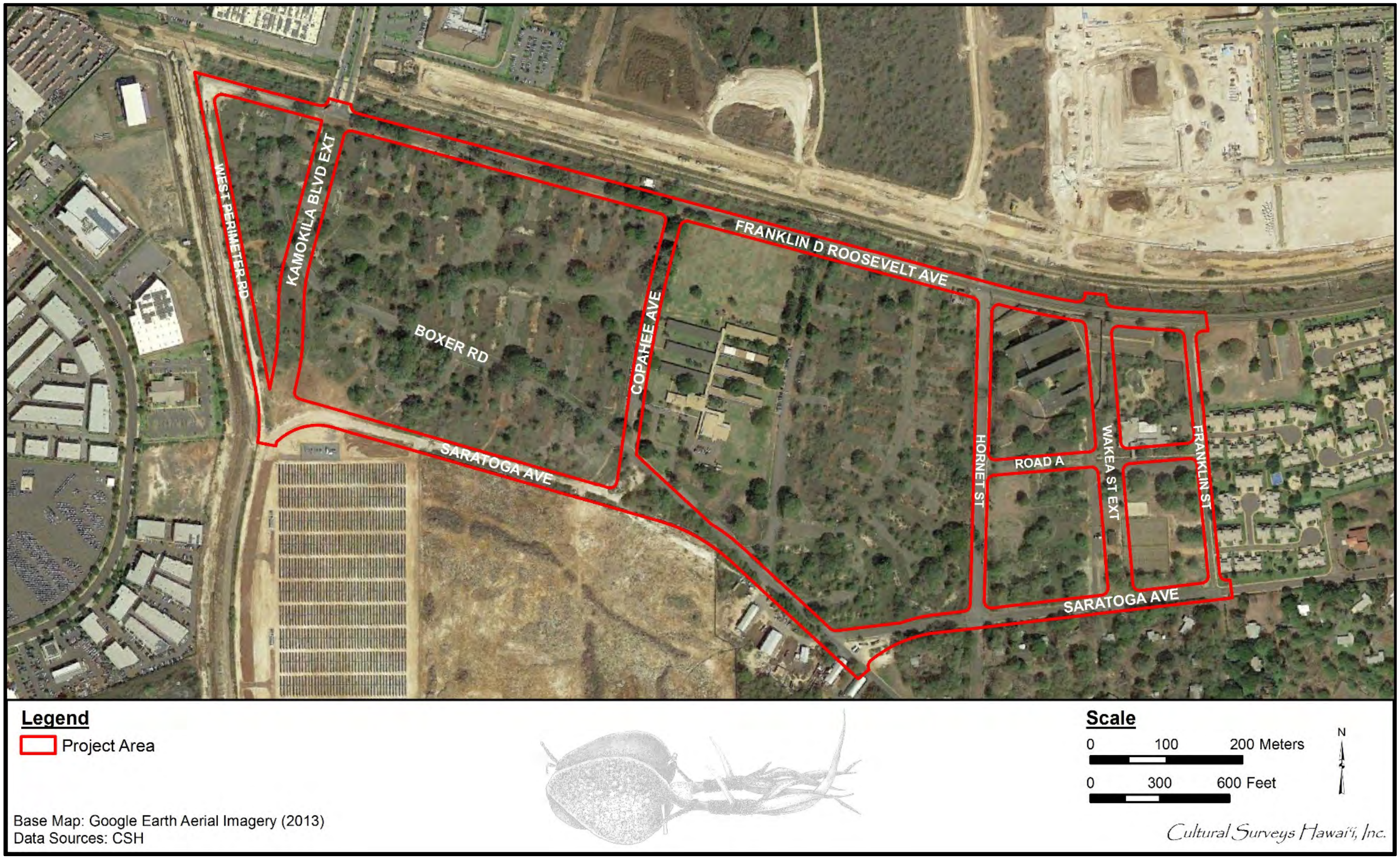


Figure 4. Aerial photograph showing the location of the project area (Google Earth 2013)


Figure 5. Project area schema as provided by client (does not show "Road A" and "Wākea St. Extension")

# 1.3 Environmental Setting

### 1.3.1 Natural Environment

The project area is in the *mauka* (inland) portion of the former Barbers Point Naval Air Station (closed), approximately 2 km (1.2 miles) inland. The terrain generally consists of limestone and alluvial deposits overlying flows of the Wai‘anae volcanic series (Macdonald et al. 1983:423). To the east of the project area is the Makakilo GI stream that runs north to south, and to the west of the project area is the Barbers Point stream that runs north to south. There is also a dry, concrete lined canal that extends north to south just west of Saratoga Street. The project area is generally level, with an elevation of approximately 14–15 m (46–49 feet [ft]) above mean sea level (AMSL). The project area is in one of the driest regions of O‘ahu. Rainfall for the area averages approximately 545 mm (21.5 inches) annually (Giambelluca et al. 2013). The average temperature in the area is approximately 23.6°C (74.5°F) (Giambelluca et al. 2014). In pre-Contact Hawai‘i, the vicinity of the project area would have consisted mostly of lowland coastal dry shrub and grassland. However, the area has been extensively disturbed and transformed by human activity, with most of the land now dominated by a variety of exotic grasses, weeds, and shrubs. These grasses and shrubs, along with pockets of *kiawe* (*Prosopis pallida*), castor bean (*Ricinus communis*), monkeypod (*Albizia saman*), *klu* (*Acacia farnesiana*), *koa haole* (*Leucaena leucocephala*), and a few scattered banyan (*Ficus* spp.) trees are characteristic of the vegetation of the project vicinity. Alternatively, portions of the area have been graded and grubbed bare.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soils consist primarily of Mamala stony silty clay loam (MnC) within the western 25% of the project area, and Coral (limestone) Outcrop (CR) in the eastern 75% of the project area (Foote et al. 1972) (Figure 6). There are small areas that consist of Ewa silty clay loam (EmA) and Honouliuli clay (HxA) in the northern areas. It is believed the limestone coral outcrop is the base material and that the overlying stony silty clay loam may be of no great thickness. Furthermore, commercial agriculture sought to transport soil onto the limestone coral outcrop plains, and it may be soil cover in the western project area is only about a century old.

The surface of the Pleistocene age limestone outcrop, where not covered by alluvium or stockpiled material, has characteristic dissolution “pit caves” (Mylroie and Carew 1995). These pit caves are nearly universally, but erroneously, referred to as “sink holes” (Halliday 2005). These pit caves vary widely in extent and depth, with the more modest features comparable in volume to 5-gallon buckets. The larger features, although usually irregularly shaped, are up to several meters wide and several meters deep.

Mamala soils are described as follows:

> This series consists of shallow, well-drained soils along the coastal plains on the island of Oahu and Kauai. These soils formed in alluvium deposited over coral limestone and consolidated calcareous sand. They are nearly level to moderately sloping. [Foote et al. 1972:93]

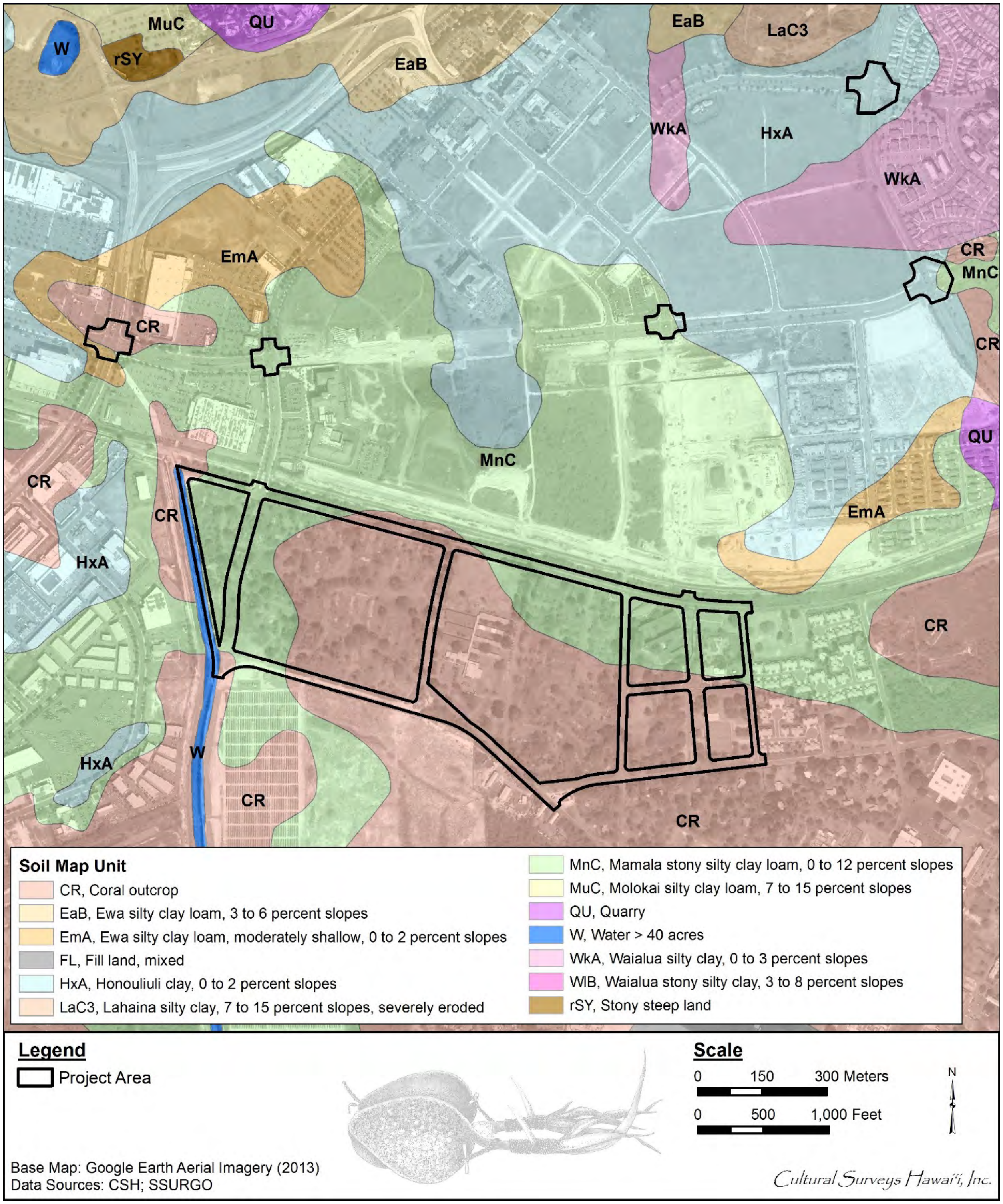


Figure 6. 2013 Google Earth aerial image with an overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA SSURGO 2001)

Coral (limestone) Outcrop (Cr) soils are described as follows:

> Coral outcrop (Cr) consists of coral or cemented calcareous sand on the island of Oahu . . . Coral outcrop makes up about 80 to 90 percent of the acreage. The remaining 10 to 20 percent consists of a thin layer of friable, red soil material in cracks, crevices, and depressions within the coral outcrop. This soil material is similar to that of the Mamala series. [Foote et al. 1972:29]

Ewa soils are described as follows:

> This series consists of well-drained soils in basins and on alluvial fans on the islands of Maui and Oahu. These soils developed in alluvium derived from basic igneous rock. They are nearly level to moderately sloping. [Foote et al. 1972:29]

Honouliuli soils are described as follows:

> This series consists of well-drained soils on coastal plains on the island of Oahu in the Ewa area. These soils developed in alluvium derived from basic igneous material. They are nearly level and gently sloping. [Foote et al. 1972:43]

### 1.3.2 Built Environment

The project area is approximately 700 m (0.4 miles) north of the Kalaeloa Airport runway in Barbers Point (see Figure 4). It is within a former military area that contains vestiges of the former structures and roads associated with previous military development. These include foundations of former military buildings, roads in various states of repair, and a few unpaved trails made by off-road vehicles.

# Section 2 Methods

## 2.1 Field Methods

CSH completed the fieldwork component of this study under archaeological fieldwork permit number 17-08, issued by the State Historic Preservation Division (SHPD) pursuant to HAR §13-282. Fieldwork was conducted 17 and 18 October 2017, and 15 November 2017 by CSH archaeologists Gina Farley, M.A., Katherine I. Harrington, M.A., Alexandra Bennicas, B.A., and Allison Hummel, M.A., under the general supervision of Principal Investigator David Shideler, M.A. This work required approximately 5 person-days to complete. Fieldwork consisted of a 100% pedestrian inspection of the project area and GPS data collection.

A 100%-coverage pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished through systematic sweeps spaced 5 m apart. GPS data collection and photography of any potential historic properties was accomplished during the field inspection. The GPS data collected was compared with historic data and maps to determine if the potential historic properties corresponded with any documented historic structures.

## 2.2 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘I at Mānoa, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (2000).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

# Section 3 Background Research

## 3.1 Traditional Background

As a traditional land unit, Honouliuli Ahupua‘a contained tremendous amounts of varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, a long coastline fronts the normally calm waters of leeward O‘ahu. In addition, 6.4 km (4 miles) of shore fronts the west side of the West Loch of Pearl Harbor. The “karstic desert” and marginal characterization of the limestone plain—the area’s most readily visible terrain—does not do justice to the *ahupua‘a* as a whole. The following available resources contribute to the richness of this land unit:

1. 19.3 km (12 miles) of coastline with continuous shallow fringing reef offering rich marine resources;
2. 6.4 km (4 miles) of frontage on the waters of West Loch (west side of Pearl Harbor, or Pu‘uloa) offering extensive fisheries (mullet, *awa*, shellfish) and frontage suitable for the development of fishponds (e.g., Laulaunui);
3. The lower portion of Honouliuli Valley in the ‘Ewa plain providing rich, level alluvial soils with plentiful sources of irrigation from either the stream or abundant springs, stretching well up the valley;
4. A broad limestone plain with innumerable limestone sinkholes offering nesting sites for a large population of avifauna, which may have been one of the early attractions to human settlement; and
5. An expansive upland forest zone extending as far as 19.3 km (12 miles) inland from the edge of the coastal plain comprising a biologically diverse forest with *kukui* (*Aleurites moluccanus*) *‘ōhia* (*Metrosideros polymorpha*), *‘iliahi* (sandalwood; *Santalum* spp.), *hau* (*Hibiscus tiliaceus*), *tī* (*Cordyline fruticosa*), and banana (*Musa* sp.), among others.

The *‘ili* (smaller land division within an *ahupua‘a*) of Honouliuli, where Honouliuli Stream empties into the northern portion of West Loch, is understood to have been the political and cultural center of the *ahupua‘a.* This area, east of the present project area, contained a dense settlement with rich lands irrigated for taro cultivation. The name of the *ahupua‘a*, translated as “dark bay” (Pukui et al. 1974:51), may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate the *‘ili* of Honouliuli contained a large settlement. Additionally, the political power of this village was potentially great enough that its jurisdiction extended well to the northwest. The northwest area was anticipated to fall under the dominion of the ruling Wai‘anae chiefs.

### 3.1.1 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been compiled and summarized numerous times in various reports (Charvet-Pond and Davis 1992, Hammatt and Folk 1981, Haun and Kelly 1991, Maly 1992, Sterling and Summers 1978, Tuggle and Tomonari-Tuggle 1997). Some of the themes of these traditions include connections with Kahiki (i.e., Tahiti, thought to be one of the primary sources of major migrations to Hawai‘i in pre-Contact times), and the special character and relationship to the places known as Pu‘uokapolei and Kualaka‘i. There are several versions of the chief Kaha‘i leaving from Kalaeloa for a trip to Kahiki; upon his return to the Hawaiian Islands he brought back the first breadfruit (Kamakau 1991:110) and planted it at Pu'uloa, near Pearl Harbor in 'Ewa (Beckwith 1940:97). Several stories associate places in Honouliuli with the gods Kāne and Kanaloa, with the Hawaiian pig god Kamapua'a and the Hina family, and with the sisters of Pele, the Hawaiian volcano goddess. These deities all have strong connections with Kahiki (Kamakau 1991:111; Pukui et al. 1974:200). In addition, there are several references to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali'i, while Ko 'Olina is reported to have been a vacationing place for ruling chief Kākuhihewa. The locations of traditional place names for Honouliuli are illustrated in Figure 7.

#### 3.1.1.1 The Naming of Honouliuli

Honouliuli is the largest *ahupua'a* in the *moku* (district) of 'Ewa. One translation of the name for this district is given as "unequal" (*Saturday Press*, 11 August 1883). Others translate the name as "strayed" and associate it with legends of the gods, Kāne and Kanaloa:

> When Kane and Kanaloa were surveying the islands they came to Oahu and when they reached Red Hill saw below them the broad plains of what is now Ewa. To mark boundaries of the land they would throw a stone and where the stone fell would be the boundary line. When they saw the beautiful land lying below them, it was their thought to include as much of the flat level land as possible. They hurled the stone as far as the Waianae range and it landed somewhere, in the Waimanalo section. When they went to find it, they could not locate the spot where it fell. So Ewa (strayed) became known by the name. The stone that strayed. [Told to E.S. by Simeon Nawaa, 22 March 1954 in Sterling and Summers 1978:1]

Honouliuli has been translated as "dark water," "dark bay," or "blue harbor" and was named after the waters of Pearl Harbor (Jarrett 1930:22), which marks the eastern boundary of the *ahupua'a*. The Hawaiian name for Pearl Harbor, "Pu'uloa," is usually translated as "long hill" but may refer to a heaped mound. Another explanation for the name comes from the "Legend of Lepeamoa," the chicken-girl of Pālama. In this legend, Honouliuli is the name of the husband of the chiefess Kapālama and grandfather of Lepeamoa (Thrum 1923:164–184). "Her grandfather gave his name, Honouliuli, to a land district west of Honolulu" (Thrum 1923:170). Westervelt (1987:209–210) provides an almost identical account.

It seems likely the boundaries of the westernmost *ahupua'a* of 'Ewa were often contested with Wai'anae people. However, the 'Ewa people could cite divine sanction that the dividing point was between two hills at Pili o Kahe:

> Eventually the stone was found at Pili o Kahe. This is a spot where two small hills of the Wai'anae Range come down parallel on the boundary between Honouliuli and Nānākuli ('Ewa and Wai'anae). The ancient Hawaiians said the hill on the 'Ewa side was the male and the hill on the Wai'anae side was female. The stone was found on the Waianae side hill and the place is known as Pili o Kahe.
>
> (Pili = cling to, Kahe = flow). The name refers, therefore, to the female or Waianae side hill. And that is where the boundary between the two districts runs. [Told to E.S. by Simeon Nawaa, 22 March 1954, cited in Sterling and Summers 1978:1]

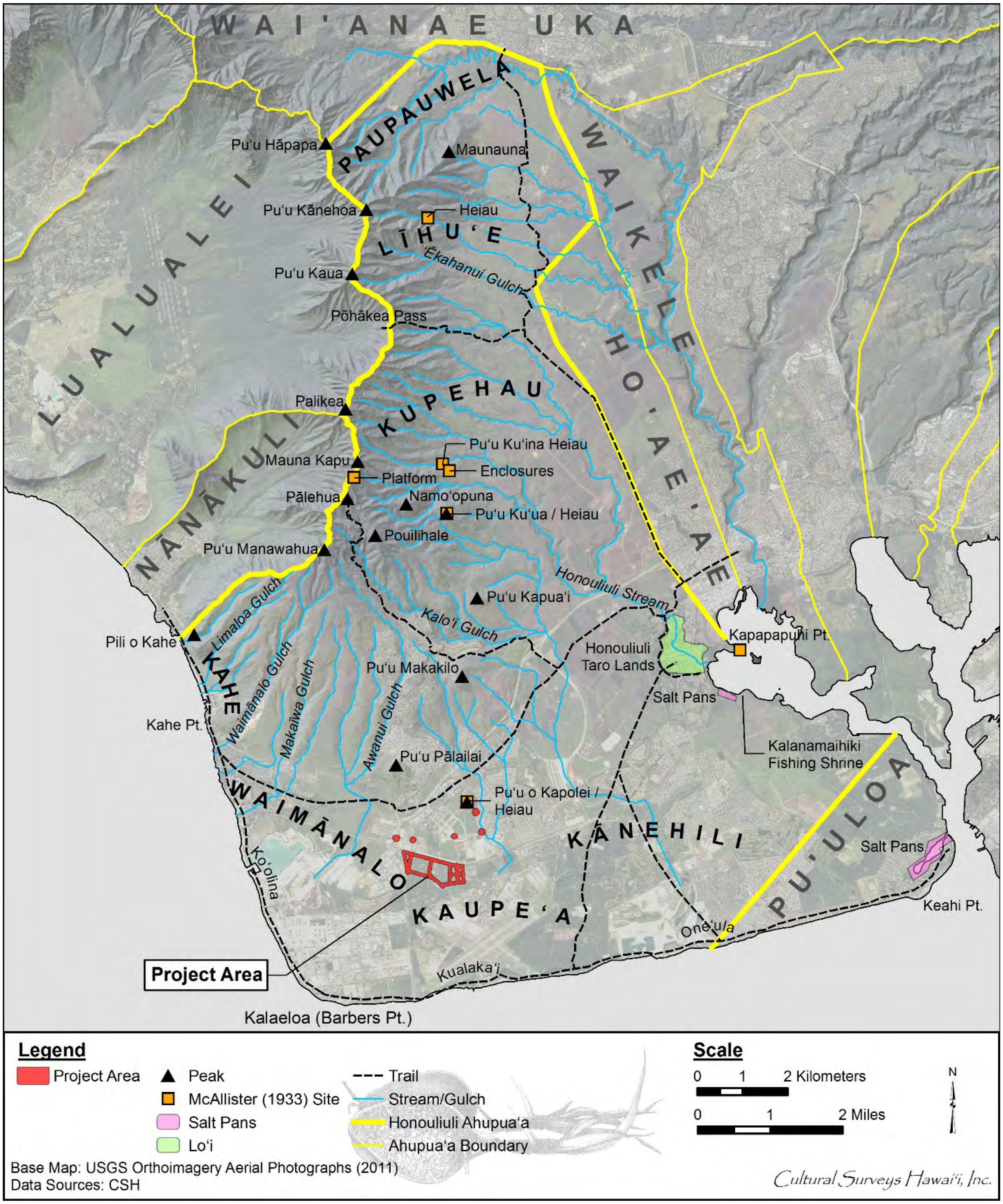


Figure 7. 2011 USGS Orhtoimagery aerial photograph with overlay of place names of Honouliuli (adapted from Sterling and Summers 1978)

### 3.1.1.2 The Pele Family at Honouliuli

Kapolei (literally "beloved Kapo"), specifically the 50.6-m (166-ft) high cone of that name, was named in reference to the volcano goddess Pele's sister, Kapo (Pukui et al. 1974:89). Pōhākea Pass is known as one of the resting places of another of Pele's sisters, Hi‘iaka, as she was returning from Kaua‘i with Pele's lover, Lohiau (Fornander 1919:5:188 note 6). A considerable number of *mele* (songs) and *pule* (prayers) are ascribed to Hi‘iaka as she stood at the summit of Pōhākea (*Aluna au a Pōhākea, Kū au, nānā ia Puna,* in Emerson 1915:162–168). From her vantage point and with her powers of vision, Hi‘iaka could see that her beloved *lehua* groves and friend Hopoe at Puna, Hawai‘i Island, had been blasted by her jealous sister Pele. She could also see that in her canoe, off the coast of Wai‘anae, Lohiau was seducing her traveling companion Wahine‘ōma‘o. Additionally, a spring located at Kualaka‘i near Barbers Point was named Hoaka-lei (*lei* reflection) because Hi‘iaka picked *lehua* flowers (from *‘Ōhi‘a-lehua* trees, *Metrosideros macropus*) here to make a *lei* (a garland or wreath symbolizing love, honor, or friendship) and saw her reflection in the water.

### 3.1.1.3 Kamapua‘a

Kamapua‘a, the pig god, is associated with Honouliuli as follows:

> Kamapua‘a subsequently conquered most of the island of O‘ahu, and, installing his grandmother [Kamaunuaniho] as queen, took her to Puuokapolei, the lesser of the two hillocks forming the southeastern spur of the Wai‘anae Mountain Range, and made her establish her court there. This was to compel the people who were to pay tribute to bring all the necessities of life from a distance, to show his absolute power over all. [Nakuina 1904:50]

Nakuina (1904:50) further notes "[a]" very short time ago [prior to 1904] the foundations of Kamaunuaniho's house could still be seen at Puuokapolei." Another account (*Ka Loea Kālai‘āina* 13 January 1900) speaks of Kekeleaiku, the older brother of Kamapua‘a, who also was said to have lived on Pu‘uokapolei.

### 3.1.1.4 The Traveling Mullet of Honouliuli (Fish Stories)

The story of (Ka) Ihuopala‘ai is also associated with the tradition of the *‘anae-holo*, or traveling mullet:

> The home of the anae-holo is at Honouliuli, Pearl Harbor, at a place called Ihuopalaai. They make periodical journeys around to the opposite side of the island, starting from Puuloa and going to windward, passing successively Kumumanu, Kalihi, Kou, Kalia, Waikiki, Kaalawai, and so on, around to the Koolau side, ending at Laie, and then returning by the same course to their starting point. [Thrum 1907:271]

Thrum (1907) provides an account where Ihuopala‘ai is a male who possesses a Kū‘ula, or fish god, who supplied the large mullet known as *‘anae*. His sister lived in Lā‘ie, and there came a time when there were no fish. She sent her husband to visit Ihuopala‘ai, who was kind enough to send the fish following his brother-in-law on his trip back to Lā‘ie. This story is associated with a poetical saying documented by Pukui (1983) about Honouliuli:

*Ka i‘a hali a ka makani*

The fish fetched by the wind [Pukui 1983:145]

Pukui (1983:145) further explains "[t]he *‘anaeholo*, a fish that travels from Honouliuli, where it breeds, to Kaipāpa‘u on the windward side of O‘ahu. It then turns about and returns to its original home. It is driven closer to shore when the wind is strong."

#### 3.1.1.5 Pu‘uokapolei and the Reckoning of the Seasons (Kamakau)

Kamakau (1976) relates the following:

> . . . the people of O‘ahu reckoned from the time when the sun set over Pu‘uokapolei until it set in the hollow of Mahinaona and called this period Kau [summer], and when it moved south again from Pu‘uokapolei and it grew cold and the time came when young sprouts started, the season was called from their germination *(‘ōilo*) the season of Ho‘oilo [winter, rainy, season]. [Kamakau 1976:14]

#### 3.1.1.6 Pu‘u Kapolei and the Plains of Kaupe‘a and Kānehili

There are several places on the ‘Ewa coastal plain associated with *ao kuewa*, the realm of the homeless souls. Kamakau (1964:47–49) explains Hawaiian beliefs of the afterlife as follows:

> . . . There were three realms (*ao*) for the spirits of the dead . . . There were, first, the realm of the homeless souls, the *ao kuewa*; second, the realm of the ancestral spirits, the *ao ‘aumakua*; and third, the realm of Milu, *ke ao o Milu* . . .
>
> The *ao kuewa*, the realm of homeless souls, was also called the *ao ‘auwana*, the realm of wandering souls. When a man who had no rightful place in the *‘aumakua* realm (*kanaka kuleana ‘ole*) died, his soul would wander about and stray amongst the underbrush on the plain of Kama‘oma‘o on Maui, or in the *wiliwili* grove of Kaupe‘a on Oahu. If his soul came to Leilono [in Hālawa, ‘Ewa near Red Hill], there he would find the breadfruit tree of Leiwalo, *ka‘ulu o Leiwalo*. If it was not found by an *‘aumakua* soul who knew it (*i ma‘a mau iaia*), or one who would help it, the soul would leap upon the decayed branch of the breadfruit tree and fall down into endless night, the *pō pau ‘ole o Milu*. Or, a soul that had no rightful place in the *‘aumakua* realm, or who had no relative or friend (*makamaka*) there who would watch out for it and welcome it, would slip over the flat lands like a wind, until it came to a leaping place of souls, a *leina a ka ‘uhane* . . . [Kamakau 1964:47]
>
> On the plain of Kaupe‘a beside Pu‘uloa [Pearl Harbor], wandering souls could go to catch moths (*pulelehua*) and spiders (*nanana*). However, wandering souls could not go far in the places mentioned earlier before they would be found catching spiders by ‘aumakua souls, and be helped to escape. . . . [Kamakau 1964:49]

The breadfruit tree, Leilono, was said to have been on the ‘Ewa-Kona border, above Āliamanu. In another section of his account of the dead, Kamakau calls the plain of wandering souls the "plain at Pu‘uokapolei":

> There are many who have died and have returned to say that they had no claim to an ‘aumakua [realm] (*kuleana‘ole*). These are the souls, it is said, who only wander

upon the plain of Kama‘oma‘o on Maui or on the plain at Pu‘uokapolei on Oahu. Spiders and moths are their food. [Kamakau 1964:29]

This association of Pu‘u o Kapolei and Kānehili with wandering souls is also illustrated in a lament on the death of Kahahana, the paramount chief of O‘ahu killed by his father, Kahekili, after Kahahana became treacherous and killed the high priest Kaopulupulu:

| | |
|---|---|
| Go carefully lest you fall dead in the sun, | *E newa ai o hea make i ka lā,* |
| The god that dwells on Kapolei hill. | *Akua noho la i Pu‘uokapolei.* |
| The sun is wailing on account of the | *E hanehane mai ana ka lā i nā* |
| women of Kamao, | *wahine o Kamao*, |
| A hiding god, blossoming ohai of the banks, | *Akua pe‘e, pua ‘ohai o ke kaha*, |
| Contented among the stones- | *I walea wale i ke a-* |
| Among the breadfruit planted by Kahai. | *I ka ulu kanu a Kahai*. |
| Thou hast spoken of by the oo- | *Haina ‘oe e ka oo-* |
| By the bird of Kanehili. | *E ka manu o Kānehili.* |

[Fornander 1919:6 (2):297]

Fornander also provides some notes on this lament. The god dwelling at Kapolei is the god Kahahana, stating that this is where his soul has gone. Kamao is one of the names of the door to the underworld. This lament also draws an association with wandering souls and the place where the first breadfruit tree was planted by Kahai at Pu‘uloa (Fornander 1919:6 [2]:304).

Pukui offers the following Hawaiian saying, which places the wandering souls in a *wiliwili* (*Erythrina sandwicensis*) grove at Kaupe‘a:

| | |
|---|---|
| The wiliwili grove of Kaupe‘a | *Ka wiliwili of Kaupe‘a*. |

In ‘Ewa, O‘ahu. Said to be where homeless ghosts wander among the trees. [Pukui 1983:180]

Beckwith (1940:154) has stressed that “the worst fate that could befall a soul was to be abandoned by its *‘aumakua* [family god; deified ancestor] and left to stray, a wandering spirit (*kuewa*) in some barren and desolate place.” As these wandering spirits were often malicious, the places they wandered were avoided.

In a chant by Hi‘iaka, several place names in ‘Ewa are mentioned as she travels from Pu‘uokapolei toward the ‘Ewa coast. In the chant, Hi‘iaka is moving downhill from Kaupe‘a, probably the plains adjacent to Pu‘uokapolei, toward the coast to the plains of Kānehili. The chant also refers to Pe‘e-kaua, which may be a variation of Kau-pe‘e or Kaupe‘a. Hi‘iaka sang this bitter chant addressed to Lohi‘au and Wahine-oma‘o, and it references the association of the Plains of Kaupe‘a as a place for the wandering of lost souls. The name Kānehili also refers to wandering, as the word *hili* means “to go astray” (Emerson 1915:162). Hi‘iaka’s chant is presented below:

*Ku‘u aikana i ke awa lau o Pu‘uloa,*

*Mai ke kula o Pe‘e-kaua, ke noho ‘oe,*

*E noho kaua e kui, e lei i ka pua o ke kaunoʻa,*

*I ka pua o ke akuli-kuli, o ka wili-wili;*

*O ka ihoʻna o Kau-peʻe i Kane-hili,*

*Ua hili au; akahi no ka hili o ka la pomaikaʻi;*

*E Lohiau ipo, e Wahine-omaʻo,*

*Hoe ʻa mai ka waʻa i aʻe aku au.*

We meet at Ewa's leaf-shaped lagoon, friends;

Let us sit, if you will on this lea

And bedeck us with wreaths of Kaunaoʻa,

Of akuli-kuli and wili-wili,

My soul went astray in this solitude;

It lost the track for once, in spite of luck,

As I came down the road to Kau-peʻa.

No nightmare dream was that which tricked my soul.

This way, dear friends; turn the canoe this way;

Paddle hither and let me embark.

[Emerson 1915:162–163]

**3.1.2 Pre- to Early Post-Contact Period**

Various Hawaiian legends and early historical accounts indicate the *ahupuaʻa* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *aliʻi* (chiefly class). This substantial population was supported by the plentiful marine and estuarine resources available at the coast. The coastal area contains several historic properties that are interpreted as permanent habitations. Other important subsistence-related features of the *ahupuaʻa* included irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990) and the lower forested mountain slopes for the procurement of forest goods.

As suggested by Handy and Handy, the exploitation of the forest resources along the slopes of the Waiʻanae Range probably acted as a viable subsistence alternative during times of famine:

> . . . The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *wao*, or upland jungle, than was the case on the windward coast. Yet the *wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. [Handy and Handy 1972:469–470]

These upper valley slopes may have been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced by the existence of a probable quarrying site (State Inventory of Historic Places [SIHP] # 50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft) elevation, west of the current study area (Hammatt et al. 1991).

Honouliuli was not as densely populated as other parts of ʻEwa. Habitation and ceremonial sites were usually found along streams in the foothills, where taro could be cultivated, including at Kaloʻi Gulch and Puʻu Kuʻua. A more populated area was Puʻuloa, on the east side of the *ahupuaʻa*, along the west loch of Pearl Harbor.

The Hawaiian *aliʻi* were also attracted to the region. One historical account of particular interest refers to an *aliʻi* residing in Ko ʻOlina, southwest of the current study area:

> Ko ʻOlina is in Waimānalo near the boundary of ʻEwa and Waiʻanae. This was a vacationing place for chief Kakuhihewa and the priest Napuaikamao was the caretaker of the place. Remember Reader; this Koolina is not situated in the Waimānalo on the Koolau side of the island but the Waimānalo in ʻEwa. It is a lovely and delightful place and the chief; Kakuhihewa loved this home of his. [Sterling and Summers 1978:41]

John Papa ʻĪʻī describes a network of Leeward Oʻahu trails (Figure 8). In later historic times these trails encircled and crossed the Waiʻanae Range, allowing passage from West Loch to the Honouliuli lowlands, past Puʻu o Kapolei and Waimānalo Gulch to the Waiʻanae coast and onward, circumscribing the shoreline of Oʻahu (ʻĪʻī 1959:96–98). Early historical maps, such as a Malden 1825 map (see Figure 9), show trails to the north, east, south and west; however, they are all a kilometer or more distant, suggesting little activity in the project area vicinity.

Other early historical accounts of the general region typically refer to the more populated areas of the ʻEwa district. Missions and schools were established in these areas, where subsistence resources were perceived to be greater. However, the presence of historic properties along the coral plains and coast of southwest Honouliuli Ahupuaʻa indicate pre- and early post-Contact populations also adapted to less inviting areas.

Subsequent to Western Contact, the landscape of Honouliuli, the ʻEwa plains, and the Waiʻanae slopes was adversely affected by the removal of sandalwood and other trees, as well as the introduction of domesticated animals and new vegetation. Goats, sheep, and cattle brought to the Hawaiian Islands by Vancouver in the early 1790s were allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Waiʻanae by at least 1840 (Frierson 1972:10). During this time, possibly as early as 1790, exotic plant species were also introduced to the area. This included species suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of introduced vegetation are given by Smith and outlined by Frierson (1972):

> early, circa 1790:
>
> Prickly pear cactus, *Opuntia tuna*
>
> *Haole koa, Leucaena leucocephala*
>
> Guava, *Psidium guajava*
>
> 1835–1840:
>
> Burmuda [*sic*] grass, *Cynodon dactylon*
>
> Wire grass, *Eleusine indica*

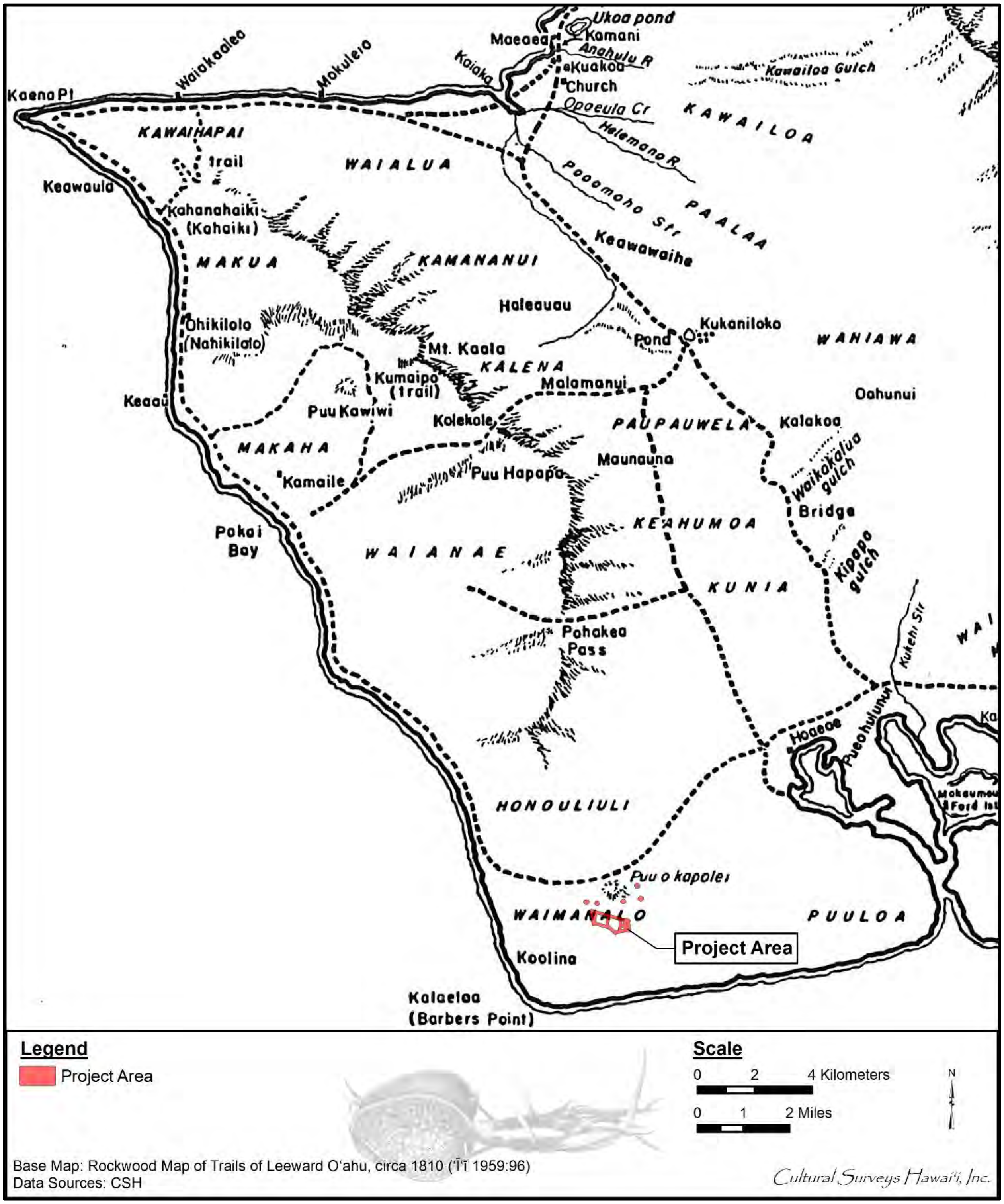


Figure 8. Portion of 1810 Rockwood Map of Trails of Leeward Oʻahu as described by ʻĪʻī (1959:96)

1858:

Lantana, *Lantana camara*. [Frierson 1972:10–11]

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

### 3.1.3 Honouliuli Settlement Patterns

Archaeological and traditional sources show a general settlement pattern of three main areas within Honouliuli Ahupuaʻa: a coastal zone, the Honouliuli taro lands, and inland settlement at Puʻu Kuʻua.

#### 3.1.3.1 The Coastal Zone – Kalaeloa (Barbers Point)

Archaeological research at Barbers Point has focused on the areas in and around the Deep Draft Harbor (Barrera 1975, Davis and Griffin 1978, Hammatt and Folk 1981, McDermott et al. 2000). Series of small clustered shelters, enclosures, and platforms show limited but recurrent use at the shoreline zone for marine-oriented exploitation. This settlement covers much of the shoreline, with more concentrated features around small marshes and wet sinks. Immediately behind the shoreline, under a linear dune deposit, is a buried cultural layer believed to contain some of the earliest habitation evidence in the area.

The plentiful and easily exploited bird population may have attracted early Hawaiians to the area. Evidence for the capture of the Hawaiian Petrel (*ʻuaʻu*; *Pterodroma sandwichensis*) was found at SIHP # 50-80-12-2763, a pit cave (Hammatt and Folk 1981). Initial heavy exploitation of nesting seabirds and other species, in conjunction with habitat destruction, may have contributed to some avian extinctions.

There is evidence of limited agriculture in mulched sinkholes and limited soil areas. The low annual rainfall averages for the area suggest any agricultural activities would have been limited. Agriculture may have involved tree crops and roots (e.g., sweet potato [*Ipomoea batatas*]). However, the archaeological content of the sites indicates a major focus on marine resources.

Davis and Griffin (1978) distinguish functional classes of historic properties based on surface area size and argue that the Barbers Point settlement consists of functionally integrated, multi-household residence groups. Hammatt and Folk (1981) plotted density contours of midden (by weight) and artifacts (by number) for residence sites. These generally indicated narrowly defined spatial foci of discard and may suggest the continuous use of sites, or a lack of refurbishing or additions to structures over time (Hammatt and Folk 1981). The sites reflect small habitation areas that typically lack the full range of features found in larger, permanent residence complexes (e.g., high platforms, complex enclosures, and conspicuous ceremonial sites).

#### 3.1.3.2 Honouliuli Taro Lands

The rich irrigated lands of the *ʻili* of Honouliuli are centered around the west side of Pearl Harbor, at Honouliuli Stream and its broad outlet into the West Loch waters, the *ahupuaʻa*'s namesake. The major archaeological reference to this area is Dicks et al. (1987), who documented remnants of a once widespread wetland system (*loʻi* [ponded taro patch] and fishponds), as well as dryland cultivation of the adjacent slopes.

Silva’s “Historic Research Relative to the Land of Honouliuli” (in Dicks et al. 1987) depicts the Honouliuli area bordering West Loch as a major population center. This population center likely formed in response to the abundance of fish and shellfish resources in close proximity to a wide expanse of well-irrigated bottomland suitable for wetland taro cultivation. The earliest detailed map by Malden (1825; see Figure 9) shows the roads of southwest O‘ahu coalescing and descending the *pali* (cliff) as they funnel into the area of Honouliuli Village. Honouliuli was likely a locus of habitation for thousands of Hawaiians. Pre-Contact population estimates are a matter of some debate, but from 1831–1832 the earliest mission census indicates the land (*‘āina*) of Honouliuli contained 1,026 men, women, and children (Schmitt 1973:19). It is unclear whether this population relates to Honouliuli Village or Honouliuli Ahupua‘a, but the village probably contained the majority of the population. It is worth noting Honouliuli’s population was composed of less than 20% of children younger than 12 years of age, and the population decreased by more than 15% over the next four years. This indicates Honouliuli’s pre-Contact population may have been significantly greater than that reported by the mission census (Schmitt 1973:22).

#### 3.1.3.3 Pu‘u Ku‘ua: Inland Settlement

Documentation of inland settlement in Honouliuli Ahupua‘a is more problematic, as there are relatively few documented archaeological sources on inland settlement in the area. However, it is probable that the area around Pu‘u Ku‘ua on the east side of the Wai‘anae Ridge, 7 miles inland of the coast, was a Hawaiian place of some importance. In 1899, the Hawaiian Newspaper *Ka Loea Kalaiaina* related a story of Pu‘u Ku‘ua as “a place where chiefs lived in ancient times,” a “battle field,” and “thickly populated.” The article summarizes the following:

> 1) That Pu‘u Ku‘ua was entirely deserted and left uninhabited, seemingly before the coming of righteousness to Hawai‘i Nei, and
>
> 2) The descendants of the people of this place were so mixed that they were all of one class; here the gods became tired and returned to Kahiki. [Sterling and Summers 1978:33]

McAllister (1933) recorded three sites in this area: two *heiau* (pre-Christian place of worship) (Site 134, Pu‘u Kuina, and Site 137, Pu‘u Ku‘ua, both destroyed) and a series of enclosures in Kukuilua, which he calls “*kuleana* sites.” On the opposite side of the Wai‘anae range, along the trail to Pōhākea Pass, Cordy (2002:36) states “Kākuhihewa was said to have built (or rebuilt) Nīoi‘ula, a *po‘okanaka* [sacrificial] *heiau* (1,300 square meter) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into ‘Ewa, circa A.D. 1640-1660.” ‘Ī‘ī (1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. Although there is no direct archaeological evidence available that suggests intensive Hawaiian settlement occurred here, it is considered a place of high probability given the above indications Geographically, the area receives sufficient quantities of water and would have had abundant, locally available forest resources.

#### 3.1.3.4 Summary of Honouliuli Settlement Patterns

Based on the above summary of the Honouliuli settlement areas, the following general considerations are provided to place the study area within the context of the *ahupua‘a* pattern.

1. There are three areas of Hawaiian settlement in the *ahupua‘a*; the extensive limestone plain with recurrent use habitations for fishermen and gatherers, and sometime gardeners; the

rich lands of Honouliuli ʻIli for extensive wetland taro cultivation, and the likely population center of the *ahupuaʻa*; and the uplands around Puʻu Kuʻua for probable agriculture and forest resource utilization. Two (coastal zone and taro lands) are well documented, while the third (inland settlement) is less clear.

2. Honouliuli is designed as a unit to contain all the geographic elements of a typical Hawaiian valley *ahupuaʻa*. However, these elements were geomorphically arranged in an atypical relationship. The *ahupuaʻa* is not organized around a single drainage network but rather shares the western portions of Waikele drainage in its upper reaches. The vast coastline, fringing reef, and extensive limestone plain provided typical, highly advantageous features for human subsistence. Additionally, the limestone plain, which supported only limited agriculture, was an excellent source for bird catching in early times. The richest forestland for foraging for wood, birds, feathers, and other resources would have been the east slope of the Waiʻanae Range. The *mauka/makai* route would have been traversed up the Honouliuli Gulch or the Makakilo ridge and paralleled the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have remained *mauka* up to the base of the hills and then up either the Makakilo Ridge or northeast to a trail to Puʻu Kuʻua and Pōhākea Pass. The *makai* slope is the dry side of the ridgeline. Along this side, streams would respond to rainfall quickly but drain rapidly, leaving little available water for even short-term use. However, abundant springs may have provided adequate water for localized dryland cultivation.

3. The *makai* slope of the Waiʻanae Range (i.e., *mauka* of Ko Olina) was not a major thoroughfare. There is some very limited evidence of part-time agriculture in and around gulches and two foci of sparse habitation. The first is limited to the *makai* portions of gulches and lava flats; this habitation focus is considered a *mauka* component or continuation of the Ko Olina coastal settlement rather than an independent focus. The second focus is separated from the first by a barren zone and is generally above 243.8 m (800 ft) in elevation. This *mauka* habitat, possibly supported by seasonal dryland planting and forest foraging, may correspond to the lower portion of a thinly scattered but widespread zone of settlement. This zone stretches eastward and northeast along the east Waiʻanae Range slopes; it may increase in intensity along the more watered lands forming the *mauka* western boundary of Honouliuli.

4. The *ʻili* of Honouliuli, near the West Loch of Pearl Harbor, was the central place of Honouliuli Ahupuaʻa in terms of population and cultivated foods. Furthermore, considering the lack of intensive agricultural resources in other locations during pre-Contact times, it is reasonable to assume most other habitation zones were economically and socially codependent.

5. Presently, there is no archaeological evidence of high status residence in Honouliuli. Large residential structures are not present along the shoreline, where they would be expected. This may be because the ocean shoreline, though rich in marine resources, was uninviting for sport and unsuitable for fishponds. Instead, the chiefly focus of ʻEwa District was Waipiʻo; activities of this class that occurred in Honouliuli likely would have been in or near the rich lands fronting West Loch (the *ʻili* of Honouliuli). Regarding status associations within Honouliuli, it is interesting to note the connection of the Puʻu Kuʻua

> settlement with pariah (*kauwā*), or "slaves," the lowest class of Hawaiians (Sterling and Summers 1978:33).

The current project area is well back from the coast, approximately 2 km (1.2 miles) inland, and is not near any known sources of potable water. The rainfall in the project area, approximately 545 mm (21.5 inches) per year, is insufficient for non-irrigated agriculture. Pre- and early post-Contact land use in this area appears to have been very limited.

## 3.2 Historical Background

### 3.2.1 Early 1800s

Barbers Point is named after Captain Henry Barber, whose ship ran aground on 31 October 1796. At this time, a major Hawaiian community existed at the Honouliuli taro lands, where Honouliuli Stream enters the West Loch of Pearl Harbor, with a surprising amount of Hawaiian activity scattered close to the coast. Despite this, the inland areas of the ‘Ewa raised reef limestone plain had no potable water and low rainfall, suggesting little to recommend it for habitation or enterprise. Early historical maps, such as a Malden 1825 map (Figure 9), show no indication of human activity in the immediate vicinity of the project area. Following Western Contact, the landscape of the ‘Ewa plains and Wai‘anae slopes was greatly changed. Specifically, the area was adversely affected by the over-harvesting of the sandalwood forest, as well as the introduction of domesticated animals and exotic plant species.

### 3.2.2 Mid- to Late 1800s

During the Māhele of 1848, which introduced private land ownership into Hawaiian society, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No *kuleana* claims (land claims by *maka‘āinana*, or common people) were made for land within the current study area or vicinity. The vast majority of the Land Commission Awards (LCAs) were near the Pu‘uloa Salt Works and the taro lands of the *‘ili* of Honouliuli. In Honouliuli Ahupua‘a the largest award (Royal Patent 6071, LCA 11216, *‘Āpana* [parcel] 8) granted was to Miriam Ke‘ahi-Kuni Kekau‘onohi in January 1848. Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including a total of 17,502 hectares (43,250 acres). Kamakau (1961) relates the following about Kekau‘onohi as a child:

> Kamehameha's granddaughter, Ke-ahi-Kuni Kekau-‘onohi...was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest. [Kamakau 1961:208–209]

Kekau‘onohi was one of Liholiho's (Kamehameha II's) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu's stepson, Keli‘i-ahonui, and later became the wife of Chief Levi Ha‘alelea. Upon her death on 2 June 1851, all her property was passed on to her husband and his heirs. When Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for ranching operations.

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek, and James Robinson and constructed a fence around his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well driller

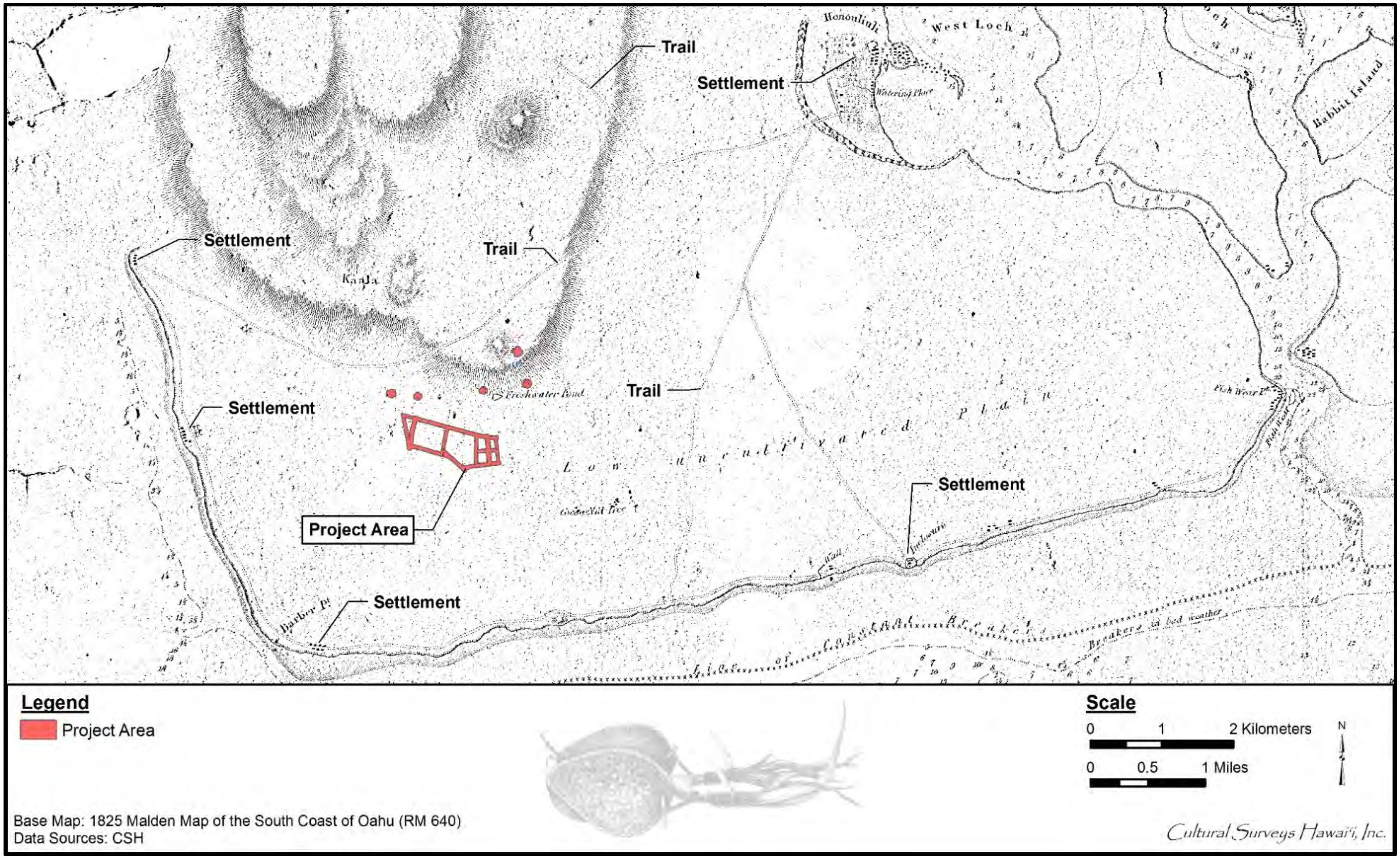


Figure 9. Portion of the 1825 Malden map of the south coast of O'ahu (RM 640) showing relationship of project area to trails

from California to search the ‘Ewa plains for water and discovered a significant, untapped source. Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within ten years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island was supplying most of Honolulu’s water needs.

Campbell leased his property to Benjamin Dillingham in 1889. Subsequently, Dillingham formed the Oahu Railway & Land Company (OR&L) in 1890. To attract business to his new railroad, Dillingham subleased all land below 200 ft elevation to William Castle. Castle in turn sublet the area to the Ewa Plantation Company for sugarcane cultivation (Frierson 1972:15). Dillingham’s Honouliuli lands above 200 ft elevation that were suitable for sugarcane cultivation were sublet to the Oahu Sugar Company.

The Ewa Plantation Company was incorporated in 1890 and continued in full operation up into modern times. The plantation grew quickly with the abundant artesian water. The Ewa Plantation Company installed ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically prior to the rainy season. This induced erosion to facilitate soil deposition onto the coral plain and increase arable land in the lowlands (Frierson 1972:17).

In 1897, the Oahu Sugar Company was incorporated to include lands in the foothills above the ‘Ewa plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the Oahu Sugar Company were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiahole Water project” (Condé and Best 1973:313). The Oahu Sugar Company took over the Ewa Plantation lands in 1970 and continued operations into the 1990s.

In western Honouliuli, Dillingham’s *mauka* lands that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892, the Ranch Department of the OR&L tapped plantation flumes in search of alternative sources of water. Von Holt leaves this account of her husband Harry’s (Superintendent of the OR&L Ranch Department) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Pālehua, and had evidently been a place of which the Hawaiians had known, for its name is Kalo‘i (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. [Von Holt 1985:136]

The spring was on the upper slopes of the southern face of Kalo‘i Gulch. A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry Von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! [Von Holt 1985:138]

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry Von Holt] got them to explain that the spring, called ‘Waihuna’ (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840 . . . A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. [Von Holt 1985:138–140]

### 3.2.3 Early 1900s to Present

Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pastureland for grazing livestock. However, by 1919 a reservoir had been established just south of Pālehua Road, and by 1920 much of the land of Honouliuli was used for commercial sugarcane cultivation (Frierson 1972:18). In the late 1920s, the main residential communities were at the northeast edge of the ‘Ewa Plain; the largest community was still at Honouliuli Village. ‘Ewa was primarily a plantation town focused around the sugar mill, with a public school and a Japanese school. Additional settlement was in Waipahu, centered around the Waipahu sugar mill operated by the Oahu Sugar Company. Historical maps of the Makakilo area indicate a lack of any other significant development in the area into the 1940s.

A 1919 map shows the project area as devoid of any formal development (Figure 12) other than a fence line likely associated with cattle ranching, a “pipe line,” and the OR&L Railroad. The OR&L is along present-day Renton Road, just north of Roosevelt Avenue, which is in the current project area. At this location, the alignment of the rail runs northwest/southeast. Gilbert Station, approximately 1.2 km (0.75 miles) west of the project area and known as a small plantation community on the OR&L Railroad, was the largest formal development in the area during this time. Another small plantation community, labelled “Waimanalo Camp” on a 1936 map (Figure 13), is depicted between present-day Roosevelt Avenue and Kapolei Parkway. The pipe line in the western portion of the project area carried water for men and cattle down to the coast.

A 1936 map suggests the project area continued to lack documented development other than a cattle control fence line, pipe line, and railroad infrastructure (see Figure 13). The vicinity is shown as largely undeveloped other than the small plantation community mentioned above, “Waimanalo Camp.”

Major land use changes came to western Honouliuli when the U.S. military began development in the area. Military installations were constructed both near the coast and in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937–1944) was at Barbers Point Beach and was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also within the vicinity was the Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and the Gilbert Military Reservation, used from 1922–1944. The largest and most significant base built in the area was the Barbers Point Naval Air Station, which operated from 1942 into the 1990s. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet.

Located atop Pu‘u o Kapolei, Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch) was used from 1931 to 1948 to house four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a Nike missile base. Palailai Military Reservation was atop Pu‘u

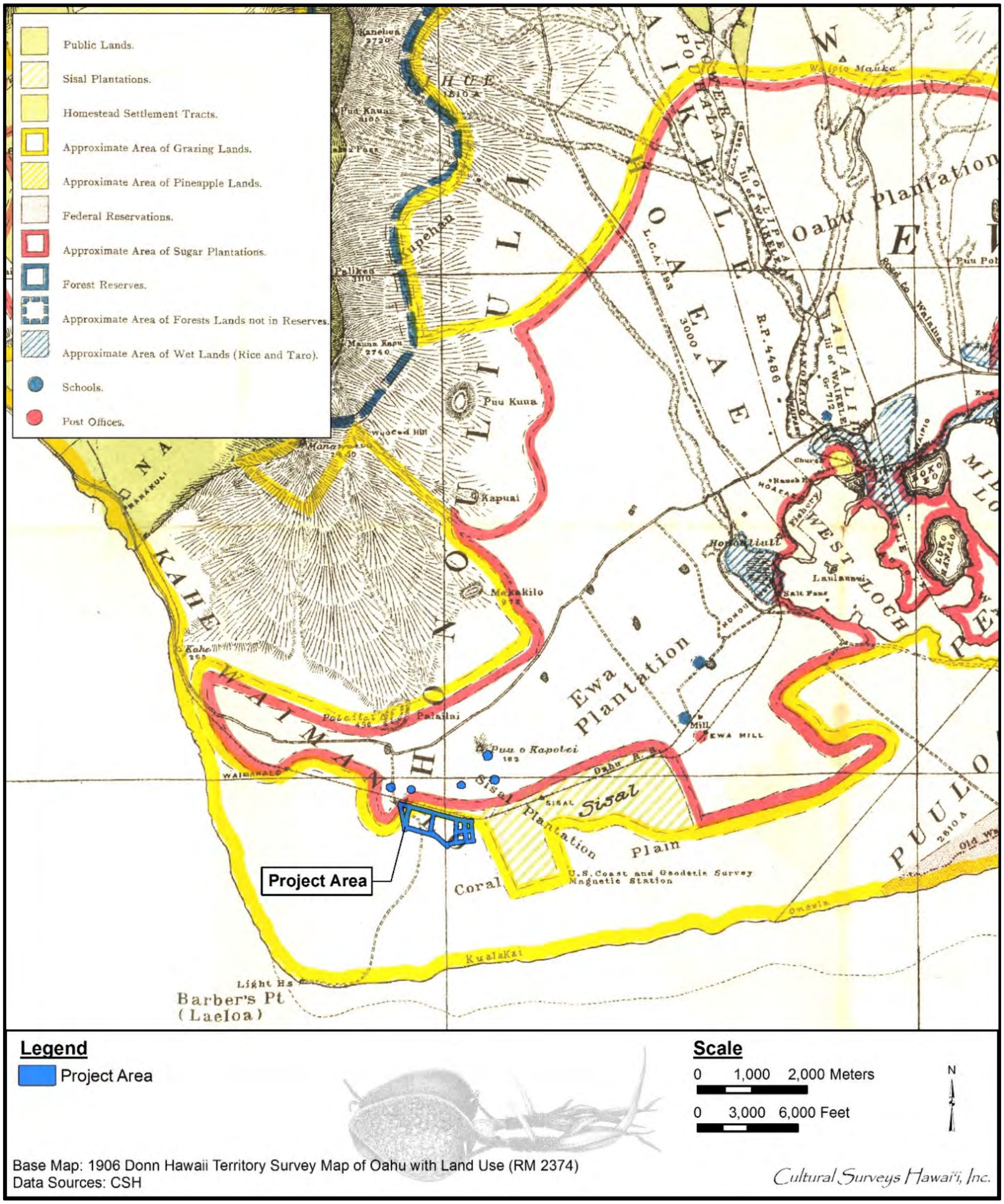


Figure 10. Portion of the 1906 Donn Hawaii Territory Survey map of O‘ahu with land use showing project area

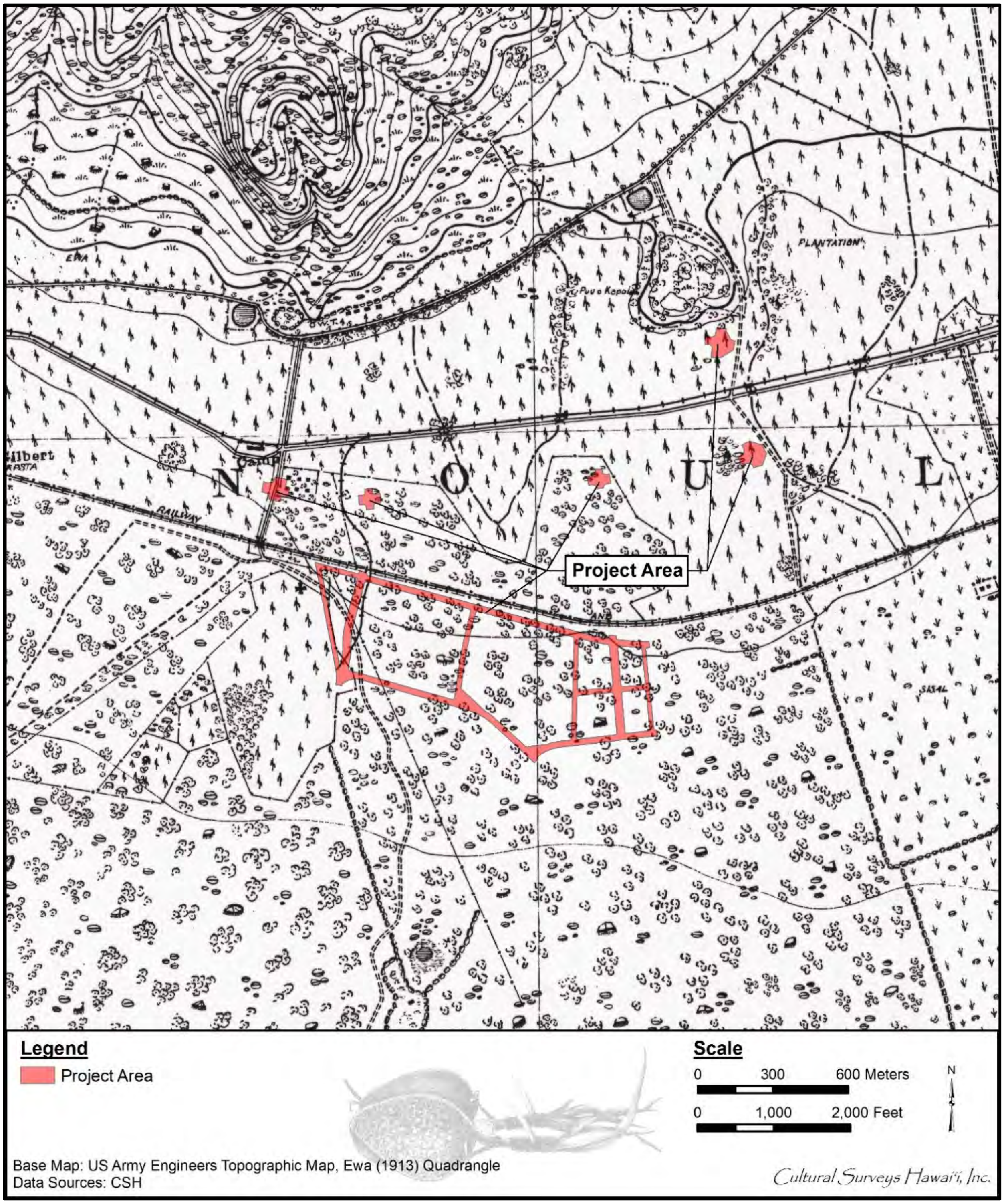


Figure 11. Portion of the 1913 U.S. Army Engineers topographic map, Ewa Quadrangle showing project area

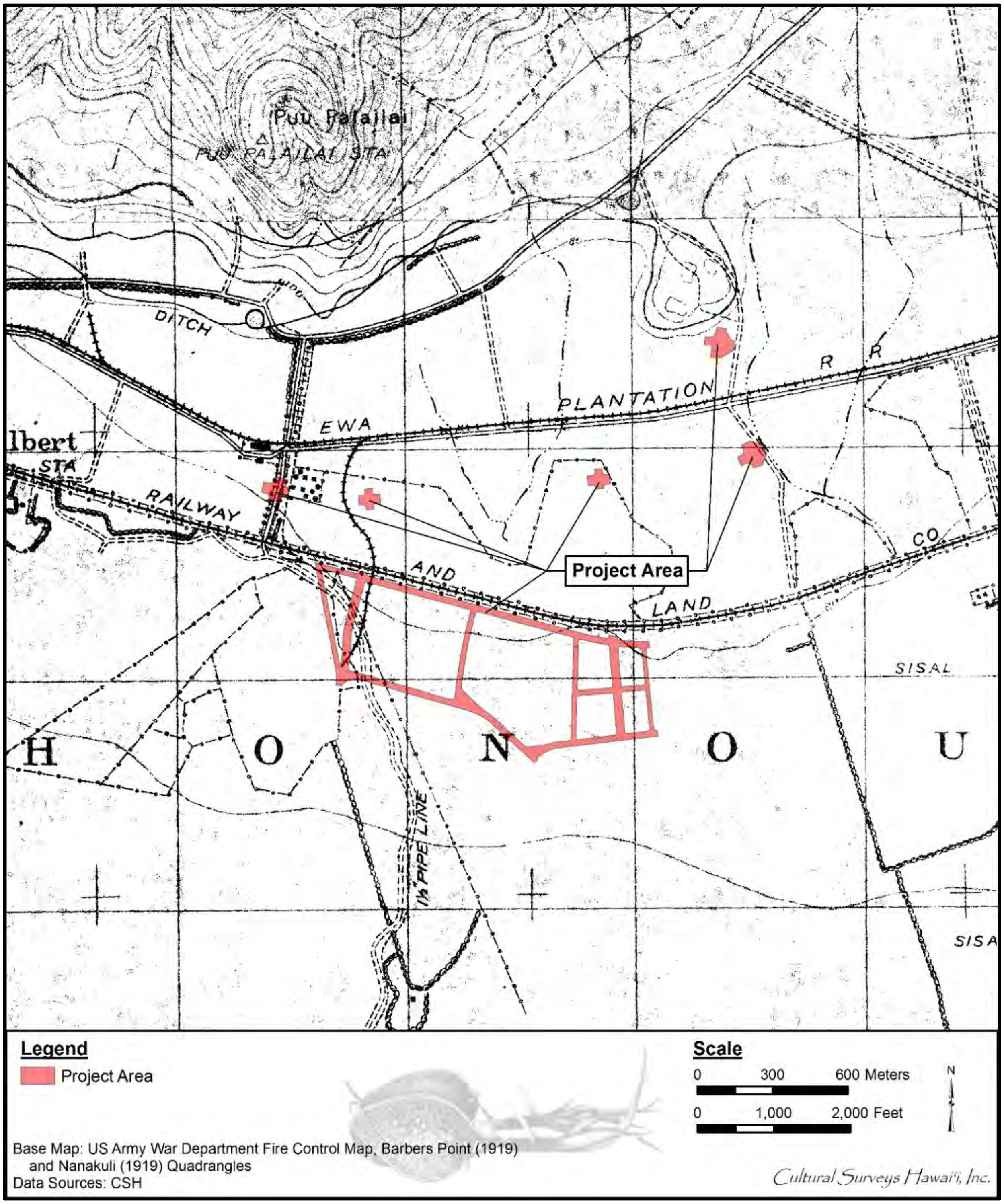


Figure 12. Portion of 1919 U.S. Army War Department fire control map, Barbers Point and Nanakuli quadrangles, showing the project area

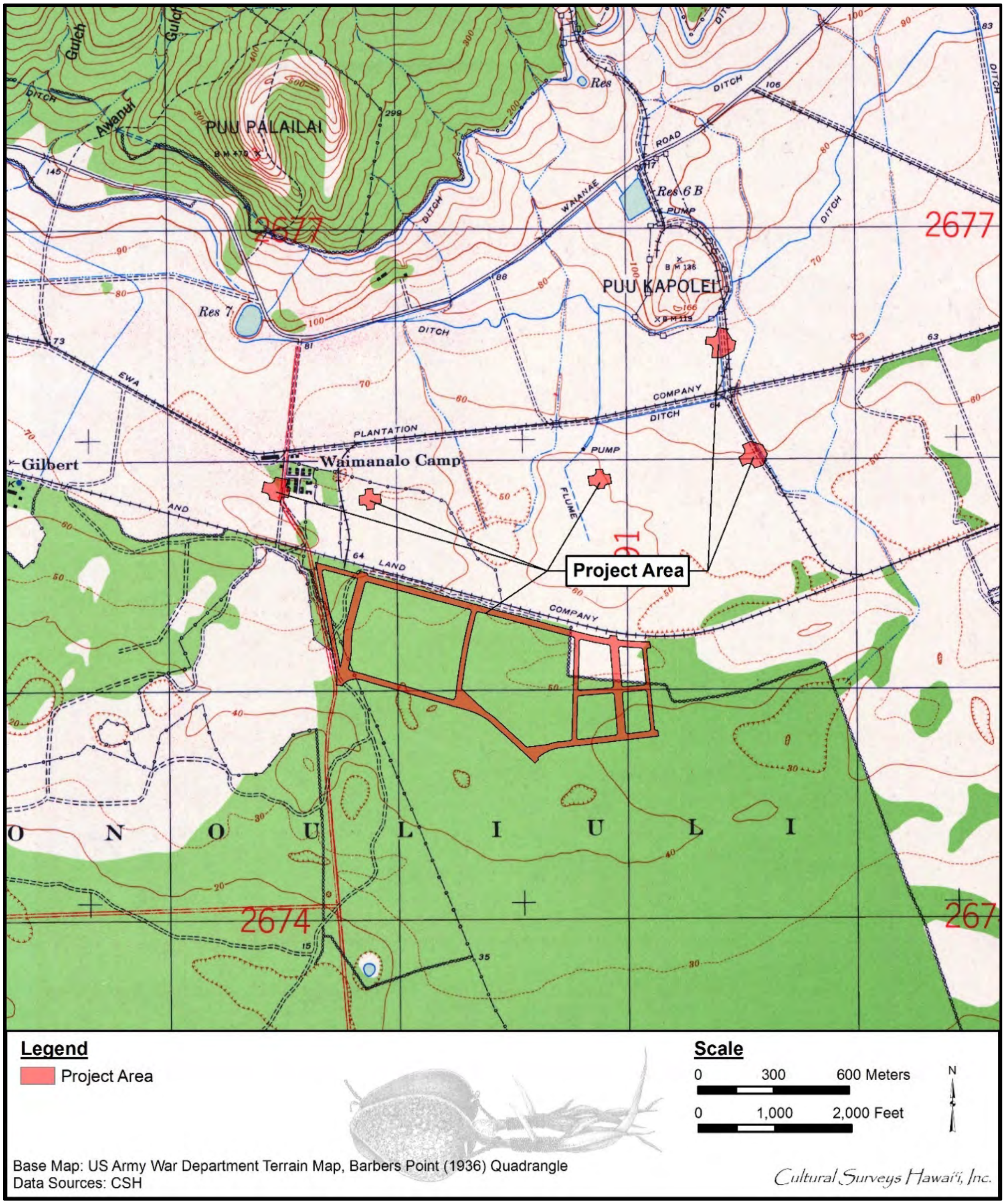


Figure 13. Portion of 1936 U.S. Army War Department terrain map, Barbers Point Quadrangle showing the project area

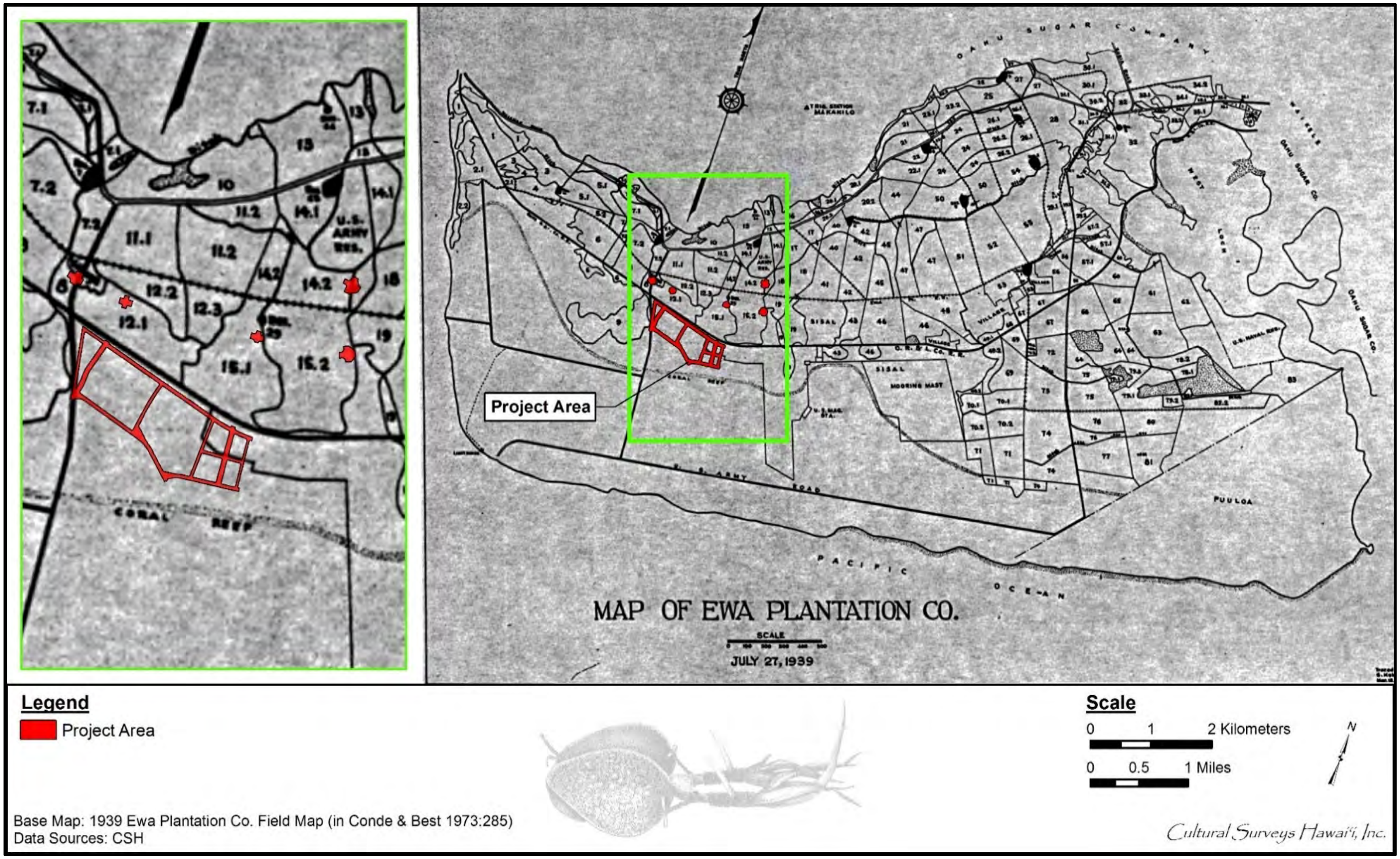


Figure 14. 1939 Ewa Plantation Company field map (from Condé and Best, 1973:285) showing project area (close-up inset at left)

Pālailai in Makakilo and was used from 1921 to house Battery Palailai and Fire Control Station B (Payette 2003). Fire Control Station A was atop Puʻu Makakilo. From 1942 to 1945, the Puʻu Makakilo Training Area, including lands in and around Puʻu Makakilo, was used for military training during World War II.

The Naval Air Station Barbers Point Final Environmental Baseline Survey (Department of the Navy 1994) presents the following succinct history of the base:

> In 1930, the U.S. Navy leased 206 acres of land on the ʻEwa Plain from the Campbell Estate for the purpose of building a mooring mast for the dirigible *Akron*. At the expiration of the lease in late 1939 or early 1940, the Navy acquired over 3,500 acres of land from the Estate. In 1941, the Marine Corps Ewa strip was completed on a portion of the land to serve as an auxiliary airfield for the Navy's Ford Island Facility. The Ewa Marine Corps Air Station was extensively damaged during the Japanese attack on Pearl Harbor on December 4, [*sic*] 1941. During World War II, the design capacity of the station was changed. The major construction of Barbers Point was completed from 1941 to 1945. [Department of the Navy 1994:3-20]

A 1943 War Department map shows a radically transformed landscape with a major east/west oriented road, presently known as Boxer Road, crossing the central portion of the project area, with a number of roads radiating off to the north (Figure 15). Note this this alignment of roads was apparently abandoned in favor of the alignment depicted on the 1953 Army map (Figure 17). In addition, a number of new structures are shown just south/southeast of the project area. These are understood to be brand new barracks office buildings and warehouses hastily erected to meet the needs of America's entry into World War II.

The 1953 Army Map Service map shows a much more developed military landscape with many new structures within and adjacent to the project area (see Figure 17). These structures, understood to be mostly military housing, including free-standing houses and duplex units, were part of the rapid development in the area during the last years of World War II. The 1943 (see Figure 15) and 1953 (Figure 18) maps suggest virtually the entire vicinity around the project area was grubbed and graded during World War II.

Grading and grubbing of the project area and its vicinity continued as the Barbers Point Naval Air Station remained operational even after 1953 (Figure 19). However, a 1977 aerial photograph (Figure 20) shows most of the 1940s-era buildings within and adjacent to the project area had been demolished by that time. The lands in the vicinity are reverting back into *kiawe* (*Prosopis pallida*) and *koa haole* (*Leaucaena leucocephala*) scrub, although the eastern portion of the project area is still shown as an active portion of the Naval Air Station.

The names of streets within and surrounding the project area typically reflect the history of U.S. naval air power, particularly ships related to U.S. Naval air power in the Southwest Pacific Theater of Operations in World War II. Roosevelt Avenue is named after the former American president and commander-in-chief who served throughout most of World War II. Copahee Avenue is named after the USS *Copahee*, a Bogue-class escort carrier, and Saratoga Avenue is named after the second aircraft carrier of the U.S. Navy. Both carriers were active in the Pacific through much of World War II. Kearsarge Avenue is named after the USS *Kearsarge* aircraft carrier, which was active in the Korean Conflict and Vietnam War. The USS *Boxer* was an Essex-class aircraft carrier

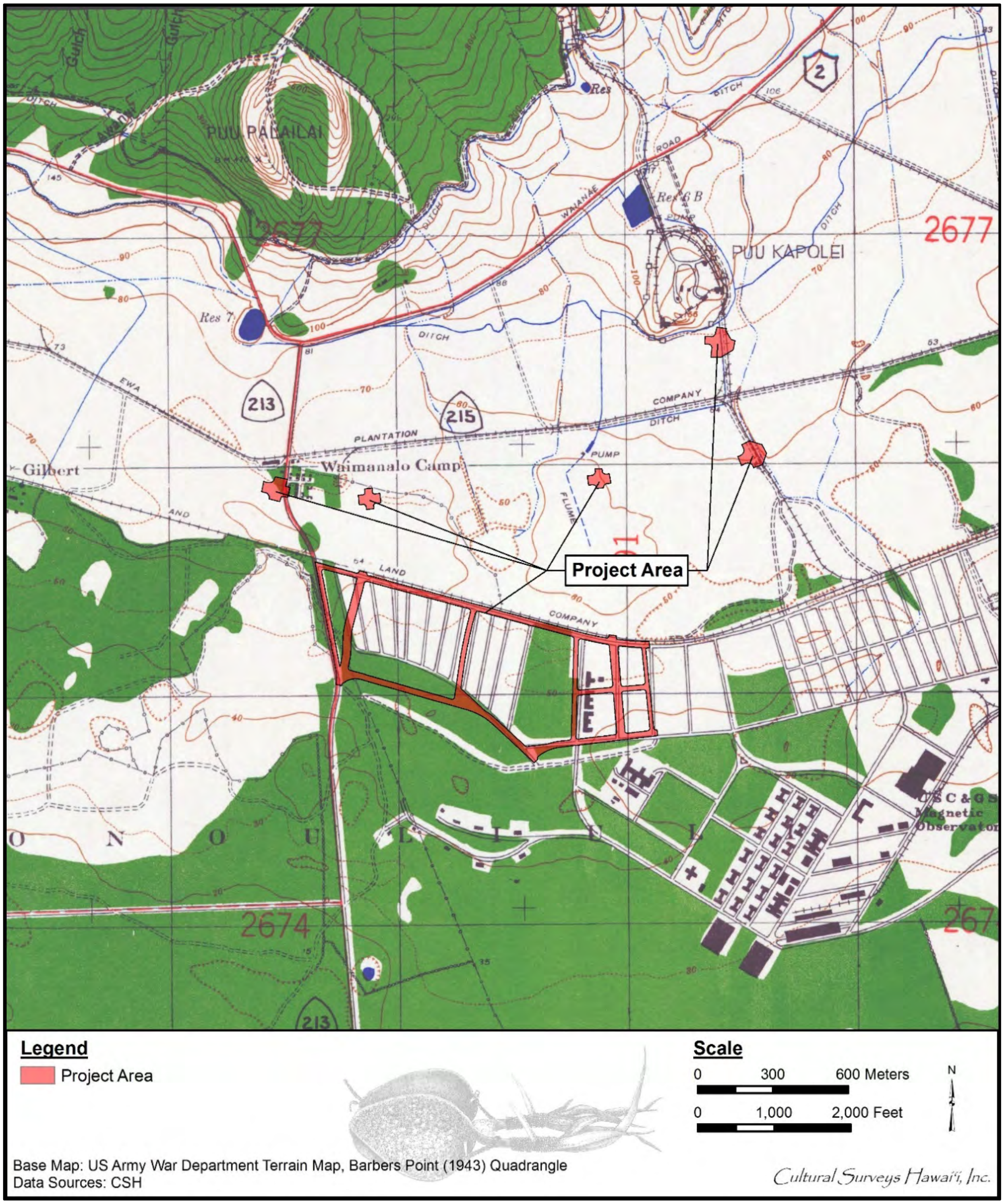


Figure 15. Portion of 1943 U.S. Army War Department terrain map, Barbers Point Quadrangle showing the project area

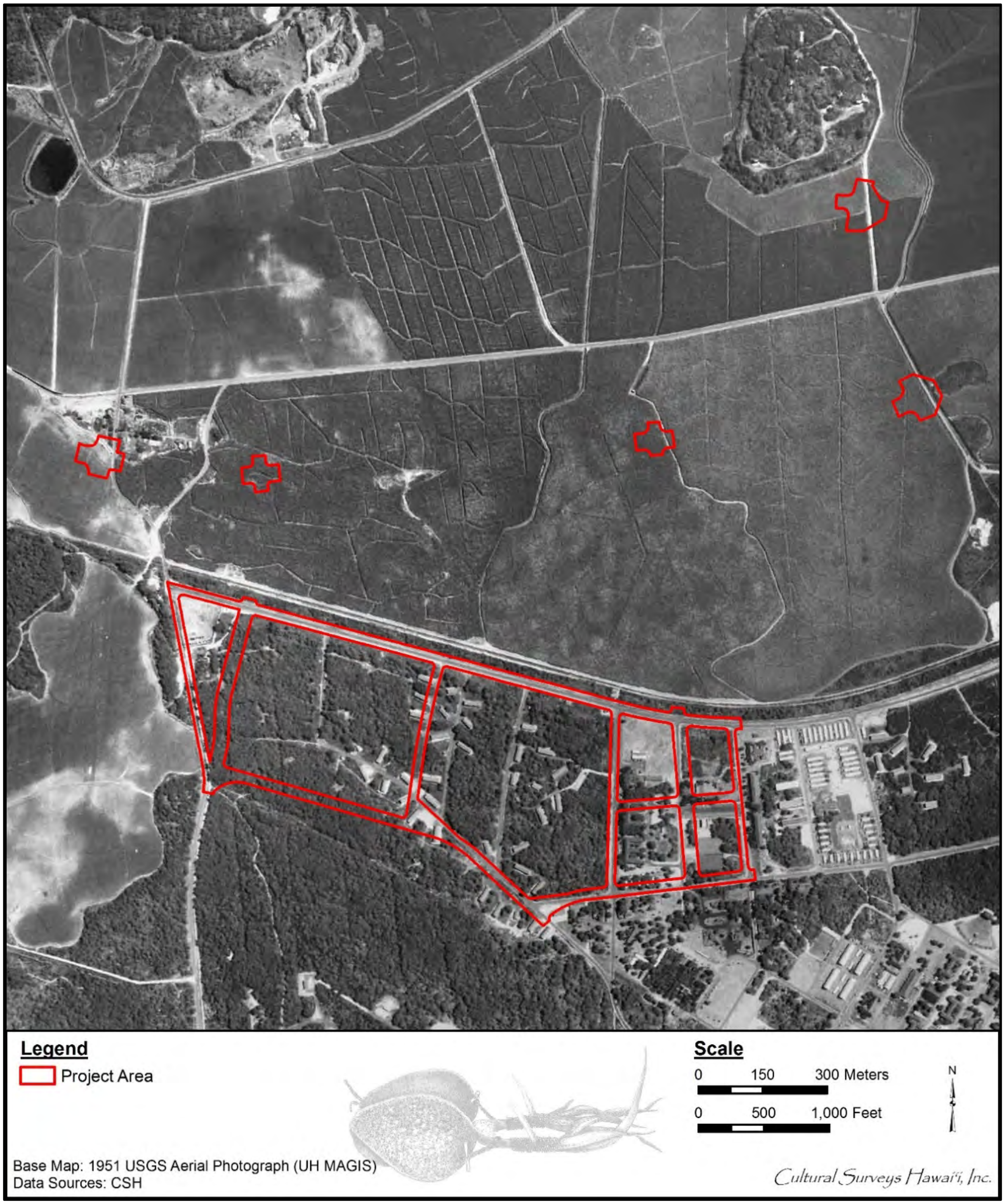


Figure 16. 1951 USGS aerial photograph (UH MAGIS) showing the project area

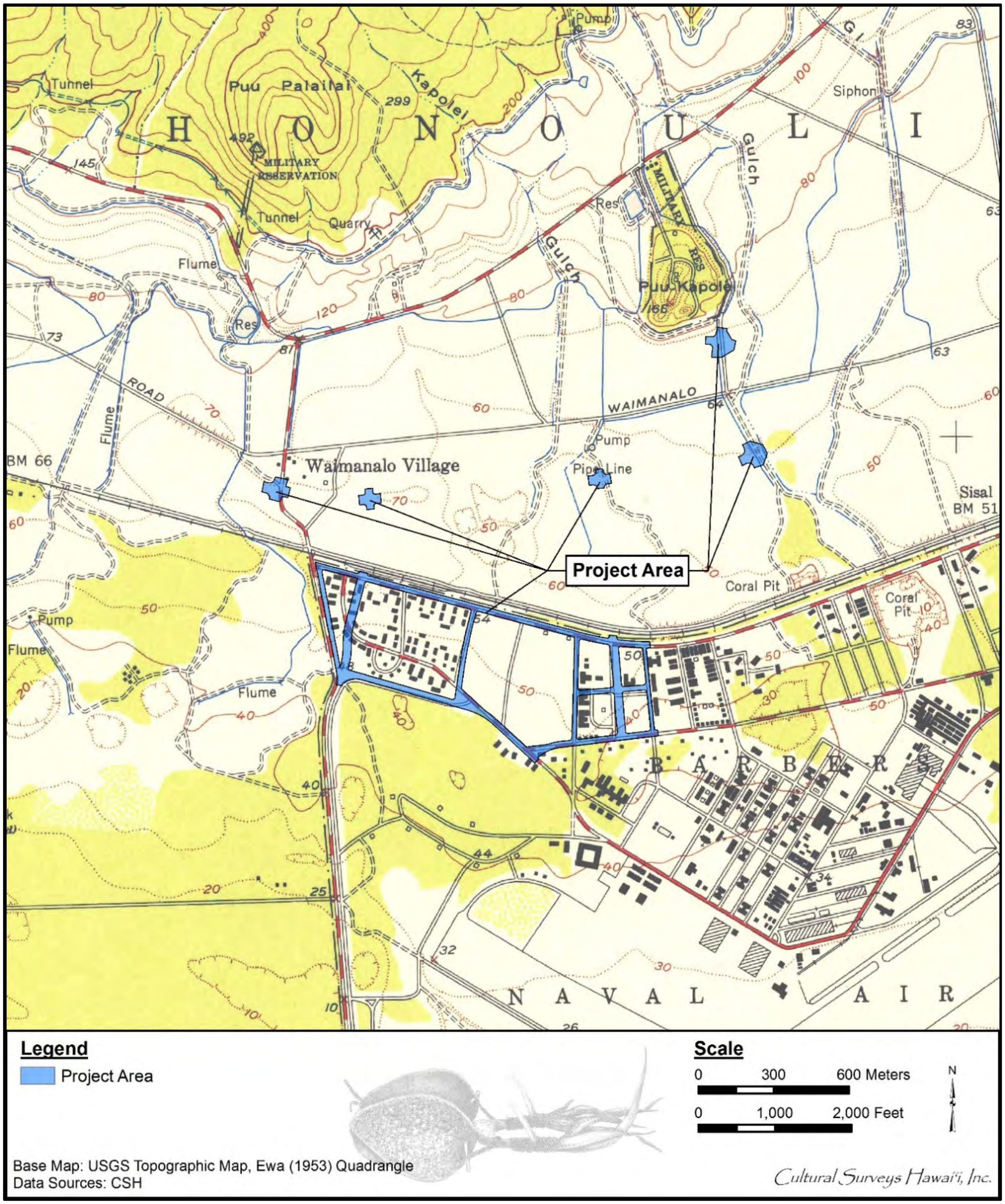


Figure 17. Portion of 1953 Ewa USGS topographic quadrangle showing the project area

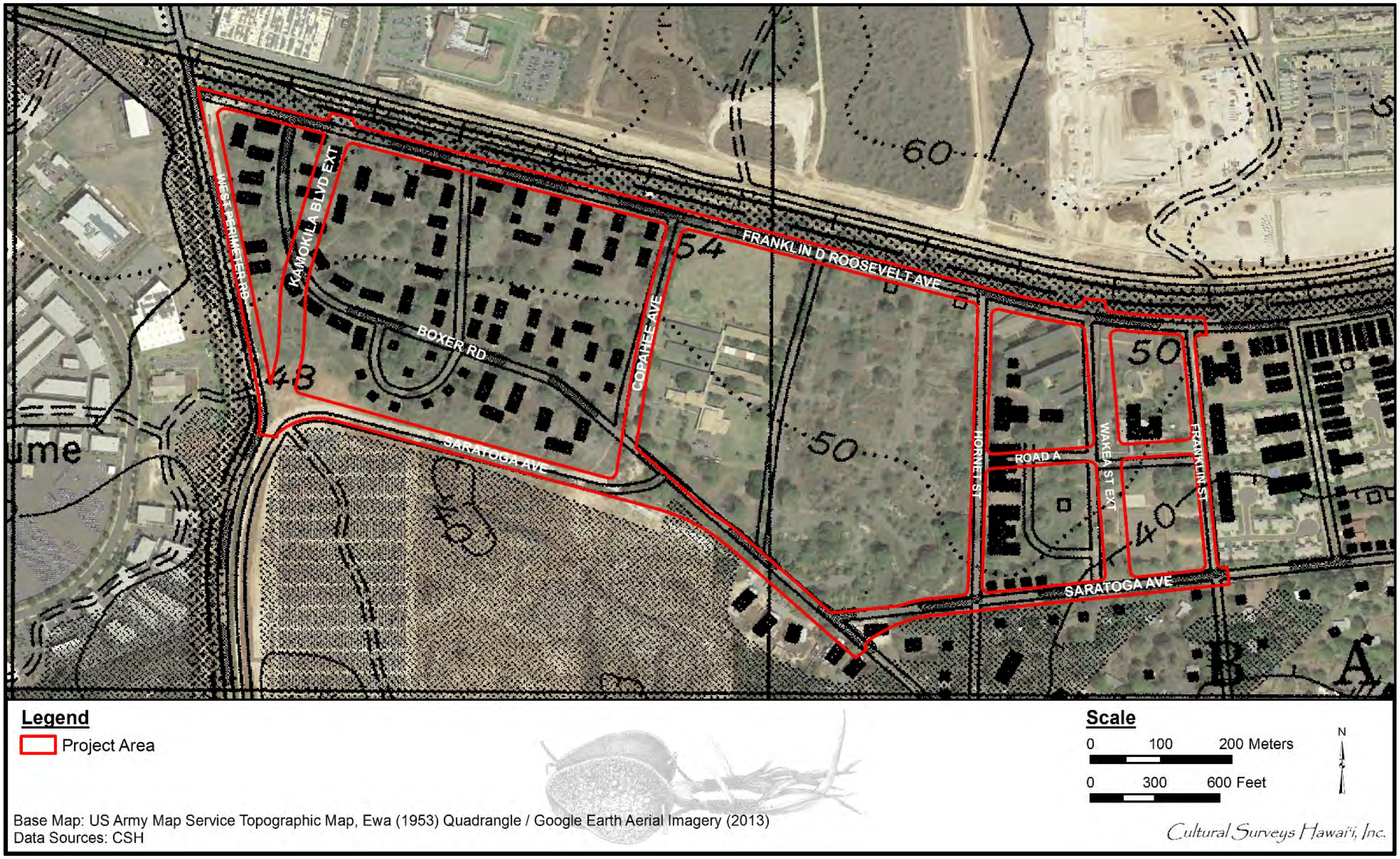


Figure 18. 1953 U.S. Army Map Service topographic map, Ewa topographic quadrangle, overlaid on a Google Earth aerial photograph (2013)

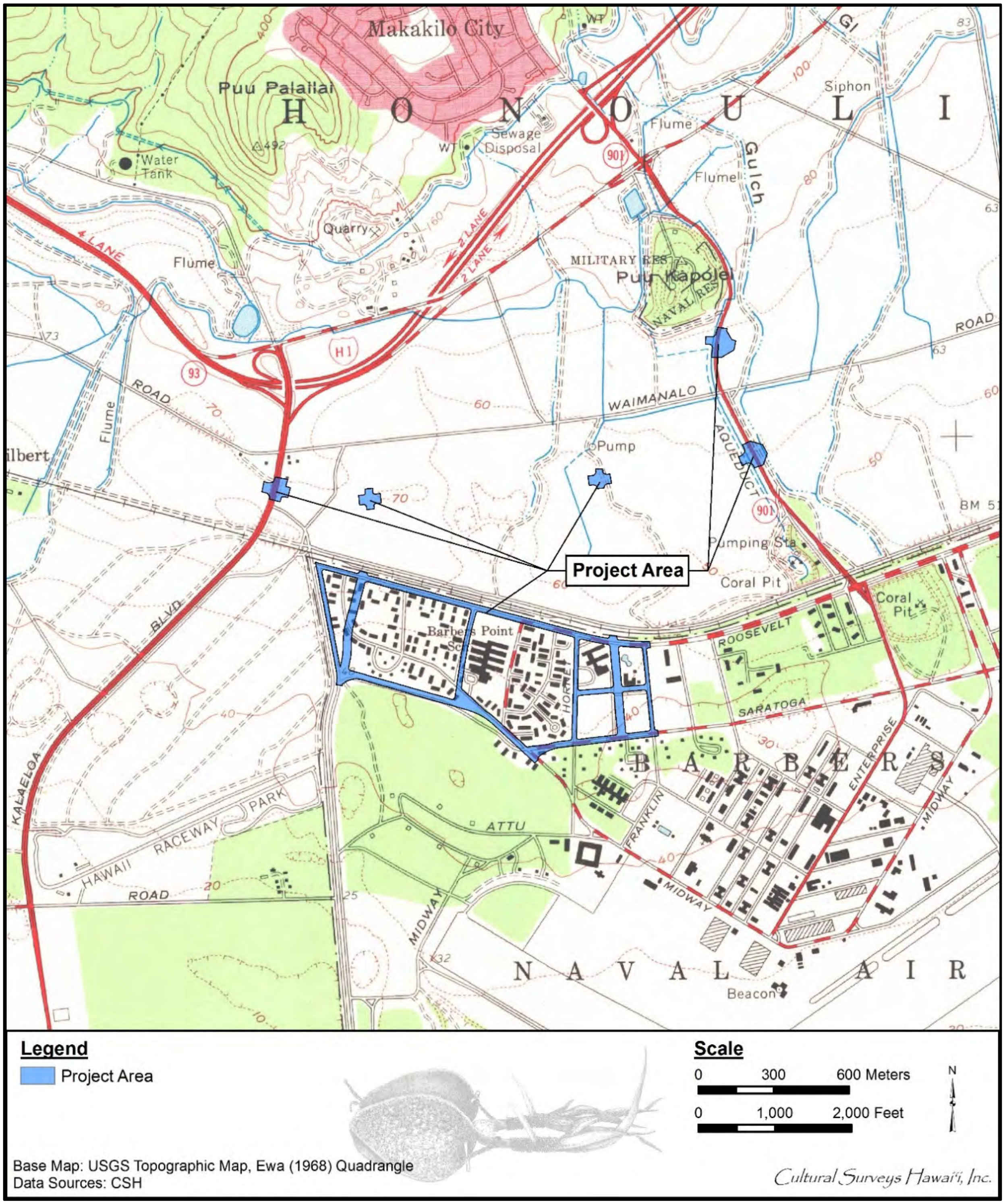


Figure 19. Portion of 1968 Ewa USGS topographic quadrangle, showing project area; note the roads going south off Roosevelt Avenue

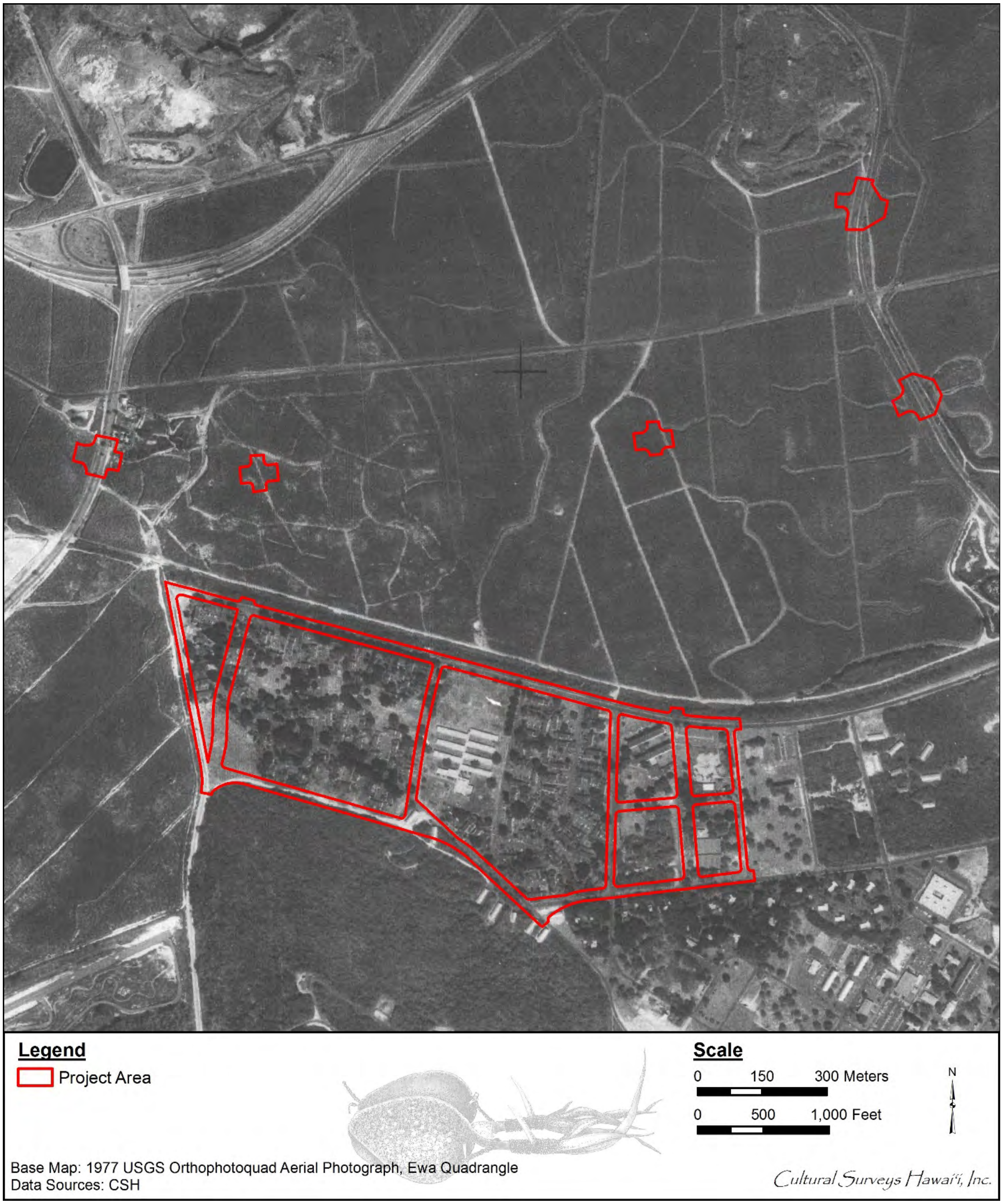


Figure 20. 1977 USGS orthophotoquad aerial photograph, Ewa Quadrangle showing the project area

(the fifth U.S. Navy ship to be so named) and was awarded eight battle stars for her service in the Korean Conflict.

## 3.3 Previous Archaeological Research

Archaeological studies conducted within and in the immediate vicinity of the current project area are discussed below. The studies most relevant to the current project are depicted on Figure 21 and are summarized in Table 1. Figure 22 shows archaeological sites in the vicinity of the project area; these are summarized in Table 2. Figure 23 shows historic structures of preservation concern in the vicinity of the project area.

The first effort to record historic properties in Honouliuli was by Thrum (1907:46), who references “a *heiau* on Kapolei hill, ‘Ewa—size and class unknown. Its walls thrown down for fencing.” The former *heiau* was on Pu‘u o Kapolei, northeast of the present study area.

In his 1930 surface survey of the island of O‘ahu, archaeologist McAllister recorded the specific locations of important archaeological and cultural sites and the general locations of some sites of lesser importance. McAllister (1933:107–108) recorded seven sites in Honouliuli (McAllister Sites 133–139), and these became the first seven sites in the Bernice Pauahi Bishop Museum’s (BPBM) Site Numbering System (OA-B6-1 through OA-B6-7). The nearest of these to the present project area is McAllister Site 138, which includes the Pu‘u o Kapolei *heiau* referenced by Thrum (see above) and an adjacent rock shelter approximately 2 km (1.2 miles) to the northeast (McAllister 1933:109).

Reports of the numerous sites resulted in a number of visits by Dr. Sinoto and student volunteers in late 1969 and early 1970. A University of Hawai‘i graduate student, Lewis, conducted a surface survey that located some 22 archaeological sites of the types typical for the Kalaeloa region, including various types of enclosures and mounds, and walls made of the locally available stacked limestone cobbles and boulders (Lewis 1970).

### 3.3.1 Oshima 1975

Oshima (1975) of the Bishop Museum Anthropology Department carried out an archaeological reconnaissance survey of a proposed drainage channel at the Campbell Industrial Park complex. Archaeological sites were encountered only in the relatively undisturbed segment between (the then) Hawaii Raceway Park and Malakole Road southwest of the current project area. These archaeological sites included a long wall about 1 m high, two small, broken walls, a small, crude, enclosed, circular platform, and the remnants of a low-walled enclosure. Little detail is provided.

### 3.3.2 Clark 1977

Clark (1977) conducted an archaeological reconnaissance survey at Pu‘uokapolei/Fort Barrette. Clark and colleagues surveyed the entire property and noted the extensive modification from the military development. Clark notes, “There are presently at least twenty abandoned, or partially abandoned, late historic military structures on the site, including bunkers, barracks, and a chapel.” The author notes that “Several basalt free-standing, and retaining, walls were seen which appear to have been built by army personnel” (Clark 1977:1). They did not find any evidence of pre-Contact use of the area including the *heiau* and rockshelter described by McAllister (1933). Clark concluded no further archaeological work was necessary within the project area.

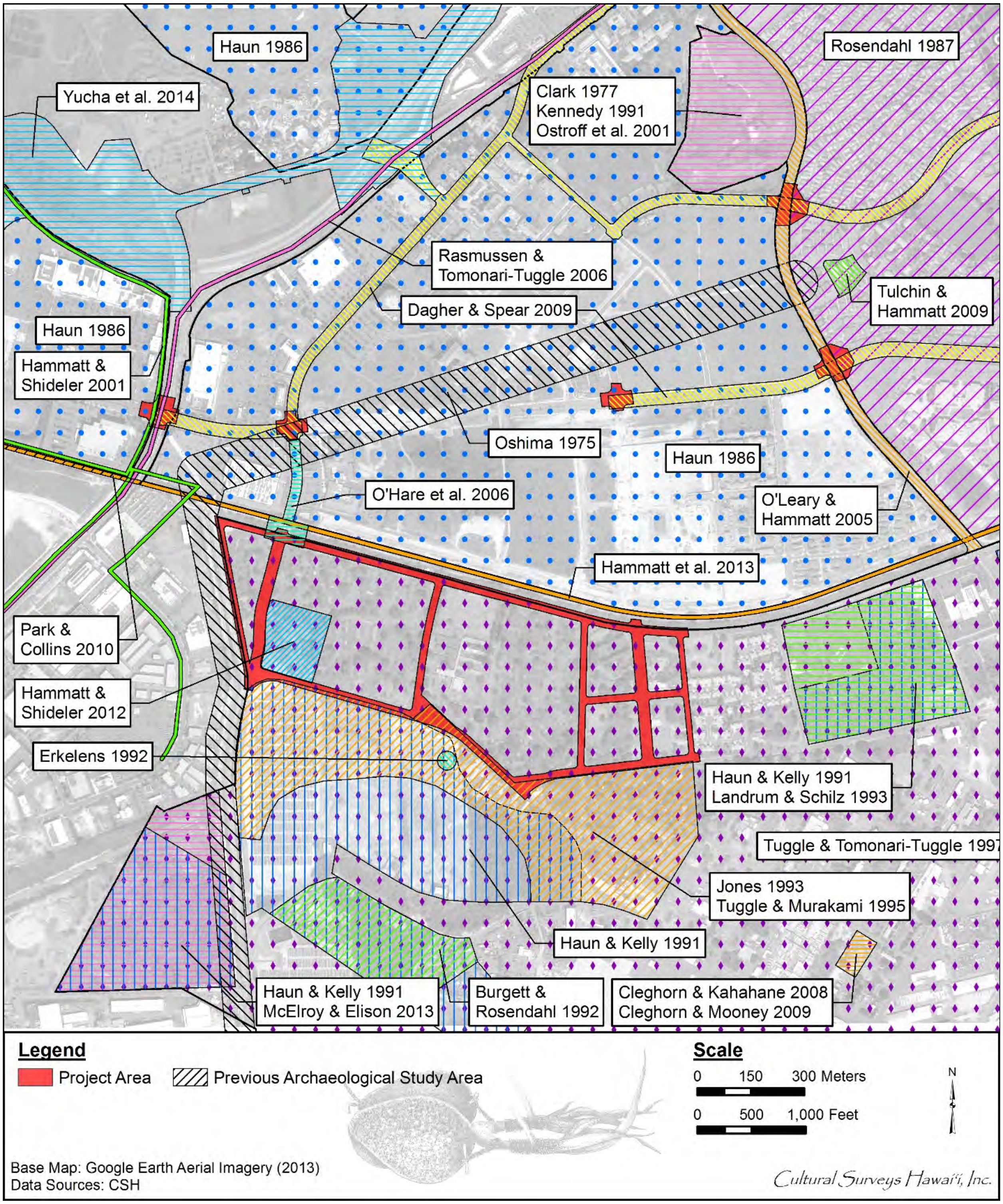


Figure 21. 2013 Google Earth aerial photograph showing archaeological studies in the vicinity of the project area

Table 1. Previous archaeological studies within and in the vicinity of the project area

| Reference | Type of Study | Location | Results (SIHP # 50-80-12) |
|---|---|---|---|
| Oshima 1975 | Archaeological reconnaissance survey | Proposed drainage channel at Campbell Industrial Park complex | Encountered archaeological sites only in relatively undisturbed segment between (the then) Hawaii Raceway Park and Malakole Rd southwest of current project area; included long wall about 1 m high, two small, broken walls, small, crude, enclosed, circular platform and remnants of a low-walled enclosure |
| Clark 1977 | Archaeological reconnaissance survey | Pu‘uokapolei/Fort Barrette | Clark notes, “There are presently at least twenty abandoned, or partially abandoned, late historic military structures on the site, including bunkers, barracks, and a chapel” and that “several basalt free-standing, and retaining, walls were seen which appear to have been built by army personnel” |
| Haun 1986 | Archaeological reconnaissance survey | ‘Ewa Town Center/Secondary Urban Center, TMKs: [1] 9-1-015:004, 005, 017; 9-1-016:004, 006, 016, 018, 024, 030; 9-2-019:001 | Two sites, an irrigation ditch and a WWII military structure, identified north of H-1; no sites identified in vicinity of present project area other than OR&L |
| Rosendahl 1987 | Archaeological reconnaissance survey | Kapolei Village Master Plan project | No archaeological sites documented near project area other than OR&L Railroad line (SIHP # -9714) |
| Haun and Kelly 1991 | Archaeological survey with notes on history of Honouliuli | 1,230 acres at Naval Air Station, Barbers Point | Recorded 43 archaeological sites, comprised of 385 discrete features; approx. 73% likely pre-Contact sites, and 27% most likely historical; approx. 47% of pre-Contact sites evaluated as probably related to habitation activities |
| Kennedy 1991 | Archaeological; surface survey and subsurface testing | Kapolei Park/Pu‘u Kapolei | Reports six features made out of basalt, but concluded they were of modern origin; observed Army infrastructure dated to early 1940s, but not designated as historic properties; no historic properties observed during subsurface testing |

| Reference | Type of Study | Location | Results (SIHP # 50-80-12) |
|---|---|---|---|
| Burgett and Rosendahl 1992 | Archaeological inventory survey | Contaminated soil stockpile/ remediation facility at Naval Air Station, Barbers Point approx. 500 m south of present project area | Identified 21 sites comprising 71+ features including mound, modified sinkhole, wall, terrace, modified outcrop, cairn, enclosure, pavement, platform, alignment, cave, and cupboard formal types; site function included agriculture, temporary habitation, agriculture/temporary habitation, possible burial, marker, and possible storage; agriculture largest functional category, with 49 features (69%) |
| Erkelens 1992 | Archaeological survey and interpretive trail development study | Site 1719 at Naval Air Station Barbers Point, just south of central portion of project area | Identified features included Feature A, a C-shape planting mound; Feature B a large enclosure (16 m by 12 m) with a 4 m by 4 m paved platform; Feature C an enclosure roughly equilateral triangle in shape with walls approximately 13 m long; Feature D low irregular pile of rock and rough alignment; Feature E a small vertical-sided mound constructed of stacked limestone |
| Jones 1993 | Letter Report for Phase I archaeological inventory survey | Barbers Point Naval Air Station “Area A,” 55-acre area immediately adjacent and south of south side of present project area | Identified 274 archaeological features in Area A including five sites:<br>SIHP # 50-80-08-1718, habitation complex including rectangular enclosure, elongate mound, two C-shape structures, and circular mound<br>SIHP # 50-80-08-1719, included two enclosures, C-shape structure, circular mound, and cairn; numerous undocumented features noted nearby<br>SIHP # 50-80-08-1720, described as small habitation/agricultural site containing circular mound and enclosure; C-shape structure also discovered<br>SIHP # 50-80-08-1723 identified as habitation complex of six sinkholes<br>SIHP # 50-80-08-1726 included a platform and mound within cleared area |

| Reference | Type of Study | Location | Results (SIHP # 50-80-12) |
|---|---|---|---|
| Landrum and Schilz 1993 | Archaeological reconnaissance and limited subsurface testing | Proposed Family Housing Construction Area, Barbers Point Naval Air Station | Six archaeological sites identified; three (SIHP #s -1728, -4649, and -4653) are boundary walls of Hawaiian Fibre Co. sisal plantation which operated from AD 1898 until AD 1930; three sites (SIHP #s -4650, -4651, and-4652) contain eight features of traditional Hawaiian origin and two of undetermined origin; nine WWII era military structures (Buildings 446 through 454) documented in companion study (Yoklavich 1992) |
| Tuggle and Murakami 1995 | Archaeological inventory survey | Family housing at Naval Air Station Barbers Point, immediately south of present project area (10.8-acre portion of Jones [1993] study area) | SIHP # -4701, sinkhole capped and modified sometime in first half of twentieth century for storage of items probably related to illegal alcohol production; three sites (SIHP #s -1723, -1724, and -1726) contained 132 features; 55 tests (shovel tests, test pits, and rock removal) indicate structures and sinkholes used for Hawaiian habitation, agriculture, and burial; human bone identified in three features, all sinkholes (SIHP #s -1724-19, -1724-54, and -1726-2); additional site (SIHP # -4702) consists of approx. 150 low stone piles and mounds that may represent Hawaiian dryland agricultural complex |
| Tuggle and Tomonari-Tuggle 1997 | Survey and inventory summary | Naval Air Station Barbers Point | Provides data on numerous sites at Naval Air Station Barbers Point |
| Hammatt and Shideler 2001 | Archaeological inventory survey | Along OR&L west of Kalaeloa Blvd and south from just east of Kalaeloa Blvd | Only OR&L alignment (SIHP # -9714) and certain Ewa Plantation sugar company irrigation infrastructure (SIHP # -4341) noted in vicinity of present project area |

| Reference | Type of Study | Location | Results (SIHP # 50-80-12) |
|---|---|---|---|
| Ostroff et al. 2001 | Archaeological inventory survey with subsurface testing | Puʻuokapolei/Fort Barrette | Two sites recorded: SIHP # -5918 includes stone mound and petroglyph of questionable age on western side of *puʻu*; SIHP # -5919 includes 40 separate features associated with Army installation known as Fort Barrette; included pillboxes, terraces, stone walls, platforms, gun emplacements, and other military related structures |
| O'Leary and Hammatt 2005 | Archaeological literature review and field inspection | Fort Barrette | Identified four historic properties: previously unrecorded disarticulated segment of concrete irrigation piping; wall segment and former railroad bed features of SIHP # -5919, historic remnant of Fort Barrett; SIHP # -138, Puʻuokapolei; and SIHP # -9714, OR&L ROW |
| O'Hare et al. 2006 | Archaeological inventory survey (recorded as an archaeological assessment) and cultural impact evaluation | Kamōkila Blvd extension from former southern termination (junction with Kapolei Pkwy) south to Franklin D. Roosevelt Ave at Kapolei, TMKs: [1] 9-1-016:001, 012, 032 | Identified OR&L ROW; in addition to original main line track, discussed a siding and two railway cars on siding |
| Rasmussen and Tomonari-Tuggle 2006 | Archaeological monitoring | Waiau Fuel Pipeline, TMK: [1] 9-1, 2, 4, 6, 7, and 8 (various parcels) | No on-site archaeological monitoring or field results near present project area |
| Cleghorn and Kahahane 2008 | Archaeological assessment (literature review and field inspection study) | Proposed Ke Kama Pono facility, Yorktown Rd, TMK: [1] 9-1-013:024 | This project area was vacant lot that appeared to have been extensively modified in past; any surface archaeological features present would have been bulldozed and destroyed; bulldozing activity may have also buried or collapsed any sink holes that may have been present |

| Reference | Type of Study | Location | Results (SIHP # 50-80-12) |
|---|---|---|---|
| Cleghorn and Mooney 2009 | Archaeological monitoring | Ke Kona Pono facility, Yorktown Rd, TMK: [1] 9-1-013:024 | Three potential sinkholes encountered but no associated cultural or paleontological remains identified; foundation remnants from a late historic military structure identified |
| Dagher and Spear 2009 | Literature search and field inspection | Kapolei Computerized Traffic Control System, TMKs: [1] 9-1-various and 9-2-various | Surface structures and/or artifacts not expected to be recovered within roadway corridor due to massive landscape modifications during Plantation era and recent times; subsurface contexts not expected to yield traces of agricultural and habitation activities and/or artifacts associated with traditional times, also due to modern landscape modifications |
| Tulchin and Hammatt 2009 | Archaeological inventory survey (recorded as an archaeological assessment) | The Villas at Malu‘ohai, 2-acre parcel in Kapolei, TMK: [1] 9-1-016:064 por. | No historic properties identified |
| Park and Collins 2010 | Archaeological monitoring | 4-mile Kahe Reverse Osmosis (RO) Water Pipeline, TMKs: [1] 9-1-015:002 and 9-2-003:011 | No new subsurface archaeological sites or deposits |
| Hammatt and Shideler 2012 | Archaeological literature review and field inspection | 10-acre Rengo Packaging Inc., TMK: [1] 9-1-013-002 por.; overlaps present study area | Encountered 13 former foundation sites, briefly described with text and photographs; no historic properties designated |
| Hammatt et al. 2013 | Archaeological inventory survey testing | Tracks Beach Park, TMK: [1] 9-2-003:011 | No new significant finds; OR&L SIHP # -9714, further described |

| Reference | Type of Study | Location | Results (SIHP # 50-80-12) |
|---|---|---|---|
| McElroy and Elison 2013 | Archaeological inventory survey | 43-acre parcel for proposed solar farm in Kalaeloa, TMK: [1] 9-1-013:001 | Two archaeological sites, SIHP # -1725 (traditional to early-historic multi-use complex) and NL-25 (twentieth century homestead) previously recorded on property; Site NL-25 not found; SIHP # 1725 first documented in Bishop Museum survey that recorded site as a complex of burials, terraces, walls, sinkholes, foundations, enclosures, pavements, cairns, and C-shaped structure (Haun 1991); all 17 features of SIHP # -1725 confirmed and ten new features found |
| Yucha et al. 2014 | Supplemental archaeological inventory survey | Phase II Kapolei Interchange, TMKs: [1] 9-1-015:017 por. and 9-2-043:001–004 por. | Three historic properties:<br>SIHP # -4341, ditch and flume system initially identified by Hammatt et al. (1991)<br>SIHP # -4342, Ewa Plantation Co. Reservoir 7 initially identified by Hammatt et al. (1991)<br>SIHP # -7669, quarry remnant related to former Palailai Quarry, newly identified during supplemental AIS investigation |

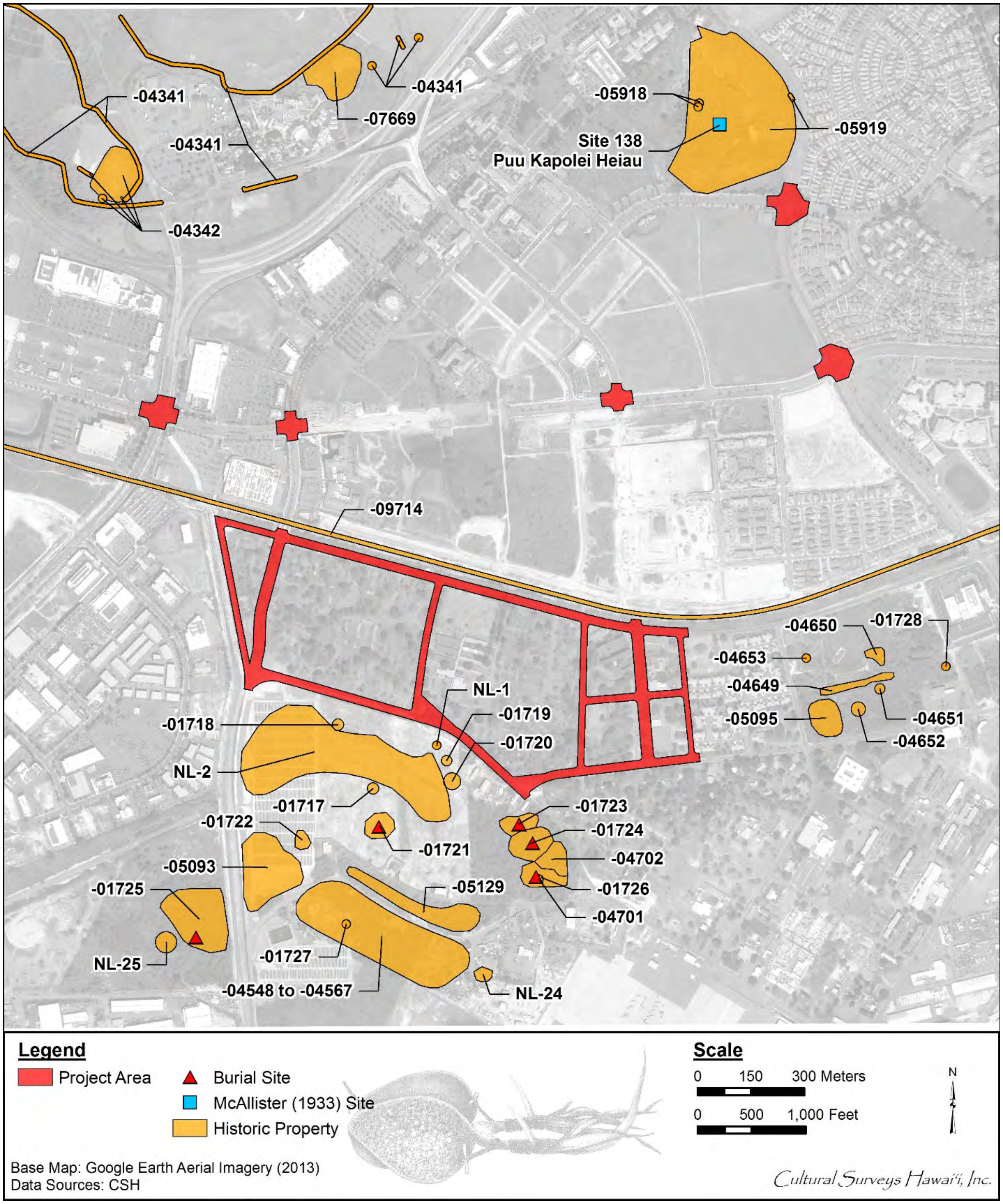


Figure 22. 2013 Google Earth aerial photograph showing relationship of the project area to known archaeological sites (adapted from NAS Barbers Point Final Environmental Baseline Survey June 1994 Figure 3-5 on page 3-24)

Table 2. NAS Barbers Point known cultural resources near present study area (adapted from NAS Barbers Point Final Environmental Baseline Survey June 1994 Table 3-2 on pages 3-22, 3-23)

| **SIHP # (50-80-12-)** | **Distance to Present Project Area** | **Description** | **Comments** | **Source(s)** |
|---|---|---|---|---|
| Site 138 | 264 m (886 ft) to N | Pu‘u Kapolei Heiau | – | McAllister 1933 |
| 1717 | 239 m (784 ft) to S | Small habitation complex including L-shape, wall, circular platform and enclosure | Agriculture and habitation and possible burial function | Haun and Kelly 1991, Tuggle and Tomonari-Tuggle 1997 |
| 1718 | 250 m (820.2 ft) to ESE | Hawaiian habitation complex | Pre-Contact; good to poor condition; “L-shape missing, upright found 1992/1993” | Haun and Kelly 1991, Jones 1993, Tuggle and Tomonari-Tuggle 1997 |
| 1719 | 500 m (1,640.4 ft) to ESE | Hawaiian habitation complex | Pre-Contact; excellent to good condition, “five additional features identified 1992/1993” | Haun and Kelly 1991, Jones 1993, Tuggle and Tomonari-Tuggle 1997 |
| 1720 | 550 m (1,804.4) to SE | Hawaiian habitation /agricultural complex | Pre-Contact; fair to poor condition; “additional C-shape identified 1992/1993” | Haun and Kelly 1991, Jones 1993, Tuggle and Tomonari-Tuggle 1997 |
| 1721 | 350 m (1,148.3 ft) to SSE | Hawaiian habitation complex | Pre-Contact; fair to poor condition | Haun and Kelly 1991, Tuggle and Tomonari-Tuggle 1997 |
| 1722 | 300 m (984.2 ft) to SE | Hawaiian habitation complex | Pre-Contact; good to poor condition | Haun and Kelly 1991, Tuggle and Tomonari-Tuggle 1997 |
| 1723 | 650 m (2,132.5 ft) to SE | Hawaiian habitation complex | Pre-Contact; good to fair condition; “C-shape and platform not located 1992/1993” | Haun and Kelly 1991, Jones 1993, Tuggle and Tomonari-Tuggle 1997 |
| 1724 | 700 m (2,296.6 ft) to SE | Hawaiian habitation /agricultural complex | Pre-Contact; excellent to fair condition | Haun and Kelly 1991, Tuggle and Tomonari-Tuggle 1997 |

| SIHP # (50-80-12-) | Distance to Present Project Area | Description | Comments | Source(s) |
|---|---|---|---|---|
| 1725 | 650 m (2,132.5 ft) to S | Hawaiian habitation complex | Pre-Contact; condition not stated , associated shell midden | Haun and Kelly 1991, Tuggle and Tomonari-Tuggle 1997 |
| 1726 | 750 m (2,460.6 ft) to SE | Hawaiian habitation complex including platform, cairn, and wall | Pre-Contact; fair to poor condition, “wall not located 1992/1993” | Haun and Kelly 1991, Jones 1993, Tuggle and Tomonari-Tuggle 1997 |
| 1727 | 500 m (1,640.4 ft) to SE | Complex including cave and cultural sinkhole | Pre-Contact; good condition; also shell midden and historic artifacts | Haun and Kelly 1991, Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 1728 | 732 m (2,401.5 ft) to E | Walls (2) | Probably associated with ranching or sisal production | Haun and Kelly 1991, Landrum and Schilz 1993, Tuggle and Tomonari-Tuggle 1997 |
| 4341 | 1,000 m (3,280.8 ft) to N | Irrigation system | Plantation related | Huan 1987 |
| 4342 | 683 m (2,240.8 ft) to N | Reservoir | Plantation related | Yucha et al. 2014 |
| 4548 | 619 m (2,030.8 ft) to S | Complex including walls (5), mound (7), and terrace (1) | Agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4549 | 619 m (2,030.8 ft) to S | Terrace | Agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4550 | 619 m (2,030.8 ft) to S | Complex including wall and terrace | Agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |

| SIHP # (50-80-12-) | Distance to Present Project Area | Description | Comments | Source(s) |
|---|---|---|---|---|
| 4551 | 619 m (2,030.8 ft) to S | Complex including walls (2), modified sinkhole (2), modified outcrop, mound, and enclosure | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4552 | 619 m (2,030.8 ft) to S | Complex including modified outcrops (2), mounds (2), and a modified sinkhole | Agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4553 | 619 m (2,030.8 ft) to S | Complex including modified sinkholes (2), wall, and enclosure | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4554 | 619 m (2,030.8 ft) to S | Modified sinkhole | Agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4555 | 619 m (2,030.8 ft) to S | Mound | Agriculture function | Burgett and Rosendahl 1992 |
| 4556 | 619 m (2,030.8 ft) to S | Complex including terraces (2), modified sinkhole, mound, and cairn | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4557 | 619 m (2,030.8 ft) to S | Complex including cairn and wall | Possible storage and agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4558 | 619 m (2,030.8 ft) to S | Complex including L-shape wall and mound | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |

| SIHP # (50-80-12-) | Distance to Present Project Area | Description | Comments | Source(s) |
|---|---|---|---|---|
| 4559 | 619 m (2,030.8 ft) to S | Complex including walls (2), mounds (5), and platform | Agriculture and possible burial function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4560 | 619 m (2,030.8 ft) to S | Complex including mound, terrace, and modified sinkhole | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4561 | 619 m (2,030.8 ft) to S | Complex including mound, cupboard, and alignment | Agriculture and possible burial and possible storage functions | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4562 | 619 m (2,030.8 ft) to S | Complex including terraces (2), wall, mound, and modified sinkhole | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4563 | 619 m (2,030.8 ft) to S | Modified sinkhole | Agriculture function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4564 | 619 m (2,030.8 ft) to S | Complex including modified sinkhole, pavings (2), and platform | Agriculture and temporary habitation, and possible burial function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4565 | 619 m (2,030.8 ft) to S | Complex including modified sinkhole and terrace | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4566 | 619 m (2,030.8 ft) to S | Complex including L-shape wall and terrace | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |
| 4567 | 619 m (2,030.8 ft) to S | Complex including modified sinkhole and wall | Agriculture and temporary habitation function | Burgett and Rosendahl 1992, Tuggle and Tomonari-Tuggle 1997 |

| SIHP # (50-80-12-) | Distance to Present Project Area | Description | Comments | Source(s) |
|---|---|---|---|---|
| 4649 | 405 m (1,328.7 ft) to E | Wall (traceable over 260-m distance) | East-west oriented remnant of portions of Hawaiian Fibre Co boundary wall | Landrum and Schilz 1993, Tuggle and Tomonari-Tuggle 1997 |
| 4650 | 542 m (1,778.2 ft) to E | Traditional Hawaiian habitation complex | Including three pit caves, one with maximum interior dimensions 9 m long by up to 5 m wide with floor to ceiling height up to 1.4 m, rectangular enclosure, and slab faced mound | Landrum and Schilz 1993, Tuggle and Tomonari-Tuggle 1997 |
| 4651 | 536 m (1,758.5 ft) to E | Habitation site | Including walled terrace and mound | Landrum and Schilz 1993, Tuggle and Tomonari-Tuggle 1997 |
| 4652 | 496 m (1,627.3 ft) to E | Mounds (3) | Mounds may have recent military origin, or may be traditional Hawaiian features | Landrum and Schilz 1993, Tuggle and Tomonari-Tuggle 1997 |
| 4653 | 335 m (1,099.1 ft) to E | Wall remnant | Wall remnant oriented in same direction as SIHP # -4649 sisal plantation wall and may be of similar origin | Landrum and Schilz 1993, Tuggle and Tomonari-Tuggle 1997 |
| 4701 | 289 m (948.1 ft) to S | Modified sinkhole | SIHP # -4701, sinkhole capped and modified sometime in first half of twentieth century for storage of probably related to illegal alcohol production | Tuggle and Murakami 1995 |
| 4702 | 222 m (728.3 ft) to S | Mounds | Consists of approx. 150 low stone piles and mounds that testing suggests represent Hawaiian dryland agricultural complex | Tuggle and Murakami 1995 |

| SIHP # (50-80-12-) | Distance to Present Project Area | Description | Comments | Source(s) |
|---|---|---|---|---|
| 5093 | 502 m (1,646.9 ft) to S | WWII portable pillbox, roads, pads | WWII infrastructure | Tuggle and Tomonari-Tuggle 1997 |
| 5095 | 364 m (1,194.2 ft) to E | WWII bivouac | WWII infrastructure | Tuggle and Tomonari-Tuggle 1997 |
| 5129 | 404 m (1,325.5 ft) to S | Hawaiian habitation complex | – | Tuggle and Tomonari-Tuggle 1997 |
| 5918 | 360 m (1,181.1 ft) to N | Mound and petroglyph | – | Ostroff et al. 2001 |
| 5919 | 225 m (738.2 ft) to N | 40 features associated with Fort Barrette | – | Ostroff et al. 2001 |
| 7669 | 998 m (3,274.3 ft) to N | Quarry remnant | – | Yucha et al. 2014 |
| 9714 | Bisects project area | OR&L alignment | Placed on National Register of Historic Places (NRHP) | NRHP form (1974) |
| NL-1 | 66 m (216.5 ft) to S | WWII sentry post | – | Tuggle and Tomonari-Tuggle 1997 |
| NL-2 | 130 m (426.5 ft) to S | Mixed complex of Hawaiian and ranching features | – | Tuggle and Tomonari-Tuggle 1997 |
| NL-24 | 554 m (1,817.5 ft) to S | Jet “boneyard” | – | Tuggle and Tomonari-Tuggle 1997 |
| NL-25 | 740 m (2,427.8 ft) to SSW | Early to mid-twentieth century homestead | – | Tuggle and Tomonari-Tuggle 1997 |

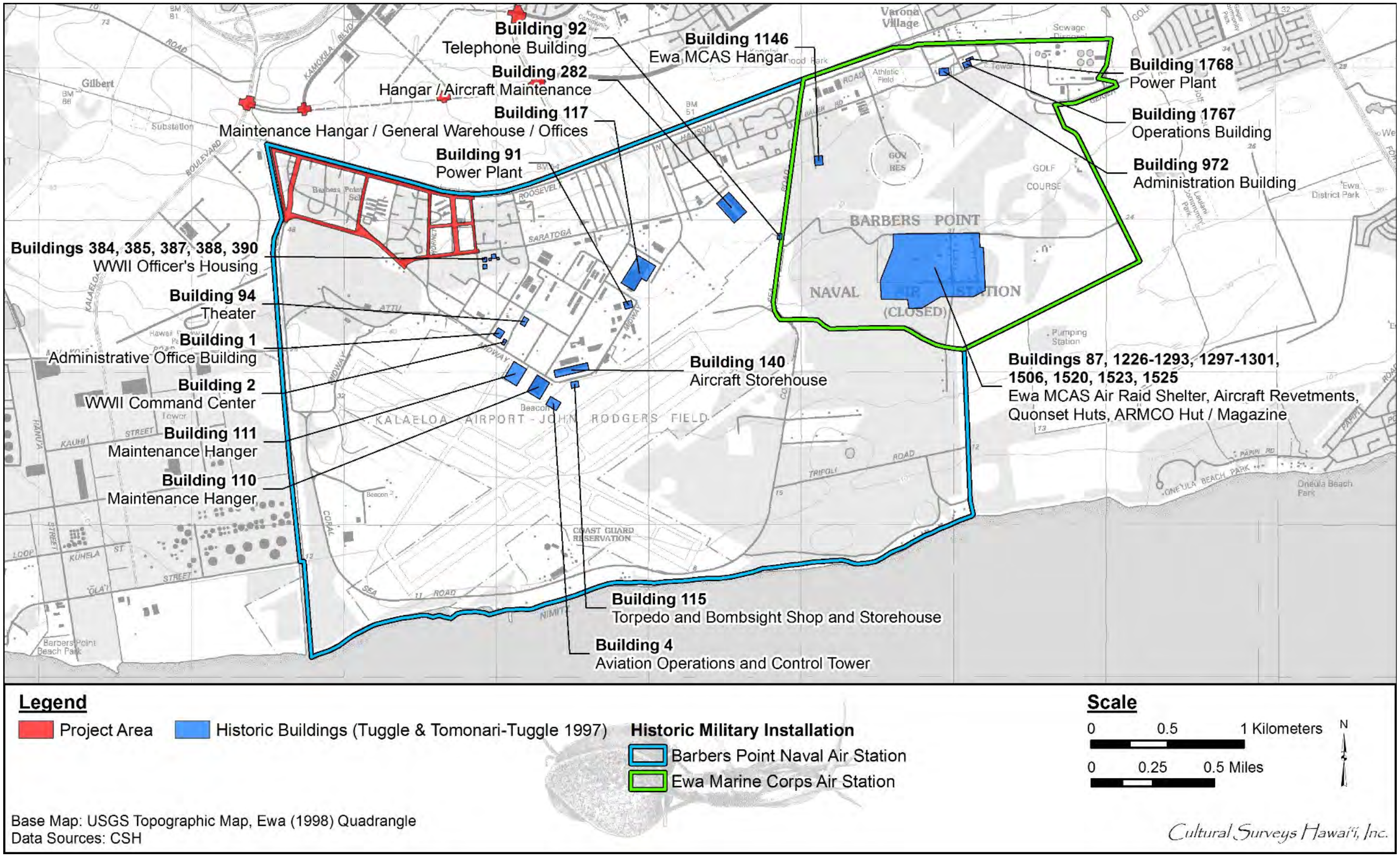


Figure 23. Map showing relationship of the project area to known historic structures of preservation concern (adapted from NAS Barbers Point Final Environmental Baseline Survey June 1994 Figure 3-6 on page 3-26)

### 3.3.3 Haun 1987

Paul H. Rosendahl, Inc. (PHRI) conducted an archaeological reconnaissance survey of approximately 1,400 acres in the Ewa Town Center (ETC)/Secondary Urban Center project area in Honouliuli (Haun 1987). Haun's (1987) survey included the northern portion of the current project area, *mauka* of the OR&L. Haun (1987) found that most of the ETC project area had been extensively modified in the late nineteenth and twentieth centuries, particularly by sugarcane cultivation. Although no historic properties were previously identified within the ETC project area, one previously identified historic property is adjacent to it. The OR&L right-of-way (ROW), SIHP # 50-80-12-9714, bounds the ETC project area on the *makai* side, along present-day Renton Road.

Two sites, an irrigation ditch and a World War II military structure, were identified within the ETC project area during the reconnaissance survey. The ditch was constructed of concrete and stone. Associated features including the remains of two structures, a roadbed, and a wall were also noted. These are part of the irrigation system used to irrigate the sugarcane fields *mauka* of the current H-1 alignment well north of the present project area.

The multi-level, ferro-concrete, World War II military structure was identified on the summit of Pu‘u Palailai. It was interpreted as an observation point consisting of a staircase-like series of rooms, each with a large opening or window facing the ocean. An associated structure consisting of a circular, dry-laid stone masonry walled enclosure was also documented. This also appeared to be military related and was interpreted as a possible revetment for a small gun position for defense of the observation point. Because the ditch and military structure were less than 50 years old at the time of the survey, no further work was recommended.

### 3.3.4 Rosendahl 1987

Rosendahl (1987) conducted an archaeological reconnaissance survey of approximately 850 acres for the Kapolei Village project extending to the east edge of the present project area. The project area was bounded by Farrington Highway on the northwest, Fort Barrette Road on the southwest, the OR&L on the southeast, and O‘ahu Sugar Company lands adjacent to Kaloi Gulch on the northeast. No archaeological sites were documented near the project area other than the OR&L Railroad line (SIHP # -9714).

### 3.3.5 Haun and Kelly 1991

Haun and Kelly (1991) produced an archaeological survey of the Naval Air Station, Barbers Point with notes on the history of Honouliuli. The survey area totaled approximately 1,230 acres. A total of 43 archaeological sites, comprised of 385 discrete features, were recorded. Of these, approximately 73% were understood as most likely pre-Contact sites; 27% were regarded as most likely historical. Approximately 47% of the pre-Contact sites were evaluated as probably related to habitation activities. Designated Survey Area A was just south of the present project area and was judged to have a moderate density of cultural remains and Survey Area B was just to the east and was judged to have a low density of cultural remains. SIHP #s -1717 through -1727 were described in Area A and SIHP # -1728 was described in Area B.

### 3.3.6 Kennedy 1991

Kennedy (1991) conducted a surface survey as well as subsurface testing with a backhoe at Kapolei Park/Pu‘u o Kapolei. Kennedy (1991:17–20) reports six features made out of basalt, but concluded they were of modern origin. Kennedy also observed Army infrastructure dated to the early 1940s, but did not designate them as historic properties. No historic properties were observed during subsurface testing. Like Clark (1977), Kennedy (1991) recommended that no further archaeological work was necessary.

### 3.3.7 Burgett and Rosendahl 1992

Burgett and Rosendahl (1992) reported on an archaeological inventory survey at a contaminated soil stockpile/remediation facility at Naval Air Station, Barbers Point approximately 500 m south of the present project area. A total of 21 sites comprising 71+ features were identified including mound, modified sinkhole, wall, terrace, modified outcrop, cairn, enclosure, pavement, platform, alignment, cave, and cupboard formal types. Site function included agriculture, temporary habitation, agriculture/temporary habitation, possible burial, marker, and possible storage. Agriculture was the largest functional category, with 49 features (69%).

### 3.3.8 Erkelens 1992

Erkelens (1992) produced an archaeological survey and interpretive trail development study for Site 1719 at Naval Air Station Barbers Point located just south of the central portion of the project area. Identified features included Feature A, a C-shape planting mound; Feature B, a large enclosure (16 m by 12 m) with a 4 m by 4 m paved platform; Feature C, an enclosure roughly equilateral triangle in shape with walls approximately 13 m long; Feature D, a low irregular pile of rock and a rough alignment; and Feature E, a small vertical-sided mound constructed of stacked limestone. Detailed plan view and cross-section maps are provided.

### 3.3.9 Jones 1993

Jones (1993) of the International Archaeological Institute Inc. (IARII) prepared a letter report for a Phase I archaeological inventory survey at Barbers Point Naval Air Station addressing three discrete project areas: a family housing project (H-208), an aviation maintenance training building (P-261), and a PATSWINGPAC addition (P-255). Designated “Area A” for a family housing project was a 55-acre area immediately adjacent to the south of the south side of the present project area. A total of 274 archaeological features were identified in Area A including five sites (SIHP #s 50-80-08-1718, 50-80-08-1719, 50-80-08-1720, 50-80-08-1723, and 50-80-08-1726) previously reported by the Bishop Museum survey (Haun 1991).

SIHP # -1718, was initially described as a habitation complex of six features, which included a rectangular enclosure, elongate mound, two C-shape structures, an L-shape structure, and a possible burial platform (Haun 1991:38–41). IARII identified all but one of these features. The L-shape structure (Feature C) could not be located, but an upright slab was recorded. The platform feature (Feature E) noted by Haun as a possible burial locus was described by the IARII archaeologists simply as a circular mound.

SIHP # -1719, included two enclosures, a C-shape structure, a circular mound, and a cairn, in excellent states of preservation. The discovery of numerous undocumented features nearby suggested the need for additional survey.

SIHP # -1720, was described as a small habitation/agricultural site containing a circular mound and enclosure (Haun 1991:43). Both the enclosure and platform were relocated. A C-shape structure was also discovered among these features and arbitrarily included within the site boundary.

SIHP # -1723 was identified as a habitation complex of six sinkholes, a C-shape structure, and a possible burial platform (Haun 1991:47–48). The IARII survey confirmed all six sinkholes; however, neither a C-shape enclosure nor platform were found. It was thought possible the mound (Feature 20A) located 25 m to the east of the sinkhole complex may represent the platform noted in the Haun 1991 Bishop Museum survey.

SIHP # -1726 had been reported as a platform, wall, and mound cluster. The Jones (1993) IARII survey recorded a platform and mound within a cleared area, but could not discern a wall as noted in the Bishop Museum report (Haun 1991:52–53).

Jones summarizes,

> Feature types recorded in Area A included linear alignments, circular mounds, elongated mounds, modified outcrops, enclosures, sinkholes, C-shape, U-shape and L-shape structures, platforms, cairns, possible hearth, and linear stacked rock. Historic features included such common forms as wall sections, with occassional anomalies represented by a 1930s-era automobile, stone-lined irrigation ditch, concrete cistern, and stone cattle tank. Recent military-related structures were present, but rare. These feature types included trash scatters of cans and building materials, a concrete bunker, and a small building utilized as a washroom. Many features, particularly those described as modified bedrock features, were probably multicomponent in function, incorporating indistinct mounds, walls, and linear stacked rock. [Jones 1993:5]

### 3.3.10 Landrum and Schilz 1993

Landrum and Schilz (1993) wrote up an archaeological reconnaissance and limited subsurface testing at a proposed Family Housing Construction Area project at Barbers Point Naval Air Station. Six archaeological sites were identified. Three sites (SIHP #s 50-80-12-1728, -4649, and -4653) are boundary walls of the Hawaiian Fibre Company sisal plantation which operated from AD 1898 until AD 1930.

Three sites (SIHP #s -4650, -4651, and-4652) contain eight features of traditional Hawaiian origin and two of undetermined origin. SIHP #s -4650 and -4651 have habitation or habitation-related components. SIHP # -4652 contains one probable agriculturally related clearing mound and two mounds of undetermined function or origin. SIHP #s -4650, -4651, and -4652 (Feature 1), are remnant examples of late prehistoric traditional Hawaiian activity within undeveloped portions of the work area. SIHP # -4650 contains features and material remains indicating semi-permanent occupation of the area (Landrum and Schilz 1993).

Nine World War II era military structures (Buildings 446 through 454) were documented in a companion study (Yoklavich 1992).

### 3.3.11 Tuggle and Murakami 1995

Tuggle and Murakami (1995) produced an archaeological inventory survey for a Family Housing construction project at Naval Air Station Barbers Point immediately south of the present project area. This was an intensive survey of a 10.8-acre portion of the Jones (1993) study area.

One site stands apart from the rest, as unrelated to early Hawaiian use. SIHP # -4701 is a sinkhole that was capped and modified sometime in the first half of the twentieth century for storage of items that were probably related to illegal alcohol production. Three of the sites (SIHP #s -1723, -1724, and -1726) contained 132 features. Some 55 tests (shovel tests, test pits, and rock removal) indicate the structures and sinkholes were used for Hawaiian habitation, agriculture and burial. Human bone was identified in three of the features, all sinkholes (SIHP #s -1724-19, -1724-54, and -1726-2). An additional site (SIHP # -4702) consists of approximately 150 low stone piles and mounds that testing suggests represent a Hawaiian dryland agricultural complex.

### 3.3.12 Tuggle and Tomonari-Tuggle (1997)

Tuggle and Tomonari-Tuggle (1997) produced *A Cultural Resource Inventory of Naval Air Station Barbers Point . . .* that summarized and synthesized prior studies accomplished at the Naval Air Station. They addressed the entirety of the Naval Air Station lands including all of the present project area seaward of the OR&L alignment. They show a series of north/south (*mauka*/*makai*) trending strips cleared by bulldozer during the construction of NAS Barbers Point ca. 1942 crossing the present project area south of the OR&L (Tuggle and Tomonari-Tuggle (1997:37). They provide summaries of finds by inventory area but none of the inventory areas appears to overlap with the present project area.

### 3.3.13 Hammatt and Shideler 2001

The field investigation of this archaeological inventory survey conducted by Hammatt and Shideler (2001) indicated cable corridors going through areas intensively disturbed by prior sugarcane cultivation, by modern construction activity associated with transportation infrastructure, and by recent development. Based on background research and fieldwork results, no further archaeological research was recommended. Only two historic properties were identified within 50 m (164 ft) of a proposed fiber optic cable alignment: the OR&L Railroad (SIHP # -9714) and Ewa Plantation Sugar Company irrigation infrastructure (SIHP # -4341).

### 3.3.14 Ostroff et al. 2001

Ostroff et al. (2001) completed an inventory survey with subsurface testing of Pu‘uokapolei/Fort Barrette. The inventory survey included a complete surface survey, the excavation of 21 trenches with a backhoe, and the excavation of four controlled test units. Two sites were recorded during the investigations: SIHP #s -5918 and -5919. SIHP # -5918 includes a stone mound and a petroglyph of questionable age on the western side of the *pu‘u*, SIHP # -5919. SIHP # -5919 includes 40 separate features associated with the Army installation known as Fort Barrette; these included pillboxes, terraces, stone walls, platforms, gun emplacements, and other military related structures. Ostroff et al. concluded SIHP # -5918 would need further investigation if any construction activities were going to take place that might impact the site. The authors also concluded Fort Barrette (SIHP # -5919) was “an excellent candidate for placement on the National Register of Historic Places” (Ostroff et al. 2001:i). Ostroff et al. (2001) do not evaluate the traditional cultural significance of Pu‘uokapolei (SIHP # -138), or make any recommendations regarding the site’s eligibility for either the State or National Register of Historic Places.

### 3.3.15 O’Hare et al. 2006

O’Hare et al. (2006) carried out an archaeological assessment and cultural impact evaluation for a Kamōkila Boulevard extension project from the former southern termination (at its junction with the Kapolei Parkway) south to Franklin D. Roosevelt Avenue at Kapolei, TMK: [1] 9-1-016:001, 012, 032. The only historic property identified was the OR&L right-of-way (SIHP # -9714) but in addition to the original main line track, a siding and two railway cars on the siding are discussed.

### 3.3.16 Rasmussen and Tomonari-Tuggle 2006

Rasmussen and Tomonari-Tuggle (2006) conducted archaeological monitoring for archaeological work on a Waiau Fuel Pipeline project (TMKs: [1] 9- 1, 3, 4, 6, 7, and 8). The fuel pipeline corridor extends from the HECO Barbers Point Tank Farm in Campbell Industrial Park to the Waiau Generating Station east of Pearl City Peninsula crossing the *ahupua‘a* of Honouliuli, Hō‘ae‘ae, Waikele, Waipi‘ o, Waiawa, Manana, Waimano, and Waiau. It appears there was no on-site archaeological monitoring or field results near the present project area.

### 3.3.17 Cleghorn and Kahahane 2008

Cleghorn and Kahahane (2008) produced an archaeological assessment (literature review and field inspection study) of the then proposed Ke Kama Pono facility at a Yorktown Road location on less than 0.25 acre of previously developed land within the former Barbers Point Air Station at Kalaeloa, (TMK: [1] 9-1-013:024). The study concluded this project area was a vacant lot that appeared to have been extensively modified in the past and that if any surface archaeological features were present, they would have been bulldozed and destroyed. It was thought that this bulldozing activity may have also buried or collapsed any sink holes that may have been present.

### 3.3.18 Cleghorn and Mooney 2009

Cleghorn and Mooney (2009) reported on archaeological monitoring for the development of the first of five 2,000 sq ft buildings of the Ke Kona Pono (“Children of Promise”) program facility located on Yorktown Road within the former Naval Air Station (NAS) Barbers Point (TMK: [1] 9-1-013:024). Three potential sinkholes were encountered but there were no associated cultural or paleontological remains identified. While foundation remnants from a late historic military structure demolished in the late 1980s were encountered and one historic bottle was found, no significant cultural remains were identified during excavations.

### 3.3.19 Dagher and Spear 2009

Dagher and Spear (2009) carried out a literature search and field inspection of the Kapolei Computerized Traffic Control System (TMK: [1] 9-1-various plats and parcels and 9-2-various plats and parcels). The study was of the area to be impacted by the construction of the North-South Roadway corridor, and the installation of 14.4 miles of underground fiber optic cable and conduits, and the installation of cameras and ancillary equipment at 22 intersections within existing ROWs in Kapolei and Makakilo. The study concluded that

> . . . surface structures and/or artifacts are not expected to be recovered within the roadway corridor due to the massive landscape modifications that have taken placed in the area during the Plantation-Era and recent times. In addition, subsurface contexts are not expected to yield traces of agricultural and habitation activities and/or artifacts associated with traditional times, this also due to modem landscape modifications, including the development of residential neighborhoods and the

various roads. Based on the findings of the literature search and field inspection, no archaeological work is recommended [Dagher and Spear 2009:15]

### 3.3.20 Tulchin and Hammatt 2009

Tulchin and Hammatt (2009) prepared an archaeological assessment (archaeological inventory survey with negative finds) for The Villas at Malu‘ohai, a 2-acre parcel in Kapolei (TMK: [1] 9-1-016:064 por.). The project area is located in Kapolei at 91-1001 Kama‘aha Avenue. It is bounded on the north by Kama‘aha Avenue, to the east by Kaiau Avenue, to the west by Fort Barrette Road, and to the south by a residential development. No historic properties were identified.

### 3.3.21 Park and Collins 2010

Park and Collins (2010) prepared an archaeological monitoring report in support of a Kahe Reverse Osmosis (RO) Water Pipeline project (TMKs: [1] 9-1-015:002 and 9-2-003:011). The 4-mile-long pipeline route lies immediately adjacent (*mauka*) to the OR&L Railroad tracks and within the OR&L ROW extending as far east as Kalaeloa Boulevard west of the present project area. Archaeological monitoring within the Kahe RO Water Pipeline project encountered no new subsurface archaeological sites or deposits.

### 3.3.22 Hammatt and Shideler 2012

Hammatt and Shideler 2012 produced an archaeological literature review and field inspection (LRFI) report for a 10-acre Rengo Packaging Inc. project (TMK: [1] 9-1-013-002 por.). The project area overlaps with the present study area. During pedestrian inspection of the project area 13 former foundation sites, understood as remnants of military housing and barracks constructed during the early 1940s and 1950s, were encountered and are briefly described with text and photographs. No historic properties were designated in this study.

### 3.3.23 Hammatt et al. 2013

CSH (Hammatt et al. 2013) produced an archaeological inventory survey testing report for work at Tracks Beach Park for a proposed Leeward Bikeway project, Phase II (TMK: [1] 9-2-003:011). For the purposes of the AIS the proposed project’s APE was defined as the entire 8.3-mile (13.4-km) 12.2-m (40-ft) wide corridor (total area of 16.35 ha or 40.4 acres) within which it was considered there may be direct impacts to historic properties. There were no new significant finds. OR&L, SIHP # -9714, previously placed on the National Register of Historic Places (National Register), is further described.

### 3.3.24 McElroy and Elison 2013

McElroy and Elison (2013) prepared an archaeological inventory survey for a 43-acre parcel for a proposed solar farm in Kalaeloa (TMK: [1] 9-1-013:001). Two archaeological sites, SIHP # -1725 (a traditional to early historic multi-use complex) and NL-25 (a twentieth century homestead) were previously recorded on the property. Site NL-25 was not found. SIHP # -1725 was first documented in a Bishop Museum survey that recorded the site as a complex of burials, terraces, walls, sinkholes, foundations, enclosures, pavements, cairns, and a C-shaped structure (Haun 1991). All 17 features of SIHP # -1725 were confirmedand ten new features were found. In addition to these archaeological features, two natural sinkholes were noted during the survey. The sinkholes showed no evidence of human modification or use, and they were not considered as archaeological sites.

### 3.3.25 Yucha et al. 2014

Yucha, et al. (2014) reported on a supplemental archaeological inventory survey for Phase II of the Kapolei Interchange project, TMKs: [1] 9-1-015:017 por. and 9-2-043:001-004 por. The project area was located at the Kapolei Interchange and included portions of the H-1 highway, off-ramp, and overpass, Farrington Highway, Kalaeloa Boulevard, and surrounding areas. The study addressed three historic properties:

- SIHP # -4341, a ditch and flume system initially identified by Hammatt et al. (1991)
- SIHP # -4342, the Ewa Plantation Company Reservoir 7 initially identified by Hammatt et al. (1991), and
- SIHP # -7669, a quarry remnant related to the former Palailai Quarry was newly identified during the supplemental AIS investigation.

## 3.4 Background Summary and Predictive Model

From the background research it is apparent that traditional Hawaiian activities would have occurred in the vicinity of the project area, including habitation, potentially some agriculture, and religious activities. This is indicated by the previous archaeology, which has identified numerous traditional Hawaiian sites surrounding the currently proposed project area. Of importance is the Puʻu o Kapolei Heiau located north of the project area. However, no sites have been documented within the boundaries of the project area, which may be a result of later activities altering or destroying any potential sites. The areas in the project vicinity appear to be heavily utilized during the post-Contact period, particularly after the early 1900s with the development of the area for military use. These areas went out of use by the 1970s, but remnants of foundations and roads can be seen on aerial photographs today. Based on the background research and the location of the project corridors in the vicinity of historic military areas, the expected finds include primarily historic foundations and related features.

# Section 4 Results of Fieldwork

The fieldwork component of this field inspection was completed during 17 and 18 October 2017, and 15 November 2017 by CSH archaeologists under the general supervision of Principal Investigator David Shideler, M.A. This work required approximately 5-person days to complete.

A pedestrian inspection and GPS data collection was conducted along nine current and proposed road segments and at six major intersections. Roosevelt Avenue, West Perimeter Road, Kamōkila Boulevard, Hornet Street, Franklin Street, Saratoga Avenue, and the intersection at Roosevelt Avenue and Kamōkila Boulevard were surveyed on 17 October 2017. Copahee Avenue and the remaining intersections were surveyed on 18 October 2017. The southern extension of Wākea Street and the to be created Road A were surveyed on 15 November 2017. The vegetation within and adjacent to the project area consisted of thick, 1- to 2-ft-tall grass, lowland coastal dry shrubs, manicured grasses, *kiawe*, *koa haole*, palm, and banyan. Where the ground was visible, limestone bedrock was visible, indicating minimal soil development in much of the area.

In many of the segments of the project area, historic debris was observed including those related to construction activities and former foundation areas. Three sites were identified during the field inspection (Table 3). All former foundation features are considered part of temporary site number CSH 1 (Figure 24 and Table 4). These former foundations were recorded via notes, photographs, and GPS points at the estimated center. They are all in poor condition with the concrete slabs having been removed and only remnants of the base course and concrete debris present. These recorded former foundation features correlate with historic buildings first depicted on the 1953 USGS topographic map (see Figure 17). They are no longer depicted on maps or aerial photographs as of the 1977 USGS Orthophotoquad aerial photograph (see Figure 20). The only feature not depicted on the 1953 map is CSH 1 Feature 1. In addition to CSH 1, two other sites were identified: CSH 2, a filled-in well of indeterminate age, and CSH 3, a historic road (see Figure 24). The results of the field inspection for the intersections and each of the linear segments are described below.

Table 3. Identified potential historic properties

| Site | Location | Description | Condition |
|---|---|---|---|
| CSH 1 | Feature 1 along Roosevelt Ave between Copahee Ave and Hornet St, Features 2 through 18 bounded by West Perimeter Rd, Saratoga Ave, Copahee Ave, and Roosevelt Ave | Historic former foundation features; concrete foundations removed, basecourse and debris remain | Poor |
| CSH 2 | Along Roosevelt Ave just west of Copahee Ave | Filled-in well | Good |
| CSH 3 | Along Saratoga Ave just east of Copahee Ave | Historic asphalt road | Good |

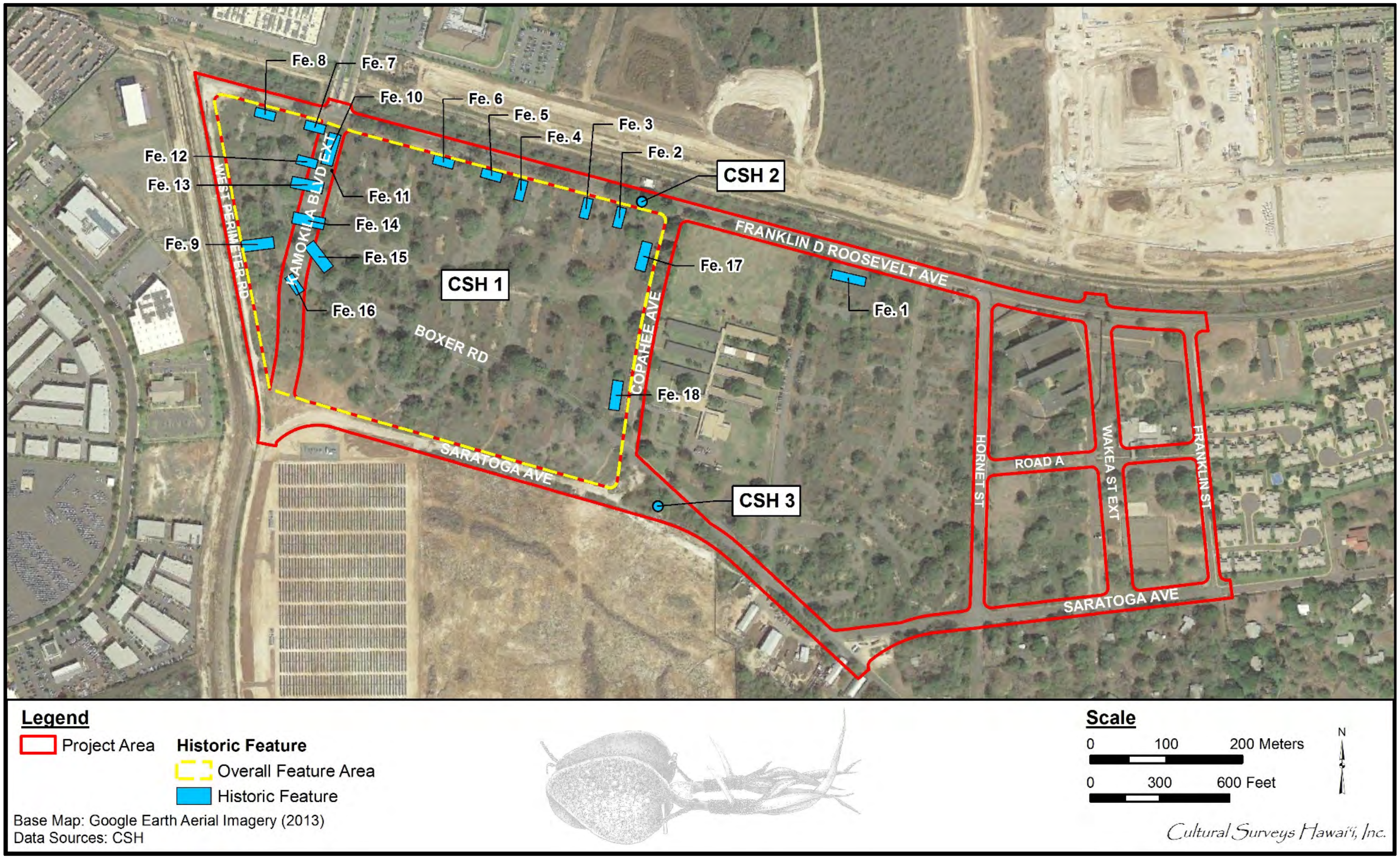


Figure 24. Aerial photograph showing the location of sites CSH 1, CSH 2, and CSH 3 (Google Earth 2013)

Table 4. CSH 1 features

| Feature | Location | Orientation | Measurement | Associated Features/Artifacts | Condition |
|---|---|---|---|---|---|
| 1 | Roosevelt Ave | East-west | 23 m by 8 m | Rusted metal debris | Poor |
| 2 | Roosevelt Ave | North-south | 16 m by 6 m | Rusted metal debris | Poor |
| 3 | Roosevelt Ave | North-south | 18 m by 6 m | Rusted metal debris | Poor |
| 4 | Roosevelt Ave | North-south | 16 m by 6 m | Rusted metal debris | Poor |
| 5 | Roosevelt Ave | North-south | 12 m by 6 m | Rusted metal debris | Poor |
| 6 | Roosevelt Ave | East-west | 17 m by 6 m | Rusted metal debris | Poor |
| 7 | Roosevelt Ave | East-west | 20 m by 5 m | Rusted metal debris | Poor |
| 8 | Roosevelt Ave | East-west | 23 m by 10 m | | Poor |
| 9 | West Perimeter Rd | North-south | 17 m by 6 m | | Poor |
| 10 | Kamōkila Blvd | North-south | 30 m by 8 m | | Poor |
| 11 | Kamōkila Blvd | N/A | 2.5 m by 2.3 m | | Poor |
| 12 | Kamōkila Blvd | East-west | 21 m by 6 m | Rusted metal debris | Poor |
| 13 | Kamōkila Blvd | East-west | 30 m by 8 m | Circular concrete depression, four concrete and metal postholes, rusted metal debris | Poor |
| 14 | Kamōkila Blvd | East-west | 21 m by 6.5 m plus extension of 9 m by 6.5 m | | Poor |
| 15 | Kamōkila Blvd | East-west | 23.5 m by 8 m | Rusted metal debris | Poor |
| 16 | Kamōkila Blvd | East-west | 20 m by 6.5 m | Rusted metal debris | Poor |
| 17 | Copahee Ave | North-south | 8 m by 6 m | Rusted metal and ceramic utility debris | Poor |
| 18 | Copahee Ave | North-south | 13 m by 6 m | | Poor |

## 4.1 The Intersections

None of the project areas at the six intersections contained potential historic properties. Each intersection and features in or near them are described below.

The intersection of Kapolei Parkway and Kalaeloa Boulevard is an asphalt-paved surface in a commercial area with landscaping and businesses in the area (Figure 25 and Figure 26). Both Kapolei Parkway and Kalaeloa Boulevard are divided six-lane roads with a concrete and grassy median. The *mauka* portion of Kalaeloa Boulevard does not have a median. There are four concrete triangles, one on each corner of the intersection that separate the right-hand turn lanes off Kapolei Parkway and Kalaeloa Boulevard. Crosswalks are on all four sides of the intersection. There is a concrete drainage canal on the *mauka* side of Kapolei Parkway and 10 m east of the intersection (Figure 27). In the grass off the *makai*/east corner of the intersection is a sign post for a petroleum pipeline (Figure 28).

The intersection of Kapolei Parkway and Kamōkila Boulevard is an asphalt-paved surface in a commercial area with decorative landscaping and several businesses in the area (Figure 29). Kapolei Parkway is a divided six-road on the western side of the intersection and a divided seven-lane road on the eastern side. Kamōkila Boulevard is a divided four-lane road on the *mauka* side of the intersection and a divided five-lane road on the *makai* side. Crosswalks are on the west, east, and *makai* sides of the intersection.

The intersection of Roosevelt Avenue and Kamōkila Boulevard is an asphalt-paved surface with commercial development on the *mauka* side of the intersection and undeveloped lands on the *makai* side (Figure 30 and Figure 31). Roosevelt Avenue is a two-lane road and Kamōkila Boulevard is a divided four-lane road with a concrete median. Crosswalks are on the west and *mauka* sides of the intersection.

The intersection of Kapolei Parkway and Wākea Street is an asphalt-paved surface in a commercial area with decorative landscaping and businesses in the area (Figure 32 and Figure 33). Kapolei Parkway is a divided five-lane road with a concrete and grassy median. Wākea Street is a divided four-lane road with a concrete and grassy median. There are four concrete triangles, one on each corner of the intersection that separate the right-hand turn lanes off Kapolei Parkway and Wākea Street. Crosswalks are on all four sides of the intersection. Approximately 10 m *makai* of the intersection is a concrete and mortared basalt drainage ditch with a concrete block on one side (Figure 34).

The intersection of Fort Barrette Road and Kapolei Parkway is an asphalt-paved surface in an area with a housing development and Kapolei High School (Figure 35 and Figure 36). Fort Barrette Road is a four-lane road. Kapolei Parkway is a divided five-lane road on the west side of the intersection and a divided six-lane road with a concrete and grassy median on the east side. There are two concrete triangles on the *mauka*/east and *makai*/east corners of the intersection that separate the right-hand turn lanes off Fort Barrette Road and Kapolei Parkway. Crosswalks are on the east and *makai* sides of the intersection. Approximately 15 m southeast of the intersection is a concrete drainage pipe in a concrete and mortared basalt drainage ditch (Figure 37).

The intersection of Fort Barrette Road and Kama‘aha Avenue is in an area with a housing development (Figure 38 and Figure 39). Fort Barrette Road and Kama‘aha Avenue are five-lane roads. Kama‘aha Avenue has a concrete and grassy median on the east side of the intersection.

Figure 25. General view of the intersection of Kapolei Parkway and Kalaeloa Boulevard, view to northeast

Figure 26. General view of the intersection of Kapolei Parkway and Kalaeloa Boulevard, view to southwest

Figure 27. Concrete drainage canal *mauka* of Kapolei Parkway and east of Kalaeloa Boulevard, view to north


Figure 28. Petroleum pipeline warning signpost off *makai*/east corner of Kapolei Parkway and Kalaeloa Boulevard intersection, view to southeast

Figure 29. General view of the intersection of Kapolei Parkway and Kamōkila Boulevard, view to northeast

Figure 30. General view of the intersection of Roosevelt Avenue and Kamōkila Boulevard, view to northeast

Figure 31. General view of the intersection of Roosevelt Avenue and Kamōkila Boulevard, view to northwest

Figure 32. General view of the intersection of Kapolei Parkway and Wākea Street, view to east

Figure 33. General view of the intersection of Kapolei Parkway and Wākea Street, view to northwest

Figure 34. Concrete and mortared basalt drainage ditch with concrete block *makai* of Kapolei Parkway and Wākea Street intersection, view to south

Figure 35. General view of the intersection of Fort Barrette Road and Kapolei Parkway, view to east

Figure 36. General view of the intersection of Fort Barrette Road and Kapolei Parkway, view to north

Figure 37. Concrete drainage pipe in concrete and mortared basalt drainage ditch southeast of Fort Barrette Road and Kapolei Parkway intersection, view to south

Figure 38. General view of the intersection of Fort Barrette Road and Kama‘aha Avenue, view to west

Figure 39. General view of the intersection of Fort Barrette Road and Kama‘aha Avenue, view to southeast

There are two concrete triangles on the *mauka*/east and *makai*/east corners of the intersection that separate the right-hand turn lanes off Fort Barrette Road and Kama‘aha Avenue. Crosswalks are on the west, east, and *mauka* sides of the intersection. Approximately 15 m *makai* and west of the intersection is a concrete culvert underneath a driveway (Figure 40).

## 4.2 A Western Portion of Roosevelt Avenue

The western portion of the Roosevelt Avenue segment is mostly undeveloped on either side of the road, with the exceptions of the Wākea Garden Apartments on the *mauka*/east corner of Roosevelt Avenue and Hornet Street Barbers Point Elementary School on the east side of Copahee Avenue, and Costco west of Kamōkila Boulevard and *mauka* of Roosevelt Avenue. Figure 41 and Figure 42 show the general area from either end of the segment. Along the *mauka* side of Roosevelt Avenue is the OR&L Railroad. Along the *makai* side of the road are various barricaded and disused asphalt roads that extend north to south. These roads are approximately located where roads are depicted on the 1943 U.S. Army War Department terrain map (see Figure 15), 1953 USGS topographic map (see Figure 17), and 1968 USGS topographic map (Figure 19). Associated with these roads are concrete and metal postholes, potentially for sign posts that have since been removed. The flora in this segment primarily consists of manicured grasses, 1- to 2-ft-tall grass, *kiawe*, and *koa haole*. The features of this segment are explained from east to west below.

CSH 1 Feature 1 (Figure 43) is a former foundation located *makai* of Roosevelt Avenue and east of Tulagi Avenue. It is oriented east to west and measures approximately 23 m by 8 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There is also rusted metal debris throughout the area (Figure 44). This is the only former foundation feature that does not appear on the 1953 USGS topographic map (see Figure 17).

CSH 1 Feature 2 (Figure 45) is a former foundation located *makai* of Roosevelt Avenue and west of Copahee Avenue. It is oriented north to south and measures approximately 16 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There is also rusted metal debris throughout the area.

CSH 1 Feature 3 (Figure 46) is a former foundation located *makai* of Roosevelt Avenue and west of Copahee Avenue. It is oriented north to south and measures approximately 18 m by 7 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There is also rusted metal debris throughout the area.

CSH 1 Feature 4 (Figure 47) is a former foundation located *makai* of Roosevelt Avenue and west of Copahee Avenue. It is oriented north to south and measures approximately 16 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There is also rusted metal debris throughout the area.

Figure 40. Concrete culvert underneath driveway *makai* and west of Fort Barrette Road and Kama'aha Avenue intersection, view to south

Figure 41. General view of Roosevelt Avenue from Franklin Street, view to west

Figure 42. General view of Roosevelt Avenue from Saratoga Street, view to east

Figure 43. CSH 1 Feature 1 former foundation area, along Roosevelt Avenue segment, view to west


Figure 44. Example of rusted metal artifacts found in CSH 1 features

Figure 45. CSH 1 Feature 2 former foundation area, along Roosevelt Avenue segment, view to south

Figure 46. CSH 1 Feature 3 former foundation area, along Roosevelt Avenue segment, view to south

Figure 47. CSH 1 Feature 4 former foundation area, along Roosevelt Avenue segment, view to south

CSH 1 Feature 5 (Figure 48) is a former foundation located *makai* of Roosevelt Avenue and west of Copahee Avenue. It is oriented north to south and measures approximately 12 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There is also rusted metal debris throughout the area.

CSH 1 Feature 6 (Figure 49) is a former foundation located *makai* of Roosevelt Avenue and west of Copahee Avenue. It is oriented east to west and measures approximately 17 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There is also rusted metal debris throughout the area.

CSH 1 Feature 7 (Figure 50) is a former foundation located along the segment between Boxer Road and Roosevelt Avenue. It is oriented east to west and measures approximately 20 m by 5 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface. The area contains rusted metal debris, two concrete and metal postholes, and ground utility holes.

CSH 1 Feature 8 (Figure 51) is a former foundation located *makai* of Roosevelt Avenue between Kamōkila Boulevard and Saratoga Street. It is oriented east to west and measures approximately 23 m by 10 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface. The area around this feature contains concentrations of concrete debris and milled wood. The area appears to have been used as a refuse dump as there are various piles of trash, mostly organic, in the area.

CSH 2 (Figure 52) is a circular water well of indeterminate age located on the *makai* side of Roosevelt Avenue and west of Copahee Avenue. It has been filled in with basalt cobbles and has a water pipe coming up out of the ground just west of it. It has been cordoned off by a square metal pole enclosure.

## 4.3 A West Perimeter Road

The West Perimeter Road portion of the project area is the westernmost segment that extends from Roosevelt Avenue to Saratoga Avenue. The West Perimeter Road is currently an unimproved gravel road overgrown with grass in several places. Figure 53 and Figure 54 show the general area from either end of the segment. This transect is bisected along its length by a fence that separates the unimproved road, which also extends along the length of the transect and the canal to the west (Figure 55 and Figure 56). *Mauka* of Roosevelt Avenue and outside the project area is the OR&L Railroad and *mauka* of that is a Costco. The *mauka* end of the road is barricaded by limestone boulders. At various points along the segment there are concentrations of modern and historic refuse such as refrigerators, TVs, other appliances, and piles of broken concrete. The vegetation within this segment of the project is consistent with the other segments: tall grasses, *kiawe*, *koa haole*, and coastal dry shrubs.

Figure 48. CSH 1 Feature 5 former foundation area, along Roosevelt Avenue segment, view to west

Figure 49. CSH 1 Feature 6 former foundation area, along Roosevelt Avenue segment, view to west

Figure 50. CSH 1 Feature 7 former foundation area, along Roosevelt Avenue segment, view to east

Figure 51. CSH 1 Feature 8 former foundation area, along Roosevelt Avenue segment, view to east

Figure 52. CSH 2 filled-in well, along Roosevelt Avenue segment, view to west

Figure 53. General view of West Perimeter Road from Roosevelt Avenue, view to south

Figure 54. General view of West Perimeter Road from Saratoga Avenue, view to northeast

Figure 55. Fence bisecting West Perimeter Road segment, view to southwest

Figure 56. Canal west of unimproved road and fence, along West Perimeter Road segment view to southwest

CSH 1 Feature 9 (Figure 57) is a former foundation located along the segment between Roosevelt Avenue and Saratoga Avenue. It is oriented north to south and measures approximately 17 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface.

At the southern end of this segment where the unimproved road meets the Saratoga Avenue segment is a modern concrete pillar lying on across the unimproved road and a large pile of concrete chunks.

## 4.4 A southern extension of Kamōkila Boulevard

The southern extension of Kamōkila Boulevard segment has thick 1- to 2-ft-tall grass throughout most of the segment. Figure 58 through Figure 60 show the general area of the segment. Where there was little or no grass cover, limestone bedrock was at the ground surface. Approaching Boxer Road from the south, a significant reduction in thick grassy vegetation was observed and concrete aggregate debris and limestone gravels were encountered in the dry silty ground surface substrate. The *mauka* side of Boxer Road was barren with only minimal shrub and dry grass cover, and the occasional *kiawe* and *koa haole* tree. Areas of use were indicated along the *makai* side of the southwestern bend of Boxer Road and between Boxer Road and Roosevelt Avenue by rectangular clearings and concentrated areas of debris. All but the asphalt surfaces were former foundation sites. The features are described from north to south below.

CSH 1 Feature 10 (Figure 61) is a former foundation located along the segment between Roosevelt Avenue and Boxer Road. It is oriented north to south and measures approximately 30 m by 8 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface.

CSH 1 Feature 11 (Figure 62) is a former foundation located along the segment between Boxer Road and Roosevelt Avenue. It is oriented east to west and measures approximately 21 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface. There are also some rusted metal debris on the feature.

CSH 1 Feature 12 (Figure 63) is an irregularly shaped concrete slab located along the segment between Roosevelt Avenue and Boxer Road approximately 6 m east of Feature 11. It measures approximately 2.5 m by 2.3 m. The feature is in fair condition with the concrete slab present, but it is overgrown with grass.

CSH 1 Feature 13 (Figure 64) is a former foundation located along the segment between Roosevelt Avenue and Boxer Road. It is oriented east to west and measures approximately 30 m by 8 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface. A circular concrete and mortar depression is present off the southwest corner of the feature that contains rusted metal pipes and concrete debris (Figure 65). This depression has an outer diameter of approximately 78 cm and an inner diameter of approximately 53 cm. Along the northern perimeter of the feature are four concrete bases with metal postholes aligned east to west and evenly spaced (Figure 66). It is likely these postholes

Figure 57. CSH 1 Feature 9 former foundation area, along West Perimeter Road segment, view to east

Figure 58. General view of Kamōkila Boulevard from Roosevelt Avenue, view to south

Figure 59. General view of Kamōkila Boulevard from Boxer Road, view to north

Figure 60. General view of Kamōkila Boulevard from Saratoga Avenue, view to north

Figure 61. CSH 1 Feature 10 former foundation area, along Kamōkila Boulevard segment, view to north

Figure 62. CSH 1 Feature 11 former foundation area, along Kamōkila Boulevard segment, view to east

Figure 63. CSH 1 Feature 12 former foundation area, along Kamōkila Boulevard segment, view to northeast

Figure 64. CSH 1 Feature 13 former foundation area, along Kamōkila Boulevard segment, view to west

were used for flag poles or sign posts. An asphalt surface is located north of and adjacent to Feature 4. It measures approximately 22 m by 12 m. It is in fair condition and overlies a pre-existing sidewalk along Boxer Road. This surface is not depicted on historic maps and is considered likely to be modern.

An asphalt surface (Figure 67) is located between CSH 1 Feature 13 and Feature 14. It is oriented east to west and measures approximately 22 m by 12 m. It is in fair condition and overlies a pre-existing sidewalk along Boxer Road. This surface is not depicted on historic maps and is considered likely to be modern.

CSH 1 Feature 14 (Figure 68) is a former foundation located along the segment between Roosevelt Ave and Boxer Road. It is oriented east to west and measures approximately 21 m by 6.5 m with a rectangular extension from the northeast corner that measures approximately 9 m by 6.5 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface.

CSH 1 Feature 15 (Figure 69) is a former foundation located north of the southwest bend of Boxer Road. This feature is oriented east to west and measures approximately 23.5 m by 8 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface. The area also contains rusted metal debris, milled wood debris, and a few small in situ concrete slab remnants.

An asphalt surface (Figure 70) is located adjacent to the southwest bend of Boxer Road and is oriented east to west. It measures approximately 24 m by 15 m. It is in fair condition. The area contains large rectangular wooden beams measuring approximately 6 to 7 m long and 0.3 m thick (Figure 71). There is also metal hardware debris scattered on the surface of the asphalt. This feature is not depicted on historic maps and is considered likely to be modern.

CSH 1 Feature 16 (Figure 72) is a former foundation located south of the southwest bend of Boxer Road in a grassy area. It measures approximately 20 m by 6.5 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of base course gravel with pieces of concrete aggregate debris remaining on the surface. There are also some rusted metal debris on the feature.

## 4.5 Copahee Avenue

The Copahee Ave segment is fronted by the Barbers Point Elementary School to the east, and undeveloped lands to the west. Figure 73 and Figure 74 show the general area from either end of the segment. In the project area between the Barbers Point Elementary School's fence and the road are remnants of an older fence, including concrete and metal postholes, as well as fire hydrants. Along the western side of the road are remnants of a potentially historic-style sidewalk (Figure 75). The flora in this segment is consistent with the rest of the project area.

CSH 1 Feature 17 (Figure 76) is a former foundation located along the segment on the west side of Copahee Ave. It is oriented north to south and is approximately 8 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature's surface is composed of red, silty, granular clay, base course gravel with pieces of concrete

Figure 65. Concrete depression off of southwest corner of CSH 1 Feature 13, along Kamōkila Boulevard segment, view to east

Figure 66. Concrete and metal postholes on north side of CSH 1 Feature 13, along Kamōkila Boulevard segment, view to east

Figure 67. Asphalt surface between CSH 1 Feature 13 and Feature 14, along Kamōkila Boulevard segment, view to west

Figure 68. CSH 1 Feature 14 former foundation area, along Kamōkila Boulevard segment, view to east

Figure 69. CSH 1 Feature 15 former foundation area, along Kamōkila Boulevard segment, view to northeast

Figure 70. Asphalt surface *makai* of southwest bend of Boxer Road, along Kamōkila Boulevard segment, view to south

Figure 71. Wooden beam on asphalt surface, along Kamōkila Boulevard segment, view to northwest

Figure 72. CSH 1 Feature 16 former foundation area, along Kamōkila Boulevard segment, view to west

Figure 73. General view of Copahee Avenue from Roosevelt Avenue, view to south

Figure 74. General view of Copahee Avenue from Saratoga Avenue, view to north

Figure 75. Potentially historic sidewalk, along Copahee Avenue segment, view to west

Figure 76. CSH 1 Feature 17 former foundation area, along Copahee Avenue segment, view to southeast

aggregate debris remaining on the surface. There are a few remnant in situ pieces of concrete that have been pushed up by *kiawe* roots (Figure 77). There are also some rusted metal and ceramic utility debris on the feature (Figure 78).

CSH 1 Feature 18 (Figure 79) is a former foundation located along the segment on the west side of Copahee Avenue. It is oriented north to south and measures approximately 13 m by 6 m. The former foundation is in poor condition with the concrete slab having been previously removed. The feature’s surface is composed of red, silty, granular clay, base course gravel with pieces of concrete aggregate debris remaining on the surface. There are two in situ parallel concrete slabs with a 3 m gap between them (Figure 80).

## 4.6 A northern portion of Hornet Street

The northern portion of the Hornet St segment is mostly undeveloped with flora consistent with the rest of the project area. Figure 81 and Figure 82 show the general area from either end of the segment. A fence extends along the western side of the road, along which is modern trash. A historic-style curb is along the eastern side of Hornet Street at the *mauka* end of the segment (Figure 83). On the *mauka* end and east of Hornet Street is the modern Wākea Garden Apartments. No other potential historic properties were observed along this segment.

## 4.7 A southern extension of Wākea Street

The southern extension of Wākea Street segment consists of a disused asphalt road and tall grasses and trees. On the *mauka* end of the segment along Roosevelt Avenue is the Wākea Garden Apartments. On the *makai* end of the segment along Saratoga Avenue is a tennis court complex. Figure 84 through Figure 85 show the general area from either end of the segment. The apartment complex’s parking lot is located within the project area. Just *makai* of the parking lot are two fences separating the apartment complex’s property and another parcel of land to the east and another to the *makai* (Figure 86). One fence has black construction fabric on it and the other has view protectors woven into it. Both fences are within the project area in the *mauka* portion of the segment. Between the fence and the Road A segment is an asphalt surface with asphalt curbs that are associated with abandoned buildings facing the Road A segment (Figure 87). The asphalt surface and asphalt curbs appear to be of modern origin. Extending *makai* from *makai* of the apartment complex’s property to Saratoga Avenue along the western boundary of the segment is a disused asphalt road (Wākea Street). *Makai* of the Road A segment, the grass is manicured due to the tennis courts which are along the eastern side of the segment. Within the project area between the tennis courts and the disused Wākea Street is a building associated with the tennis courts (Figure 88). The building appears to be of modern origin and the function is unknown, although it is clear that it is not the restroom facilities. *Makai* of the building is a basalt and concrete mortar planter that measures approximately 2.5 m by 2.5 m. On one edge there is an etching that reads “KANIELA MASONRY 5/18/87” (Figure 89). An unimproved extends at a diagonal from Wākea Street toward the tennis courts and ends *mauka* and to the east of the planter. At the *makai* end of the segment, the southwest corner of the tennis courts is within the project area.

## 4.8 A northern portion of Franklin Street

The *mauka* portion of Franklin Street segment is fronted by a housing development on the eastern side. Figure 90 and Figure 91 show the general area from either end of the segment. Near

Figure 77. In situ concrete in CSH 1 Feature 17, along Copahee Avenue segment, close-up view


Figure 78. Metal utility fragment in CSH 1 Feature 17, along Copahee Avenue segment, raised lettering on surface of fragment reads "…APCO"

Figure 79. CSH 1 Feature 18 former foundation area, along Copahee Avenue segment, view to north

Figure 80. In situ concrete in CSH 1 Feature 18, along Copahee Avenue segment, close-up view

Figure 81. General view of Hornet Street from Roosevelt Avenue, view to south

Figure 82. General view of Hornet Street from Saratoga Avenue, view to north

Figure 83. Potentially historic curb, along Hornet Street segment, close-up view

Figure 84. General view of Wākea Street segment, view to south

Figure 85. General view of Wākea Street segment, view to north

Figure 86. Two fences within project area along Wākea Street segment, view to north

Figure 87. Asphalt surface and asphalt curbs along Wākea Street segment, view to east

Figure 88. Building associated with tennis courts along Wākea Street segment, view to north

Figure 89. Basalt and concrete mortar planter along Wākea Street, note the engraving saying "KANIELA MASONRY 5/18/87," view to west

Figure 90. General view of Franklin Street from Roosevelt Avenue, view to south

Figure 91. General view of Franklin Street from Saratoga Avenue, view to north

Figure 92. General view *makai* half of Road A segment, view to west

the *mauka* end of the road on the western side is a historic flat-roofed building outside the project area. This building first appears on the 1953 USGS topographic map (see Figure 17). At the *makai* end of the road on the western side are the tennis courts also noted for the Saratoga Avenue segment. No other potential historic properties were observed along this segment.

## 4.9 A to-be-created Road A segment

The to-be-created Road A segment consisted of tall grasses, some *kiawe* and *koa haole*, and disused asphalt surfaces. Figure 92 through Figure 93 show the general area from either end of the segment. Where the segment meets Franklin Street, in the *makai* portion of the segment is a blocked and disused driveway and parking lot that extends west (see Figure 92). In the *mauka* portion of the segment are abandoned buildings associated with the driveway and parking lot (Figure 95 through Figure 97). These structures appear to be of modern origin. Between the buildings and the parking lot is an overgrown concrete sidewalk. To the west of Wākea Street, the project area is tall grasses and trees. In this area there are limestone bedrock outcroppings. According to the 1953 historic map (see Figure 17), there were once structures or a parking lot on the western end of the segment. These former structures were previously removed and no evidence of them were found during the field inspection. This may be a result of the tall grasses in this area or due to the remnant foundations having degraded beyond the point of recognition. No other potential historic properties were observed along this segment.

## 4.10 A northwestern portion of Saratoga Avenue including a to be created segment

The northwestern portion of Saratoga Avenue including a to-be-created segment consists of Saratoga Avenue, which is asphalt paved from Franklin Street to Boxer Road and unimproved from Saratoga Street to Copahee Avenue, and a section of Boxer Road between the two segments of Saratoga Road that are asphalt paved. Figure 98 and Figure 99 show the general area from either end of the segment. Along the asphalt-paved portion of Saratoga Avenue there is little development on the *makai* side with the occasional utility and unused road encountered. At the eastern end of the road are duplex-style housing and a tennis court to the *mauka* side. On the *makai* side of Saratoga Avenue near the intersection with Bennington Street is a series of modern concrete slabs interconnected by concrete sidewalks (Figure 100). There are PVC pipes coming up out of some of the slabs. There is also a modern light post next to one of the *makai*-most slabs and associated concrete and metal postholes in the vicinity. A large ornamental octopus tree (*Schefflera actinophylla*) is among the flora in the area, along with grasses, *kiawe*, and *koa haole*.

A concrete drainage ditch (Figure 101) of indeterminant age is located on the *makai* side of Saratoga Ave near the intersection with Bennington Street. It measures approximately 1.15 m by 0.7 m and is approximately 0.7 m deep. It is in fair condition, but has been covered by a boulder.

At the intersection with Boxer Road is an empty limestone ground surface at the *makai* and east corner. On the western side of Boxer Road is a complex of historic buildings (Figure 102 through Figure 104) that are still in use on Department of Hawaiian Home Lands (DHHL) property. These buildings are outside of the project area. Two are closed corrugated aluminum hangers and three are open-air corrugated aluminum and wooden hangers. These buildings first appear on the 1951 USGS aerial photograph (see Figure 16) and the 1953 U.S. Army Service topographic map (see Figure 18). The flora in this portion of the segment is consistent with that found in the other portion.

Figure 93. General view of *mauka* half of Road A segment, view to west

Figure 94. General view of western portion of Road A segment, view to west

Figure 95. Abandoned buildings along Road A segment, view to north

Figure 96. Abandoned buildings along Road A segment, view to northwest

Figure 97. Abandoned buildings along Road A segment, view to north

Figure 98. General view of Saratoga Avenue from Franklin Street, view to west

Figure 99. General view of Saratoga Avenue from Saratoga Street, view to east

Figure 100. Modern concrete slab interconnected with sidewalks, note modern light post, along Saratoga Avenue segment, view to north

Figure 101. Concrete drainage, along Saratoga Avenue segment, view to southwest


Figure 102. Historic gabled roof building with siding, west of Boxer Road, along Saratoga Avenue segment, view to west

Figure 103. Historic gabled roof buildings without siding, west of Boxer Road, along Saratoga Avenue segment, view to east


Figure 104. Historic Quonset hut building, west of Boxer Road, along Saratoga Avenue segment, view to southeast

CSH 3 (Figure 105) is a disused historic asphalt-paved road located along the Boxer Road portion of the segment. It extends from Boxer Road south to the fence and is approximately 4.15m wide. It is in fair condition and is overgrown with exotic succulents. The asphalt is approximately 10 cm thick and has a 10-cm-thick base course of crushed coral (Figure 106). This road appears on the 1953 U.S. Army Service topographic map (see Figure 18), but appears to have fallen out of use by the time the 1968 USGS topographic map (see Figure 19) was produced. There are associated concrete and metal postholes within the vicinity of the road, likely for sign posts that have since been removed.

Along the unimproved portion of Saratoga Avenue on the *makai* side of the segment is a fence with geo-mesh, which is lined with organic refuse and modern trash for the portion from Copahee Avenue to Saratoga Street. About 200 m west of Copahee Avenue is a mound of large limestone boulders that appear to act as a roadblock on Saratoga Avenue (Figure 107). On the *makai* side of the fence at the west end of the segment is a DHHL solar farm. The flora within and adjacent to this segment consists of 1- to 2-ft-tall grass and *kiawe*. East of Copahee Avenue, the *kiawe* is denser and there are exotic succulents in the area. In many areas of this segment the limestone bedrock is at the ground surface.

Figure 105. CSH 3 disused asphalt road, along Saratoga Avenue segment, view to south

Figure 106. Cross-section of CSH 3, along Saratoga Avenue segment, view to northwest

Figure 107. Limestone boulders blocking Saratoga Avenue west of Copahee Avenue, view to east

# Section 5 Summary and Recommendations

## 5.1 Summary

Traditional and historic documentation of the Honouliuli area suggests it was significant in the pre-Contact period. It was associated with several gods, including the Pele sisters, lost souls of the deceased, Hawaiian *ali‘i*, irrigated lowlands for wetland taro cultivation, and rich marine resources off the coast. However, there was little settlement on the coral plains and coast of southwest Honouliuli Ahupua‘a in the vicinity of the project area as it was a less productive resource area. The nearest pre-Contact archaeological site to the present project area is Pu‘u o Kapolei Heiau. In the early historic period, domestic animals and vegetation were brought into this area and the animals were allowed to freely graze. Pre- and early post-Contact land use in this area appears to have been very limited. The general area in the vicinity of the project began to be drastically altered during the early 1900s when the OR&L Railroad and the various military complexes on Barbers Point were constructed. Many of the military buildings became disused and are no longer visible except as foundations on maps or aerial photos as of 1977. Currently, the town of Kapolei is primarily located north of Roosevelt Avenue where there are housing and commercial districts.

During the field inspection, several remnants of historic foundations were documented and labeled as part of temporary site CSH 1. These features correspond with the historic military buildings built in the 1940s to 1950s. While these features are older than 50 years of age, they lack integrity due to the buildings and foundations having been removed and only remnants of base course and debris remaining. A former road (CSH 3) was also documented along Saratoga Avenue near the area of CSH 1. CSH 3 corresponds with a road seen on historic maps (see Figure 18). Consultation with SHPD is recommended regarding formal historic property designations for these remnant foundations and former road. CSH’s informed opinion is that the CSH 1 features do not fulfill the criterions pursuant to HAR §13-275-6. These criterions are as follows:

- a Be associated with events that have made an important contribution to the broad patterns of our history;
- b Be 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; or
- 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.

A filled-in well (CSH 2) of indeterminate age was documented along Roosevelt Avenue. Consultation with SHPD is recommended regarding formal historic property designation for this well due to the historic nature of artesian well drilling in the area.

A potentially historic and still in use concrete and mortar curb was documented along the east side of Hornet Street. Consultation with SHPD is recommended regarding formal historic property designation for this curb. All of the road segments in the project area align with roads on historic maps going back to the 1951 aerial photograph (see Figure 16), with Roosevelt Avenue, the eastern portion of Saratoga Avenue, and Franklin Street appearing even earlier on a 1943 map (see Figure 15). All of these roads have been repaved on multiple occasions. The roads are named after people or ships of importance to the Navy. No other potential historic properties were observed during the field inspection.

## 5.2 Recommendations

While the features of CSH 1 are older than 50 years of age, they appear to lack integrity due to the buildings and foundations having been removed and only remnants of base course and debris remaining. Consultation with SHPD is recommended regarding formal historic property designations for these remnant foundations and the former road (CSH 3). CSH’s informed opinion is that the CSH 1 features do not fulfill the criteria pursuant to HAR §13-275-6. Consultation with SHPD is recommended regarding formal historic property designation for the filled-in well (CSH 2) due to the historic nature of artesian well drilling in the area.

Based on the results of this study, early consultation with SHPD is recommended to determine what (if any) further archaeological study is indicated. CSH recommends a combination of on-site and on-call monitoring with on-site monitoring limited to the southern extension of Kamōkila Boulevard, the Wākea Street Extension, and “Road A” and on-call monitoring for all other areas of the project that are current roadways. Reasoning for this recommended monitoring plan is due to the potential for historic surface and subsurface sites to be encountered within the areas previously utilized by the Barbers Point Naval Air Station. Due to the heavily disturbed nature at the intersections, it is unlikely that historic properties would be encountered.

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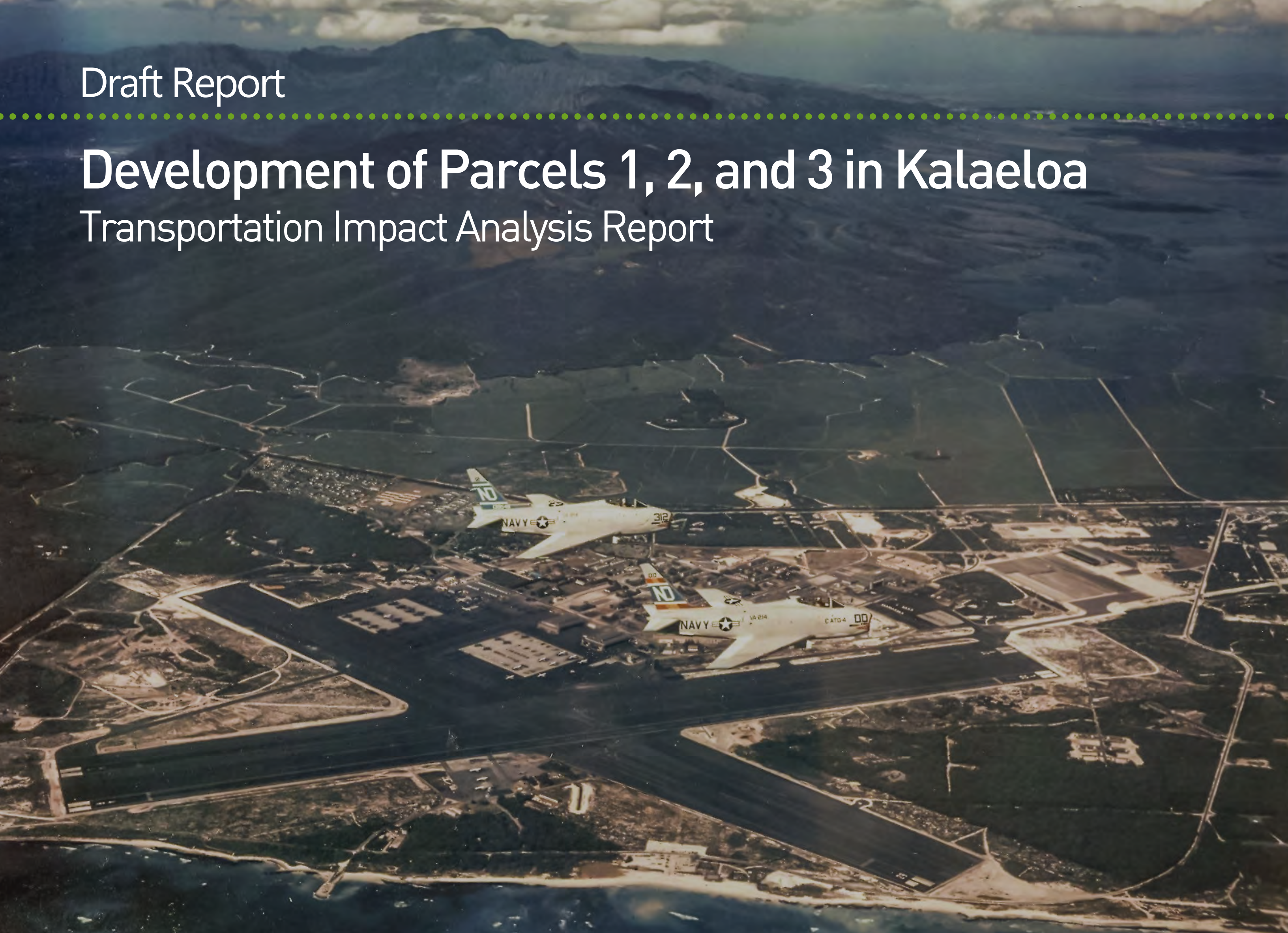
## ***Appendix E***

*Draft Report: Traffic Impact Analysis Report for the Development of Parcels 1, 2, and 3 in Kalaeloa. Fehr & Peers, December 29, 2017*

Draft Report

# Development of Parcels 1, 2, and 3 in Kalaeloa

## Transportation Impact Analysis Report




**Prepared by**

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**Prepared for**

R.M. Towill Corporation

# DRAFT REPORT

# Transportation Impact Analysis

# for the Development of

# Parcels 1, 2, and 3 in Kalaeloa

Parcel 1 TMK: 91013002

Parcel 2 TMK: 91013004

Parcel 3 TMK: 91013128 & 91013129

Prepared for:
R.M. Towill Corporation

December 29, 2017

SD15-0169

FEHR PEERS

## Table of Contents

## Appendices

## List of Figures

## List of Tables

# 1.0 EXECUTIVE SUMMARY

This report presents the results of the transportation impact analysis report (TIAR) for the proposed residential development complex located within the Kalaeloa area of West Oahu. The proposed project will be either all residential units or a mixed-use development comprising 251 fewer residential units, supporting retail uses, and a Veterans Affairs (VA) Clinic. The project will be developed on three distinct parcels located on the makai side of Roosevelt Avenue between Kamokila Blvd and Franklin Street within the Kalaeloa Master Plan area. In addition, the development is expected to be fully constructed and occupied by Year 2020. This study analyzed the following two project alternatives to be constructed on the three parcels:

- **1,500 Residential Unit -** A total of 496 single family and 1,004 multi-family units are proposed on Parcels 1, 2, and 3 according to the following layout: Parcel 1 will include 126 single family and 404 multi-family dwelling units; Parcel 2 will include 370 single family dwelling units; and Parcel 3 will include 600 multi-family dwelling units, or
- **Mixed-Use Development** – Includes a total of 139 single family and 1,110 multi-family units, 169,000 square feet (s.f.) of retail uses, and an 80,000 square foot VA Clinic. Parcel 1 will include 82 single family and 351 multi-family units, the VA Clinic, and 51,000 s.f. of retail uses. Parcel 2 will include 57 single family and 345 multi-family units, and 28,000 s.f. of retail uses. Parcel 3 will include 414 multi-family units and 90,000 s.f. of retail uses.

The impacts of the proposed project to the surrounding transportation system were evaluated following guidelines established by the City & County of Honolulu Department of Planning & Permitting (DPP) Traffic Review Branch (TRB) and the Hawaii Depart of Transportation – Highways Division (HDOT). The operations of 12 existing key intersections were evaluated during the weekday morning (AM) and evening (PM) peak hours for Existing (2017), as well as for Near Term (2020) conditions without and with the project. Impacts were identified assuming sequential and cumulative development of the three parcels: Parcel 1 only, Parcels 1 and 2, and Parcels 1 through 3.

The project is anticipated to generate the following trips for each alternative development scenario:

**1,500 Residential Units**

- <u>Parcel 1:</u> a total of 4,299 daily trips, including 274 trips during the AM peak hour (64 inbound/210 outbound) and 332 trips during the PM peak hour (209 inbound/123 outbound).
- <u>Parcels 1 & 2:</u> a total of 7,764 daily trips, including 542 trips during the AM peak hour (131 inbound/411 outbound) and 689 trips during the PM peak hour (434 inbound/255 outbound).
- <u>Parcels 1, 2, and 3:</u> a total of 12,259 daily trips, including 804 trips during the AM peak hour (191 inbound/613 outbound) and 980 trips during the PM peak hour (617 inbound/363 outbound).

**Mixed-Use Development**

- Parcel 1: a total of 9,740 daily trips, including 647 trips during the AM peak hour (373 inbound/274 outbound) and 765 trips during the PM peak hour (351 inbound/414 outbound).
- Parcels 1 & 2: a total of 14,880 daily trips, including 936 trips during the AM peak hour (503 inbound/460 outbound) and 1,139 trips during the PM peak hour (560 inbound/579 outbound).
- Parcels 1, 2, and 3: a total of 22,454 daily trips, including 1,186 trips during the AM peak hour (582 inbound/604 outbound) and 1,702 trips during the PM peak hour (855 inbound/847 outbound).

These estimates do not include vehicle reductions associated with transit trips anticipated to use the planned extension of the Honolulu Rail Transit system to West Kapolei as some residents are expected to use the rail transit line via the East Kapolei station after its opening in 2019, but trips to the station would be made by automobile and bus transit. Additionally, non-auto reductions accounting for bicycle and pedestrian project trips were also not included to provide a more conservative traffic analysis. A non-auto trip reduction of about a five (5) percent is reasonable given the existing and planned adjacent facilities and the nearby complementary land uses. A five (5) percent vehicle reduction would only decrease project peak hour traffic by 59 and 85 trips in the AM and PM peak hours, respectively, under the Parcel 1, 2, and 3 Mixed-Use scenario (i.e. the higher of the two buildout scenarios). Although encouraging non-auto travel is important from a community and sustainability perspective, this reduction is not significant enough to eliminate any of the project impacts identified in this analysis.

The project is expected to a total of five (5), seven (7), and seven (7) intersection impacts under the Parcel 1, Parcels 1 and 2, and Parcels 1, 2, and 3 development scenarios, respectively, under the Mixed-Use development alternative. One less intersection is expected to be significantly impacts under each of the development scenarios for the 1,500 Residential Unit alternative. **Table ES-1** shows the intersection impacts and under which parcel scenario those impacts would be triggered. Note that the impacts identified in **Table ES-1** are for the Mixed-Use development alternative with the higher trip generation estimate unless otherwise noted.

All of the impacts at intersections can be reduced to a less than significant level through the following improvements listed in **Table ES-2. Table ES-2** shows the LOS for each impacted intersection without and with the proposed mitigations under both project alternatives, as well as the level of project responsibility for each improvement.

The Kamokila Boulevard extension, makai of Roosevelt Avenue, and Roosevelt Avenue Diamond Head of Kamokila Boulevard are assumed to be two-lane roadways with the proposed project. Project traffic is expected to be accommodated on these two-lane roadways, but would be constrained at the adjacent intersections (i.e., Roosevelt Avenue/Kamokila Boulevard and Fort Barrette Road-Enterprise

Street/Roosevelt Avenue). However, the project mitigation to install a traffic signal at each intersection will improve operations on Kamokila Boulevard, Roosevelt Avenue, and Fort Barrette Road and enhance vehicular flow through the study area.

With the project's proposed mitigation measures at the impacted intersections, additional roadway capacity and access to the Kalaeloa area is not needed. However, as traffic continues to grow in the overall area from subsequent development, traffic volumes at two key locations (the Fort Barrette Road-Enterprise Street/Roosevelt Avenue intersection and the Kamokila Boulevard/Kapolei Parkway intersection) will cause LOS E or worse operations, and additional intersection improvements would be difficult to implement due to right-of-way constraints and/or the need for non-standard configurations. Accordingly, new capacity via the Wakea Street extension between Kapolei Parkway and Roosevelt Avenue would likely be needed to provide an additional route for motorists to access Kalaeloa and to balance vehicle delay and peak hour congestion on the surrounding roadway network

Overall, the proposed project is not expected to substantially increase the walking, biking, or transit demand to a level where it could not be accommodated by existing or planned facilities. In addition, the project is expected to enhance multi-modal facilities and services, especially with the promotion of the use of passive and active spaces and non-motorized modes. The project is also expected to not conflict with any existing facilities and planned improvements. Thus, the project's impacts to pedestrian, bicycle, and transit facilities and services are therefore considered less than significant.

**TABLE ES-1: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE (IMPACTED LOCATIONS WITHOUT MITIGATION)**

| Intersection | Traffic Control[1] | Peak Hour | Near Term LOS[2] (Mixed-Use Development unless otherwise noted) | | | |
|---|---|---|---|---|---|---|
| | | | Baseline | Parcel 1 | Parcels 1 & 2 | Parcels 1,2, and 3 |
| 5. Kapolei Pkwy / Kalaeloa Blvd | Signal | AM | C | C | C | C |
| | | PM | **F** | ***F*** | ***F*** | ***F*** |
| 6. Kapolei Pkwy / Kamokila Blvd | Signal | AM | C | D | ***E*** | ***F (E)**** |
| | | PM | C | D (C)* | D | ***E*** (D)* |
| 7. Kapolei Pkwy / Wakea St | SSSC | AM | **E** | ***F (E)**** | ***F*** | ***F*** |
| | | PM | **E** | ***F*** | ***F*** | ***F*** |
| | Signal | AM | **F** | ***F*** | ***F*** | ***F*** |

**TABLE ES-1: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE (IMPACTED LOCATIONS WITHOUT MITIGATION)**

| Intersection | Traffic Control[1] | Peak Hour | Near Term LOS[2] (Mixed-Use Development unless otherwise noted) | | | |
|---|---|---|---|---|---|---|
| | | | Baseline | Parcel 1 | Parcels 1 & 2 | Parcels 1,2, and 3 |
| 8. Fort Barrette Rd / Kapolei Pkwy | | PM | **F** | ***F*** | ***F*** | ***F*** |
| 9. Roosevelt Ave / Kamokila Blvd | AWSC | AM | C | ***E*** (C)* | ***F (E)**** | ***F*** |
| | | PM | C | ***E*** (D)* | ***F*** | ***F*** |
| 10. Roosevelt Ave / Copahee Ave | SSSC | AM | C | D (C) | ***F*** (D) | ***F*** (D) |
| | | PM | B | C | ***F*** (C) | ***F*** (D) |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AWSC | AM | **F** | ***F*** | ***F*** | ***F*** |
| | | PM | **F** | ***F*** | ***F*** | ***F*** |
| **TOTAL INTERSECTION IMPACTS** | | | **-** | **4** | **7** | **7** |

*Source: Fehr & Peers, 2017*

Notes:

[1] AWSC = All-way stop controlled; SSSC = Side-street stop controlled
[2] LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. For the remaining control types, the overall average delay and LOS is reported.
LOS E and F operations are highlighted in **bold.** ***LOS*** represent project impact.
* LOS is different between development alternatives. LOS in parentheses is for the 1,500 Residential Unit alternative.

**TABLE ES-2: NEAR TERM (2020) PLUS PROJECT WITH MITIGATIONS INTERSECTION LEVELS OF SERVICE**

| Intersection | Peak Hour | Baseline | Plus Parcel 1 | Plus Parcel 1 w/ Mit. | Plus Parcels 1 & 2 | Plus Parcels 1 & 2 w/ Mit. | Plus Parcels 1, 2, & 3 | Plus Parcels 1, 2, & 3 w/ Mit. | Proposed Mitigation | Project Responsibility ** |
|---|---|---|---|---|---|---|---|---|---|---|
| 5. Kapolei Pkwy / Kalaeloa Blvd | AM | C | C | C | C | C | C | C | Construct a second Diamond Head-bound left turn lane on Kapolei Parkway | Fair Share Contribution |
| | PM | **F** | ***F*** | E (D)* | ***F*** | E | ***F*** | E | | |
| 6. Kapolei Pkwy / Kamokila Blvd | AM | C | D | N/A | ***E*** | C | ***F (E)**** | C | Construct a second mauka-bound left turn lane on Kamokila Boulevard | 100% |
| | PM | C | D (C)* | | D | C | ***E*** (D)* | D (C)* | | |
| 7. Kapolei Pkwy / Wakea St | AM | **E** | ***F (E)**** | A | ***F*** | A | ***F*** | A | Install a traffic signal | Fair Share Contribution |
| | PM | **E** | ***F*** | A | ***F*** | A | ***F*** | A | | |
| 8. Fort Barrette Rd / Kapolei Pkwy | AM | **F** | ***F*** | E | ***F*** | E | ***F*** | E | Restripe Kapolei Parkway to provide 2 through lanes in both directions. Provide left-turn protected signal phasing on Kapolei Parkway and optimize timing. | Fair Share Contribution |
| | PM | **F** | ***F*** | D | ***F*** | E (D)* | ***F*** | E | | |
| 9. Roosevelt Ave / Kamokila Blvd | AM | C | ***E*** (C)* | N/A | ***F (E)**** | B | ***F*** | B (C)* | Install a traffic signal | 100% |
| | PM | C | ***E*** (D)* | | ***F*** | C (B)* | ***F*** | C | | |
| 10. Roosevelt Ave / Copahee Ave | AM | C | D (C) | N/A | ***F*** (D) | C | ***F*** (D) | D | Widen Roosevelt Avenue ewa of Copahee Avenue to provide a refuge island median for the mauka-bound left-turn movement. Install an ewa-bound left turn lane. | 100% |
| | PM | B | C | | ***F*** (C) | C | ***F*** (D) | D | | |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AM | **F** | ***F*** | C | ***F*** | D (C)* | ***F*** | D | Install a traffic signal | Fair Share Contribution |
| | PM | **F** | ***F*** | C | ***F*** | C | ***F*** | D (C)* | | |

*Source: Fehr & Peers, 2017*

**TABLE ES-2: NEAR TERM (2020) PLUS PROJECT WITH MITIGATIONS INTERSECTION LEVELS OF SERVICE**

| Intersection | Peak Hour | Baseline | Plus Parcel 1 | Plus Parcel 1 w/ Mit. | Plus Parcels 1 & 2 | Plus Parcels 1 & 2 w/ Mit. | Plus Parcels 1, 2, & 3 | Plus Parcels 1, 2, & 3 w/ Mit. | Proposed Mitigation | Project Responsibility ** |
|---|---|---|---|---|---|---|---|---|---|---|

Notes:

N/A = Not Applicable. No significant impact under this scenario, thus mitigation is not needed.
LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. Other uncontrolled movements generally operate well with limited delay.
Undesired LOS and corresponding seconds of delay per vehicle are highlighted in **bold.** ***<u>LOS</u>*** represent project impact.
* LOS is different between alternatives. LOS in parenthesis is for the 1,500 Residential alternative.
**Project responsibility: Yes = impact is project-specific and project is responsible for implementing mitigation. Fair Share Contribution = contributing to cumulative impact and project is responsible to a fair-share contribution of mitigation

# 2.0 INTRODUCTION

This transportation impact analysis report (TIAR) presents the results of the study conducted by Fehr & Peers for new residential development proposed for Parcels 1, 2, and 3 in the Kalaeloa area on the island of Oahu. The purpose of this analysis is to identify the impacts of the proposed project on the surrounding transportation system. The TIAR includes a description of the assumptions and methods used to conduct the study, as well as a discussion of the results. This TIAR was conducted in accordance with the guidelines and standards of the affected government agencies. **Figure 1** illustrates the study area, and **Figures 2, 3, and 4** illustrates the location and vehicular access points for Parcels 1, 2, and 3. Detailed site plans for the 1,500 Residential Unit alternative was not available at the time of this study, but **Figure 5** shows the site plan for the Mixed-Use Development alternative.

## 2.1 PROJECT DESCRIPTION

The proposed project will be either all residential units or a mixed-use development comprising residential units, a shopping center, and a Veteran's Affair (VA) Clinic. The project will be developed on three distinct parcels and is expected to be fully constructed by Year 2020 and is located on the makai side of Roosevelt Avenue between Kamokila Blvd and Franklin Street within the Kalaeloa Master Plan area. This study analyzed the following two project alternatives to be constructed in the three parcels:

- **1,500 Residential Unit -** A total of 496 single family and 1,004 multi-family units are proposed on Parcels 1, 2, and 3 according to the following layout: Parcel 1 will include 126 single family and 404 multi-family dwelling units; Parcel 2 will include 370 single family dwelling units; and Parcel 3 will include 600 multi-family dwelling units.

- **Mixed-Use Development** – Includes a total of 139 single family and 1,110 multi-family units, 169,000 square feet (s.f.) of shopping center, and an 80,000 square foot VA Clinic. Parcel 1 will include 82 single family and 351 multi-family units, the 80,000 s.f. VA Clinic, and 51,000 s.f. of shopping center. Parcel 2 will include 57 single family and 345 multi-family units, and 28,000 s.f. of shopping center. Parcel 3 will include 414 multi-family units and 90,000 s.f. of shopping center.

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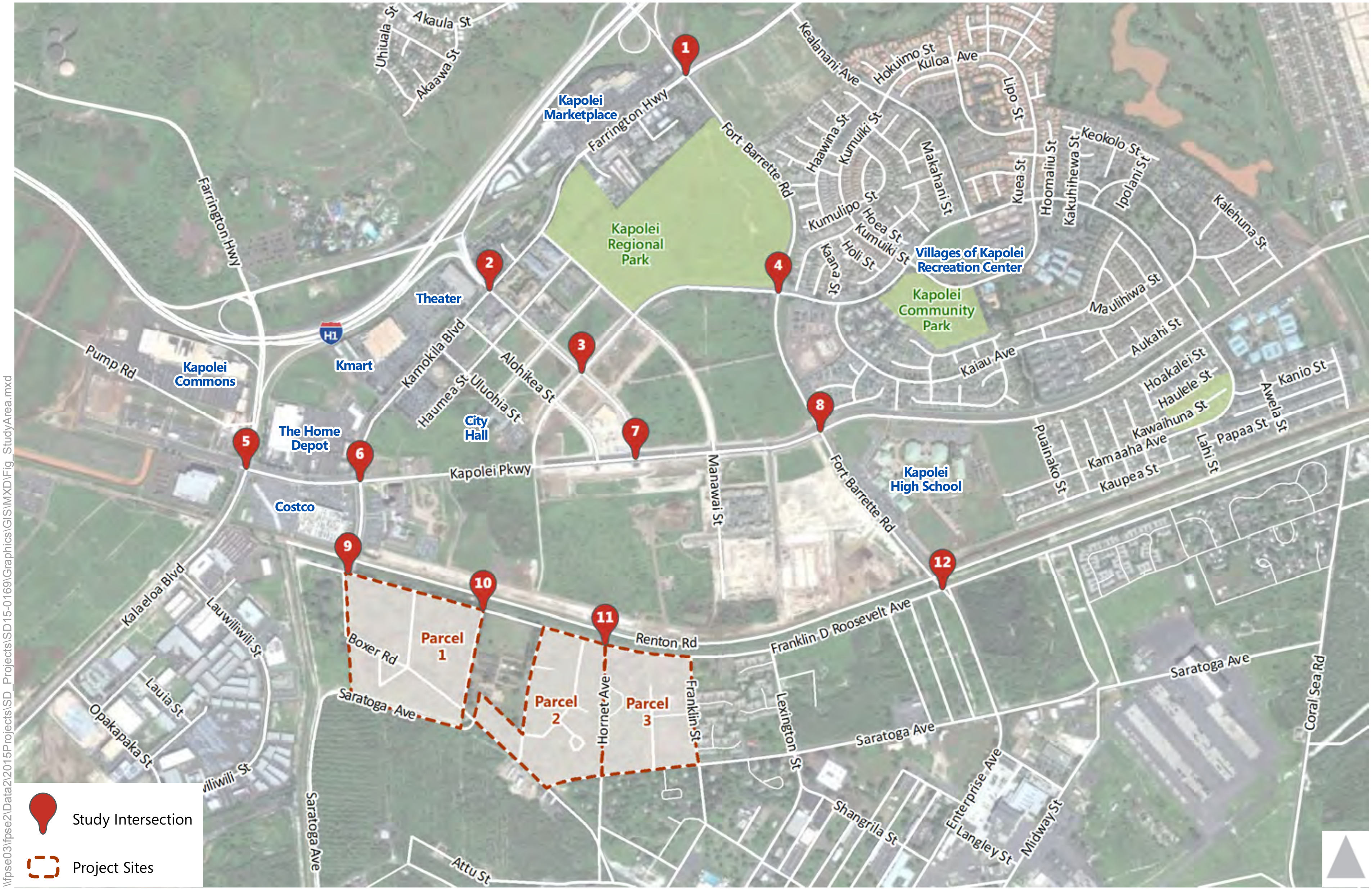
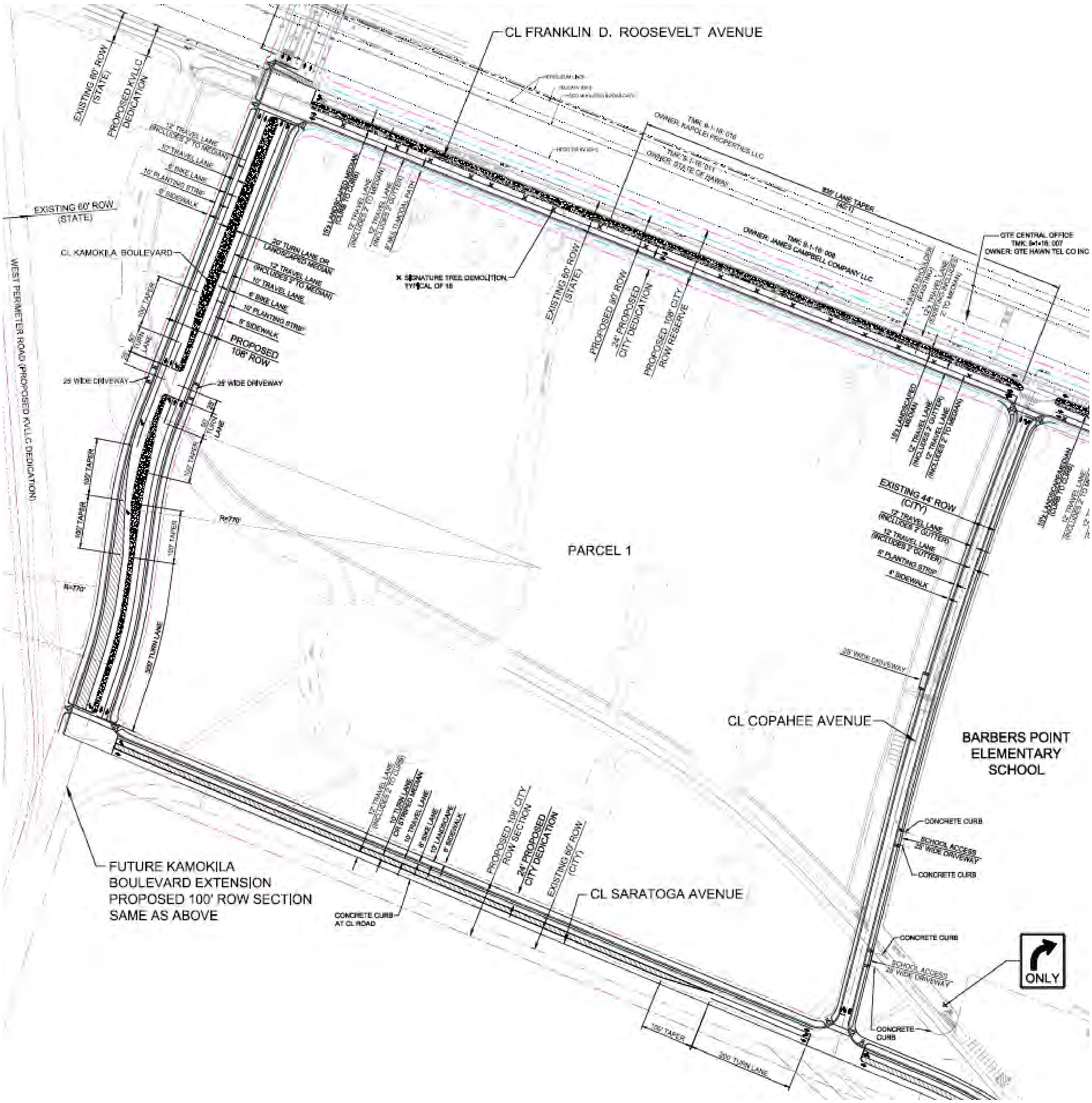



Figure 1

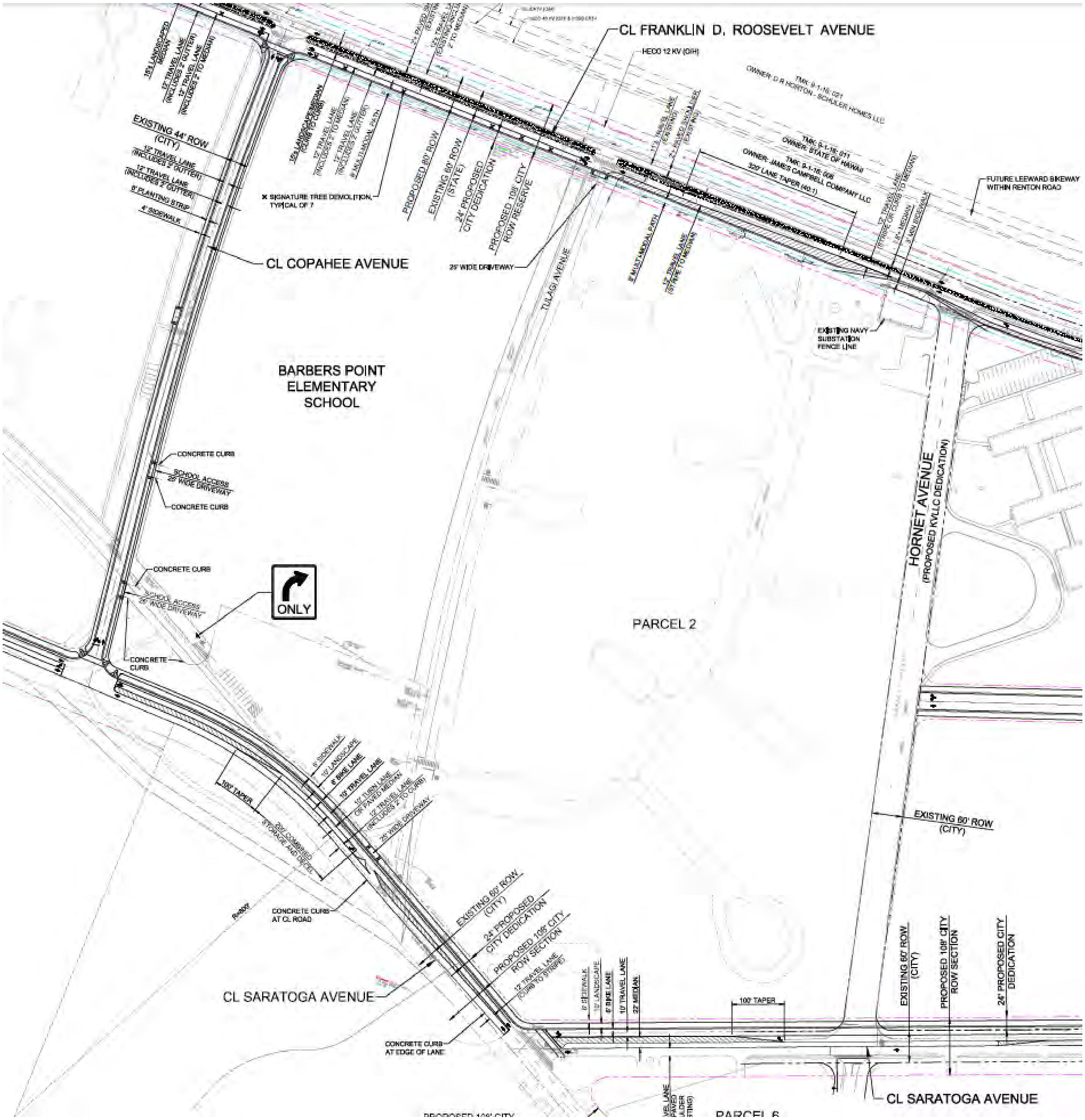
Study Area and Analyzed Intersections




**Source: Belt Collins**

Figure 2

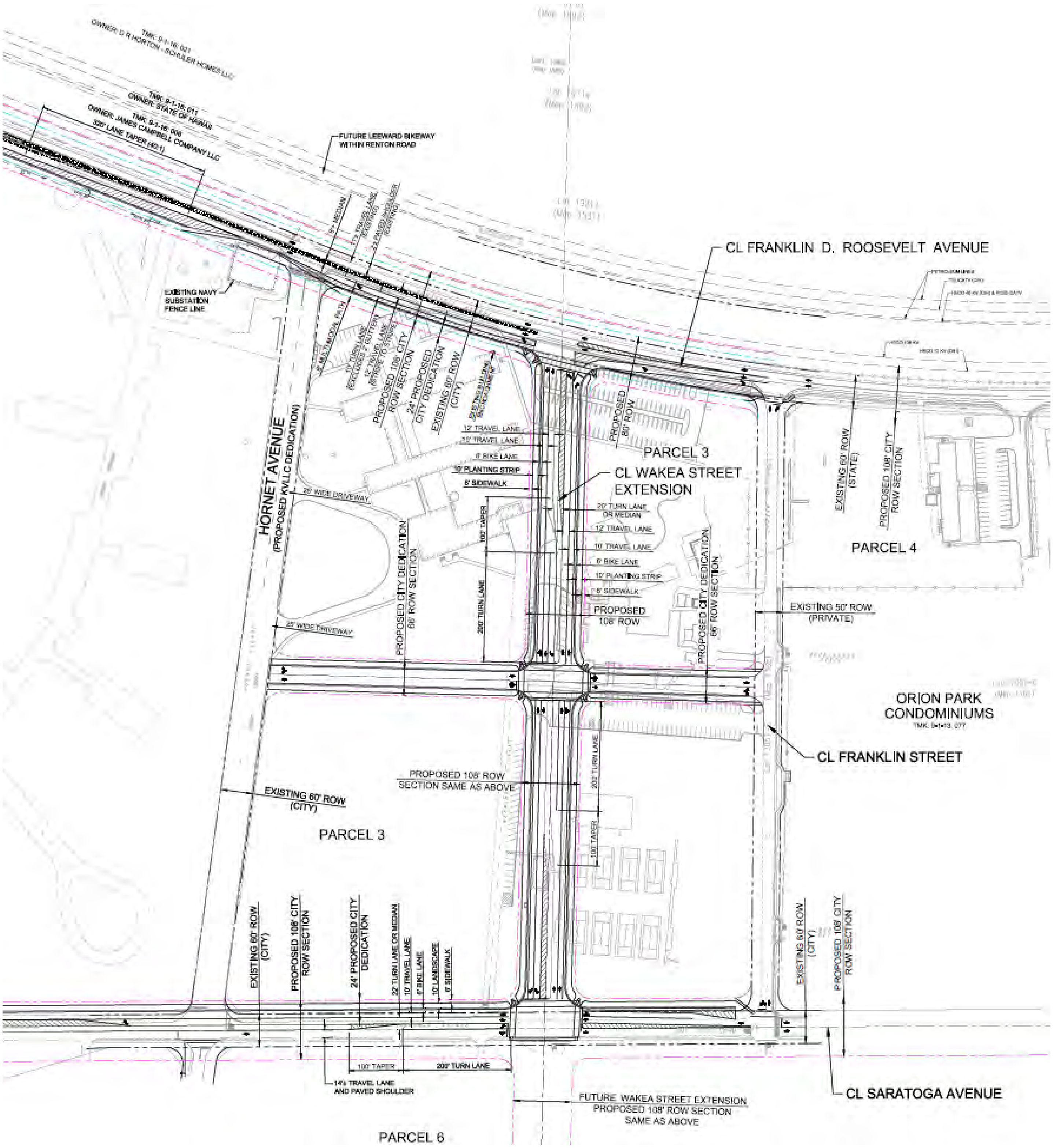
Parcel 1 Location and Access




**Source: Belt Collins**

Figure 3

Parcel 2 Location and Access




**Source: Belt Collins**

Figure 4

Parcel 3 Site Location and Access


# Land Use

This conceptual plan strategically maximized the 1,200 dwelling units which were allowed for development at the time of this study. Four hundred (400) units were equally allocated to Parcels 1, 2 and 3.

Aligned with the HCDA Transect Zones, Parcel 1 and 2, are Transect 3 are lower density and with a higher emphasis on housing. Residential density in these parcels range from 10-20 units/acre. A corner retail complex and a potential Veterans Administration (VA) Clinic is located at the corner of Kamokila Blvd. and Saratoga Ave.

Parcel 3 is designated by HCDA as Transect 4. Residential density within this parcel ranges form 20-30 units/acre. Blocks within these parcels have been designed with street retail specifically focused along the area's main street, Saratoga Avenue. Wakea Garden Apartments, and newly renovated rental apartment building has been maintained on Parcel 3a and improved with a new parking lot and neighborhood park.

| Description | | Residential Units Existing | Residential Units New | Commercial Retail | Commercial Institutional |
|---|---|---|---|---|---|
| | Total for Parcels 1/2/3 | 100 du | 1,249 du | 169,000 sf | 80,000 sf |
| **Parcel 1** | Density 10-25 du/acre | | 433 du | 51,000 sf | 80,000 sf |
| 1 a Corner Retail | 3.49 ac | | | 31,000 sf | |
| 1 b Neighborhood Park | 1.24 ac | | | | |
| 1 c VA Clinic | 8.39 ac | | | | 80,000 sf |
| 1 d Live-Work / Multi-Family | 7.01 ac | | 116 du | 20,000 sf | |
| 1 e Garden Apartments | 9.92 ac | | 235 du | | |
| 1 f Multi-family / Single-family | 2.29 ac | | 30 du | | |
| 1 g Cluster / Single-family | 2.95 ac | | 30 du | | |
| 1 h Neighborhood Park | 1.14 ac | | | | |
| 1 i Cluster / Single-family | 2.51 ac | | 22 du | | |
| **Parcel 2** | Density 10-23 du/acre | | 402 du | 28,000 sf | sf |
| 2 a Neighborhood Park | | | | | |
| 2 b Cluster | 2.01 ac | | 23 du | | |
| 2 c Single-family | 3.28 ac | | 34 du | | |
| 2 d Multi-family around Open Space | 5.13 ac | | 92 du | | |
| 2 e Multi-family | 3.69 ac | | 77 du | | |
| 2 f Mixed-use apartments | 7.79 ac | | 176 du | 28,000 sf | |
| **Parcel 3** | Density 25-35 du/acre | 100 du | 414 du | 90,000 sf | sf |
| 3 a Wakea Garden Apartments | 6. ac | 100 du | | | |
| 3 b Neighborhood Park | | | | | |
| 3 c TOD Development 1 | 6.47 ac | | 206 du | 50,000 sf | |
| 3 d TOD Development 2 | 3.59 ac | | 104 du | 10,000 sf | |
| 3 e TOD Development 3 | 3.99 ac | | 104 du | 30,000 sf | |

0' 200' 400' 800'

Figure 5

## Mixed-Use Development Site Plan

## 2.2 PROJECT STUDY AREA

The study analyzed the potential project-related traffic impacts under typical weekday AM and PM peak hour traffic conditions at full build-out in 2020. The transportation analysis evaluated the operations at twelve intersections in the vicinity of the proposed project. The analyzed intersections are listed below and are shown on **Figure 1**:

1. Farrington Highway/Makakilo Drive-Fort Barrette Road
2. Kamokila Drive/Wakea Street
3. Wakea Street/Kama`aha Avenue
4. Fort Barrette Road/Kama`aha Avenue
5. Kapolei Parkway/Kalaeloa Boulevard
6. Kapolei Parkway/Kamokila Boulevard
7. Kapolei Parkway/Wakea Street
8. Kapolei Parkway/Fort Barrette Road
9. Roosevelt Avenue/Kamokila Boulevard
10. Roosevelt Avenue/Copahee Avenue
11. Roosevelt Avenue/Hornet Street
12. Roosevelt Avenue/Fort Barrette Road-Enterprise Road

The operations of the study intersections were evaluated during the weekday morning (AM) and evening (PM) peak hours for the following scenarios:

- **Existing (2017) Conditions** – The analysis of existing traffic conditions was based on 2017 counts collected for the analyzed peak hours. The existing conditions analysis also includes a description of key area roadways and an assessment of bicycle, pedestrian, and transit facilities and services near the site.
- **Near Term (2020) Baseline Conditions** – Future volumes in the anticipated completion year of the full project build-out were projected by increasing traffic volumes using an annual growth factor to account for ambient growth *plu*s adding traffic generated from approved but not yet constructed and pending developments in the study area.
- **Near Term (2020) Plus Project Conditions** – This traffic scenario provides projected traffic volumes and an assessment of operating conditions under Near Term Baseline Conditions with the addition of project-generated traffic. The near term impacts of the proposed project on future traffic conditions were identified.

The long-term infrastructure needs for roadways serving the study parcels will be addressed in an update to the Kalaeloa Roadway Infrastructure Plan presented in a separate document

## 2.3 TRAFFIC ANALYSIS METHODS

The analysis of roadway operations performed for this study is based on procedures presented in the *Highway Capacity Manual* (HCM), published by the Transportation Research Board in 2010. The operations of roadway facilities are described with the term level of service (LOS). LOS is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents "at-capacity" operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions. The methodologies for signalized and unsignalized intersections are described below.

### 2.3.1 SIGNALIZED INTERSECTIONS

The method described in Chapter 18 of the *Highway Capacity Manual 2010* was used to prepare the LOS calculations for the signalized study intersections. This LOS method analyzes a signalized intersection's operation based on average control delay per vehicle. Control delay alone is used to characterize LOS for the entire intersection or an approach. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using Synchro 9.0 analysis software and is correlated to a LOS designation as shown in **Table 1**.

**TABLE 1: SIGNALIZED INTERSECTION LOS CRITERIA**

| Level of Service | Description | Delay in Seconds |
|---|---|---|
| A | Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay. | ≤ 10.0 |
| B | Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay. | > 10.0 to 20.0 |
| C | Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping. | > 20.0 to 35.0 |
| D | The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable. | > 35.0 to 55.0 |
| E | This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. | > 55.0 to 80.0 |
| F | This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels. | > 80.0 |

Source: *Highway Capacity Manual*, Transportation Research Board, 2010

### 2.3.2 UNSIGNALIZED INTERSECTIONS

The operations of the unsignalized intersections were evaluated either using the method contained in Chapter 19: Two-Way Stop-Controlled Intersections or Chapter 20: All-Way Stop-Controlled Intersections of the *HCM 2010*. LOS ratings for stop-sign-controlled intersections are based on the average control delay expressed in seconds per vehicle. At all-way stop-controlled intersections the overall intersection delay and LOS is reported, and the LOS is characterized solely on control delay. At two-way or side-street-controlled (TWSC) intersections, the average control delay is calculated for each minor-street stopped movement and the major-street left turns, not for the intersection as a whole. For approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. For approaches with multiple lanes, the control delay is computed for each movement; the movement with the worst (i.e., longest) delay is presented for TWSC. As shown in the **Table 2**, LOS F is assigned to the movement if the volume-to-capacity (V/C) ratio for the movement exceed 1.0 regardless of control delay. The average control delay for unsignalized intersections is calculated using Synchro 8.0 analysis software and is correlated to a LOS designation as shown in **Table 2**.

**TABLE 2: UNSIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS**

| Level of Service (v/c ≤ 1.0) | Level of Service (v/c > 1.0)[1] | Description | Average Control Delay Per Vehicle (Seconds) |
|---|---|---|---|
| A | F | Little or no delay. | ≤ 10.0 |
| B | F | Short traffic delay. | > 10.0 to 15.0 |
| C | F | Average traffic delays. | > 15.0 to 25.0 |
| D | F | Long traffic delays. | > 25.0 to 35.0 |
| E | F | Very long traffic delays. | > 35.0 to 50.0 |
| F | F | Extreme traffic delays with intersection capacity exceeded. | > 50.0 |

Source: *Highway Capacity Manual*, Transportation Research Board, 2010

Notes:
[1] For approach-based and intersection-wide assessments, such as that used for AWSC intersections, LOS is defined solely by control delay.

### 2.3.3 SIGNIFICANT IMPACT CRITERIA

The analysis of Near Term Conditions compares future baseline operations with conditions when the project is fully built out to determine whether or not project traffic is expected to result in a significant impact on the surrounding roadways. Based on previous studies conducted for the City & County of Honolulu Department of Planning and Permitting (DPP) Traffic Review Branch (TRB), the minimum desired operating standard for a signalized intersection is typically LOS D. Additionally, the Hawaii Department of Transportation (HDOT) strives to maintain LOS D intersection operations. Both agencies usually define a significant intersection impact when the operation of an intersection or turning movement changes from LOS D or better to LOS E or F. Impacts are also defined to occur when the addition of project traffic exacerbates locations already operating or projected to operate at LOS E or F. When evaluating intersection operations at any location, other factors are considered in the analysis, such as traffic volumes, volume-to-capacity (V/C) ratios (should ideally be less than 1.00), and secondary impacts to pedestrian, bicycle, and transit travel.

Each of the identified significant impacts is categorized as either a project-related or cumulative impact. If the addition of project traffic is expected to degrade LOS D or better operations to LOS E or F at a signalized intersection, then the project is considered to have a project-specific impact. An impact is considered a cumulative impact at a signalized intersection if the addition of project trips exacerbates LOS E or F operations.

For unsignalized intersections, the project is determined to have a significant project-specific impact if the addition of project traffic causes an unsignalized intersection to degrade from LOS D or better to LOS E or F and if the peak hour signal warrant is satisfied. An impact is considered a cumulative impact when it adds traffic to a study location that includes a controlled approach that operates at an undesired level (i.e., LOS E or F) and if the peak hour signal warrant is satisfied.

The City & County of Honolulu does not publish impact criteria for pedestrian, bicycle, and transit impacts. However, these impacts are generally evaluated based on whether a proposed project would: 1) conflict with existing or planned pedestrian, bicycle, or transit facilities, or 2) create walking, bicycling, or transit use demand without providing adequate and appropriate facilities for non-motorized mobility. The existing amenities for pedestrians, bicycles, and transit users were inventoried to evaluate the quality of the facilities in place today. The assessments of planned facilities outlined in planning documents, such as the *Oahu Bike Plan,* the *Ewa Roadway Connectivity Study,* and the *Honolulu High-Capacity Transit Corridor Project Final Environmental Impact Statement*, were used to evaluate future conditions for non-automobile modes. For these modes, if the proposed project is expected to conflict with existing or planned improvements to pedestrian and bicycle facilities, or if the project is expected to generate a substantial demand which could warrant additional transit service, then the project is expected to have a project-specific impact.

## 2.4 REPORT ORGANIZATION

This report is divided into eight chapters. The existing transportation system serving the project site and the current operating conditions of the key intersections are described in **Chapter 3** Existing Conditions. **Chapter 4** summarizes the methodologies used to forecast future cumulative project traffic volumes and the resultant forecasts, and presents the analysis for Near Term (2020) Baseline Conditions. **Chapter 5** describes the project trip generation, distribution, and assignment used in the transportation impact analysis. **Chapter 6** presents the analysis of the Near Term (2020) Plus Project Conditions, assesses any traffic impacts at study intersections, and identifies mitigation measures to address any project impacts. **Chapter 7** contains an assessment of the site access and on-site circulation of the proposed project, while **Chapter 8** includes an assessment of the potential future effect of the project on existing and future transit, bicycle, and pedestrian facilities.

# 3.0 EXISTING CONDITIONS

This chapter describes the existing roadway network and includes a discussion of the bicycle, pedestrian, and transit facilities located in the project study area. This chapter also includes a discussion of the existing intersection LOS results.

## 3.1 EXISTING TRANSPORTATION FACILIITIES

A comprehensive data collection effort was undertaken to identify existing transportation conditions in the vicinity of the proposed project. The assessment of existing conditions relevant to this study includes an inventory of the street system, traffic volumes on these facilities, and operating conditions at key intersections. Existing public transit service and bicycle and pedestrian facilities are also described.

### 3.1.1 EXISTING ROADWAY SYSTEM

The key roadways providing access to or in the vicinity of the site are described below. **Figure 1** illustrates the proposed project location and the surrounding roadway system.

#### 3.1.1.1 Key Mauka/Makai Roadways

*Kalaeloa Boulevard* begins at Olai Street at the makai end and extends mauka of H-1 to Farrington Highway. Kalaeloa Boulevard is located ewa of the project site and generally contains four lanes (two in each direction) with a raised landscaped median. The speed limit on this facility 25 mph. Regional access is provided via the Kalaeloa Boulevard and H-1 interchange.

*Fort Barrette Road* that extends from Farrington Highway in the makai direction to Roosevelt Avenue and is generally bounded by residential units on the Diamond Head side of the road.. Within the study area, it generally includes two travel lanes with a posted speed limit of 35 mph. The roadway widens at intersections to provide separate turn lanes. Fort Barrette is proposed to be widened to four-lanes from Farrington Highway to the Barbers Point Gate.

*Wakea Street* connects H-1 and Farrington Highway to Kapolei Parkway. This roadway has four lanes, two lanes in each direction, and is separated by a landscaped median, with a posted speed limit of 25 mph. Additionally, the Wakea Street and H-1 interchange will be expanded to include new ramp connections, an off-ramp from ewa-bound H-1, a frontage road from Makakilo Drive to Wakea Street, and a new connection to ewa-bound Farrington Highway. These improvements are part of Phase 2B of the Palailai Interchange

Complex and are expected to be completed by 2018. A discontinuous segment of Wakea Street exists makai of Kapolei Parkway which will eventually connect Kapolei Parkway to Roosevelt Avenue.

#### 3.1.1.2 Key Ewa/Diamond Head Roadways

*Farrington Highway* is a ewa-Diamond Head major arterial that provides connection from Waipahu to Kapolei. It begins at H-2 in Waipahu and extends ewa-bound to Kapolei where it turns at Kamokila Boulevard Diamond Head of Manawai Street. Within the study area, Farrington Highway is generally a four-lane divided roadway and has a posted speed limit of 35 mph.

*Kamokila Boulevard* is generally a ewa-Diamond Head roadway that is located mauka of the project site and extends between Kapolei Parkway and Farrington Highway (approximately 350 feet Diamond Head of Manawai Street). The roadway has four lanes, two in each direction, and a raised landscaped median for most of its length. The roadway becomes Farrington Highway further Diamond Head. Within the study area, Kamokila Boulevard is generally fronted by retail on the mauka side of the roadway.

*Kama'aha Avenue* is located mauka of the project site. For most of the roadway, there are four travel lanes (two in each direction) with a raised landscaped median. The speed limit is 25 mph. Kama'aha Avenue is currently built from Kapolei Parkway in the ewa side to Kapolei Parkway in the Diamond Head side. However, the segment of Kama'aha between Wakea Street and Kapolei Parkway is currently closed to traffic.

*Roosevelt Avenue* starts at Kamokila Boulevard at the ewa end and extends Diamond Head where it transitions to Geiger Road at Essex Road. It has a posted speed limit of 25 miles per hour (mph) with unsignalized intersections at all cross streets. Roosevelt Avenue is the mauka boundary of the project site.

*Saratoga Avenue* is a two lane local road that starts at Boxer Road on the ewa side and extends Diamond Head bound to its current terminus at Independence Avenue. It has a posted speed limit of 25 mph and is immediately makai of the project site.

### 3.1.2 EXISTING TRANSIT SERVICES

"The Bus" is Oahu's primary form of public transit. This system provides access within the greater urban area of Honolulu, as well as in communities on the Ewa plain, North Shore, Leeward Coast, and Windward Coast. **Figure 6** illustrates the existing and planned transit facilities and services within the greater study area of the rapidly developing western Kapolei. There are currently no bus stops or transit services directly serving the project site. The closest bus stop is located approximately 0.4 miles from the project site in the mauka-ewa direction, near the intersection of Kapolei Parkway and Kalaeloa Boulevard. Additional transit services are provided on Haumea Street, Kamokila Boulevard, Fort Barrette Road, Kalaeloa Boulevard,

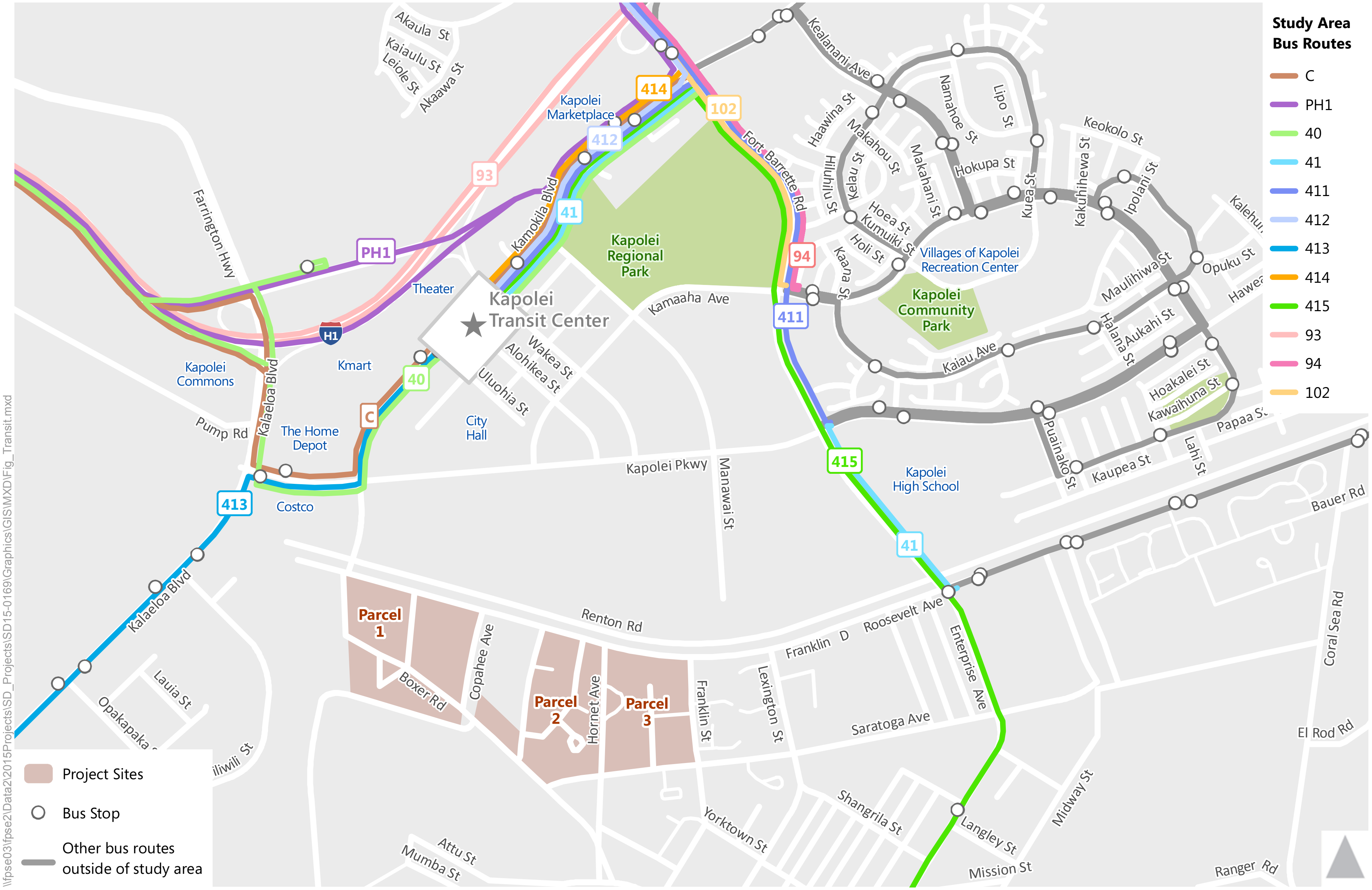



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Figure 6

Existing and Planned Transit Facilities

Roosevelt Avenue east of Fort Barrette Road, and Kapolei Parkway east of Fort Barrette Road. Transit service is expected to be expanded with increased adjacent development, especially with the future expansion of the HART rail project.

There are eight (8) fixed-route bus lines that serve the study area:

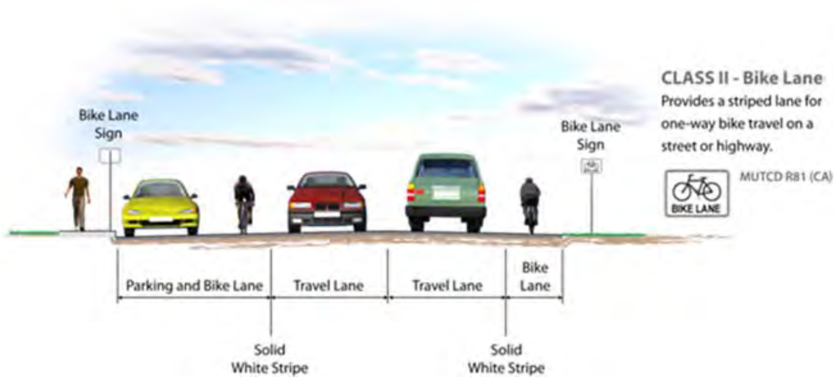
- Route C
- Route 40
- Route 41
- Route 411
- Route 412
- Route 413 (peak periods only)
- Route 414
- Route 415 (peak periods only)

### 3.1.3 EXISTING BICYCLE FACILITIES

Bicycle facilities generally consist of three types of facilities, which are outlined below:

- *Bike or Shared Use Paths* provide a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized. Generally, the recommended pavement width for a two-directional shared use path is ten (10) feet.


- *Bike Lanes* provide a restricted right-of-way and are designated for the use of bicycles with a striped lane on a street or highway. Bicycle lanes are generally five (5) feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.




- *Bike Route or Signed Shared Roadways* provide for a right-of-way designated by signs or shared lane pavement markings, or "sharrows," for shared use with pedestrians or motor vehicles.


As depicted in **Figure 7**, no bicycle infrastructure is provided within the direct proximity of the project site, though existing bicycle facilities do serve adjacent community areas. Class II bike lanes are currently provided on Kapolei Parkway, Wakea Street, Kama'aha Avenue, and Kamokila Boulevard. Similar to transit, bicycle infrastructure will be expanded and developed as planned land uses are built and occupied.

### 3.1.4 EXISTING PEDESTRIAN FACILITIES

Pedestrian facilities consist of sidewalks, crosswalks, and pedestrian signals at signalized intersections. Pedestrian facilities do not currently exist within the project site since Parcel 1, 2, and 3 consist of vacant and/or underutilized land. However all the study intersections have pedestrian facilities and connect to the sidewalk network on one or more of the approaches. However, the one exception is the intersection of Roosevelt Avenue and Copahee Avenue. There are no sidewalks or crosswalks present at this intersection.


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Figure 7

Existing and Proposed Bicycle Facilities

## 3.2 EXISTING INTERSECTION VOLUMES AND LANE CONFIGURATIONS

The operations of the 12 existing study intersections were evaluated during weekday morning (6:30 to 8:30 AM) and evening (3:30 to 5:30 PM) peak-period conditions. Traffic counts were collected during the weekday AM and PM peak periods at the study intersections in December 2017, when local schools were in session. The weekday AM peak hour of traffic for the study area generally occurs between the hours of 7:15 AM and 8:15 AM. During the weekday evening, the PM peak hour of traffic generally occurs between the hours of 3:45 PM and 4:45 PM.

Existing lane configurations and signal controls were obtained through field observations. **Figure 8** presents the existing AM and PM peak-hour turning movement volumes, corresponding lane configurations, and traffic control devices. Raw traffic count data sheets are provided in **Appendix A**.

## 3.3 EXISTING INTERSECTION LEVELS OF SERVICE

Existing peak-hour volumes and lane configurations were used to calculate levels of service for each of the study intersections. The results of the existing LOS analysis are presented in **Table 3** and the corresponding LOS calculation sheets are included in **Appendix B**.

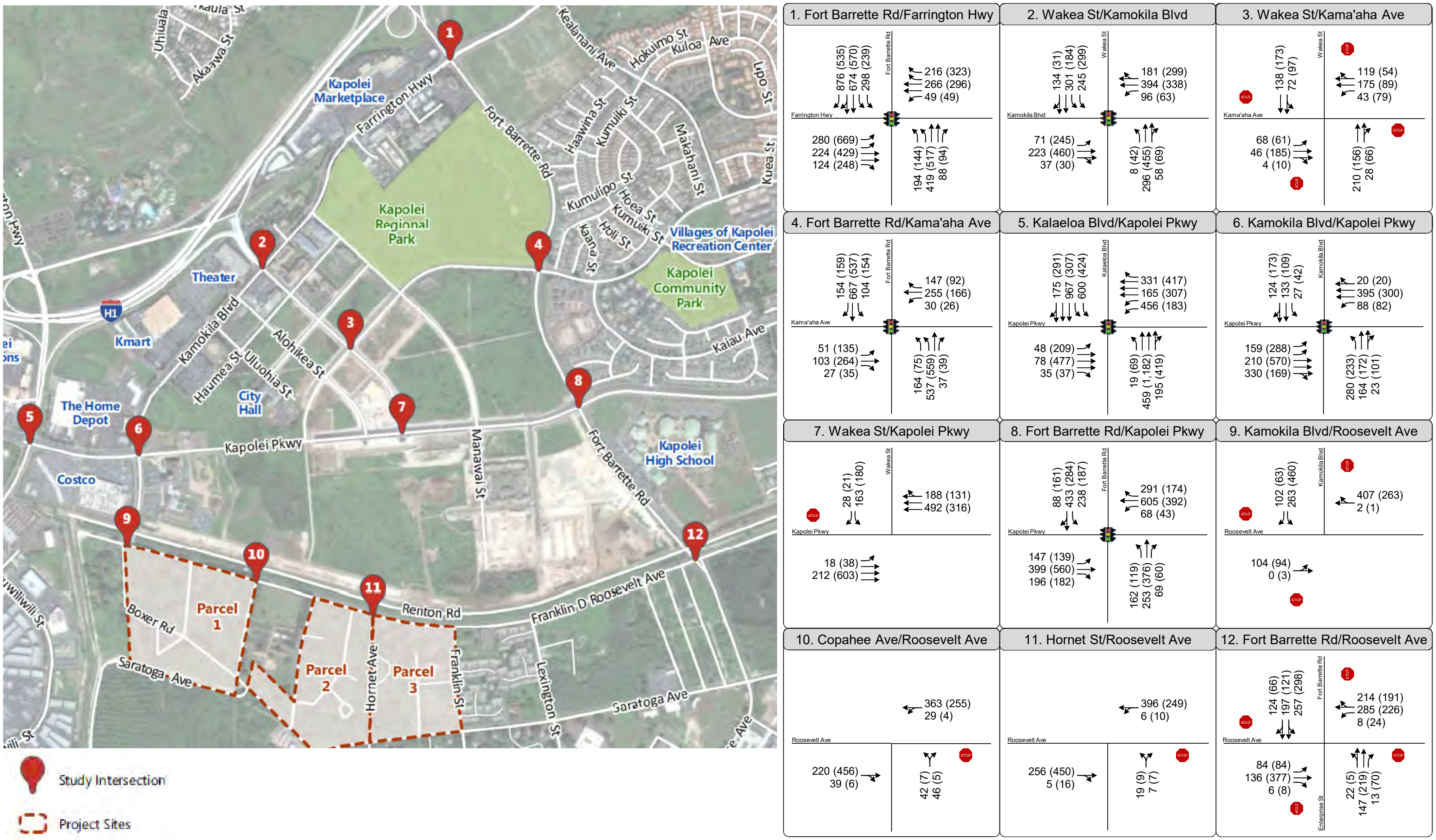



Figure 8
Peak Hour Traffic Volumes and Lane Configurations
Existing (2017) Conditions

**TABLE 3: EXISTING (2017) INTERSECTION LEVELS OF SERVICE**

| Intersection | Traffic Control[1] | Peak Hour | Delay (sec/veh)[2] | LOS[3,4] |
|---|---|---|---|---|
| 1. Farrington Hwy / Fort Barrette Rd | Signal | AM | 27.1 | C |
| | | PM | 31.6 | C |
| 2. Kamokila Blvd / Wakea St | Signal | AM | 21.5 | C |
| | | PM | 31.5 | C |
| 3 Wakea St / Kama'aha Ave | AWSC | AM | 13.5 | B |
| | | PM | 12.7 | B |
| 4. Fort Barrette Rd / Kama'aha Ave | Signal | AM | 30.4 | C |
| | | PM | 31.9 | C |
| 5. Kapolei Pkwy / Kalaeloa Blvd | Signal | AM | 24.4 | C |
| | | PM | **86.4** | **F** |
| 6. Kapolei Pkwy / Kamokila Blvd | Signal | AM | 23.8 | C |
| | | PM | 23.2 | C |
| 7. Kapolei Pkwy / Wakea St | SSSC | AM | 23.1 | C |
| | | PM | 20.5 | C |
| 8. Fort Barrette Rd / Kapolei Pkwy | Signal | AM | **162.5** | **F** |
| | | PM | **165.4** | **F** |
| 9. Roosevelt Ave / Kamokila Blvd | AWSC | AM | 15.1 | C |
| | | PM | 21.8 | C |
| 10. Roosevelt Ave / Copahee Ave | SSSC | AM | 15.4 | C |
| | | PM | 13.9 | B |
| 11. Roosevelt Ave / Hornet St | SSSC | AM | 14.3 | B |
| | | PM | 13.7 | B |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AWSC | AM | **77.3** | **F** |
| | | PM | **75.5** | **F** |

*Source: Fehr & Peers, 2017*

Notes:

**TABLE 3: EXISTING (2017) INTERSECTION LEVELS OF SERVICE**

| Intersection | Traffic Control[1] | Peak Hour | Delay (sec/veh)[2] | LOS[3,4] |
|---|---|---|---|---|

[1]AWSC = All-way stop controlled, SSSC = Side-street stop controlled
[2] Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized and all-way stop-controlled intersections. The vehicular delay for the worst movement is reported for side-street stop-controlled intersections.

[3] LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. Other uncontrolled movements generally operate well with limited delay.

[4] Undesired LOS and corresponding seconds of delay per vehicle are highlighted in **bold.**

The results of the LOS calculations indicate that all study intersections operate at an overall desirable service level (LOS D or better), with the exception of the following three intersections:

- 5. Kapolei Parkway/Kalaeloa Boulevard – During the PM peak hour, the Kapolei Parkway/Kalaeloa Boulevard intersection operates at undesirable LOS F conditions. Kalaeloa Boulevard serves heavy mauka-bound volumes during the PM peak hour as vehicles departing from the Campbell Industrial Park are traveling mauka-bound to reach the H-1/Kalaeloa Boulevard interchange. Extensive mauka-bound queues on Kalaeloa Boulevard were observed during field observations. Vehicles at the end of this queue typically needed to wait for more than one signal cycle to pass the intersection.
- 8. Fort Barrette Road/Kapolei Parkway – This intersection operates at undesirable LOS F during both the AM and PM peak hours. Long mauka-bound and makai-bound queues on Fort Barrette Road were observed during both peak hours. Additionally, the signal currently operates at split phasing for the Diamond Head-bound and ewa-bound directions, which is typically inefficient use of green time in the signal cycle and results in queue build-ups on all approaches.
- 12. Fort Barrette Road-Enterprise Street/Roosevelt Avenue – This intersection operates at undesirable LOS F in both the AM and PM peak hours. During the AM and PM peak hours, the ewa-bound through and the makai-bound left-turn/through movements operate at LOS F. This is primarily due to the all-way stop-controlled operation serving heavy traffic volumes for multiple approaches, which results in high conflicting volumes and longer vehicle delays.

The remaining nine study intersections operate at a desirable LOS (LOS D or better) at an overall intersection-level during both peak hours. However, it should be noted that it is possible for individual turning movements/approaches to operate below LOS D (the HDOT desired minimum operating level) even when the overall intersection is operating at a desirable LOS.

# 4.0 NEAR TERM (2020) BASELINE CONDITIONS

To evaluate the potential impacts of traffic generated by the proposed project on the surrounding street system, it was necessary to first develop estimates of future traffic conditions in the area without the project. Future traffic conditions without the project reflect traffic increases due to regional growth and development, as well as traffic increases generated by other specific developments near the project site. These conditions are referred to as the baseline condition (i.e., "no project" condition). The forecasted future or cumulative baseline traffic volumes were then used to identify impacts on the roadway system. Development of these future traffic scenarios is described in this chapter.

## 4.1 NEAR TERM (2020) TRAFFIC ESTIMATES

Future baseline traffic projections include two elements: 1) growth in the existing background traffic volumes reflecting the effects of overall regional growth and development in and around the study area (referred to as ambient growth); and 2) traffic generated by specific cumulative projects located in the vicinity of the project site.

### 4.1.1 AREAWIDE OR AMBIENT TRAFFIC GROWTH

The Oahu Regional Transportation Plan (ORTP) uses land use and socioeconomic attributes in Traffic Analysis Zones (TAZs) to generate and assign traffic across the roadway network and further provide AM and PM volume projections along major facilities throughout Oahu. Significant employment and housing growth is projected in the ORTP between 2007 and 2035, especially for the Ewa-Kapolei region. By 2020, the project's study area will have experienced significant residential growth and development of new commercial, industrial, business, and institutional land uses. The model growth rates derived between the base year (2007) and the horizon year (2035) traffic projections provided by a revised ORTP Travel Demand Forecasting Model (TDFM) were applied linearly to the existing traffic counts. The calculated growth rate of the Kapolei region obtained from the model was a 0.6 percent annual growth. This annual growth factor was applied to existing intersection traffic volumes collected in December 2017 to account for some level of regional growth. This growth rate was compounded over the three-year timeframe (2017 to 2020) up to full development of the proposed project.

### 4.1.2 CUMULATIVE PROJECT TRAFFIC GENERATION AND ASSIGNMENT

Future base traffic forecasts also include the effects of individual planned/approved development projects, expected to be constructed with the project's five-year development timeframe and expected to add traffic in the vicinity of the project site. Based on input from DPP staff, a total of seven (7) applicable cumulative projects were identified in the study area (see **Table 5**) and traffic from these projects were subsequently added to the cumulative base traffic projections for 2020.

Trip generation estimates and trip assignments for the approved/pending were calculated using a combination of previous studies and publicly available environmental documentation. The use of a growth factor from the regional model and the addition of cumulative project traffic results in a conservative estimate of total baseline traffic volumes for this impact analysis.

### 4.1.3 FUTURE TRANSPORTATION IMPROVEMENTS

The following roadway improvement is planned to be implemented by the year 2020 and were assumed under Near Term (2020) Baseline Conditions:

- *Wakea Street Interchange* will be expanded to include new ramp connections: an off-ramp from ewa-bound H-1 and frontage road from Makakilo Drive to Wakea Street, plus a new connection to ewa-bound Farrington Highway. These improvements are part of Phase 2b of the Palailai Interchange Complex and are expected to be completed within the next two years.

The traffic volumes at the Fort Barrette Drive/Farrington Highway and Kamokila Boulevard/Wakea Street, intersections have been adjusted to represent the shift in traffic due to the transportation project identified above. Several other transportation improvement projects are planned in the Kapolei area, including the Fort Barrette Road widening, Farrington Highway widening, and Kalaeloa East-West Spine Road; however, those projects were not assumed under 2020 conditions given that the current schedule for completion is unknown.

**Figure 9** shows the peak hour traffic volumes for the Near Term (2020) Baseline Conditions.

**TABLE 4: FUTURE DEVELOPMENTS IN KAPOLEI AND KALAELOA TRIP GENERATION**

| **Project** | **Location** | **Land Use**[1] |
|---|---|---|
| Kapolei Mixed-Use | 1020 Wakea Street, Kapolei, HI 96707 | 429 Apartment du's, 154 Senior Apartments du's, 18,000 s.f. Shopping Center, 3,385 s.f. Day Care |
| Ka Makana Ali'I Shopping Center Phase 2[2] | 91-5431 Kapolei Pkwy, Kapolei, HI 96707 | 200,000 s.f. Office |
| Mehana[3] | 840 Kakala St, Kapolei, HI 96707 | 1,100 Low-density and medium density du's, 30 accres of Mixed Use Development, 5 acres of Park |
| Hoopili[4] | Diamond Head of Kualaka'i Pkwy and makai of Farrington Hwy | 2,300 Single Family du's, 9,520 Apartments/Condominiums du's, 3 million s.f. of Industrial Space, 70 acres of Parks, 200 acres of Commercial Farm, 3 Elementary Schools, Middle School, High School |

*Source: Fehr & Peers, 2017*

Notes:

[1]du's = dwelling units; s.f. = square feet

[2]Ka Makana Ali'i Shopping Center only includes Phase 1. Construction of Phase 2 is unknown at this time and is assumed to occur after 2020.

[3]Approximately half of the Mehana development has been built and included in the existing counts. The completion and occupation of the remaining half of the development is anticipated to occur by 2018.

[4]The full buildout of Hoopili is assumed to be completed by 2035. The full buildout trips in 2035 was interpolated to yield 2020 trips.

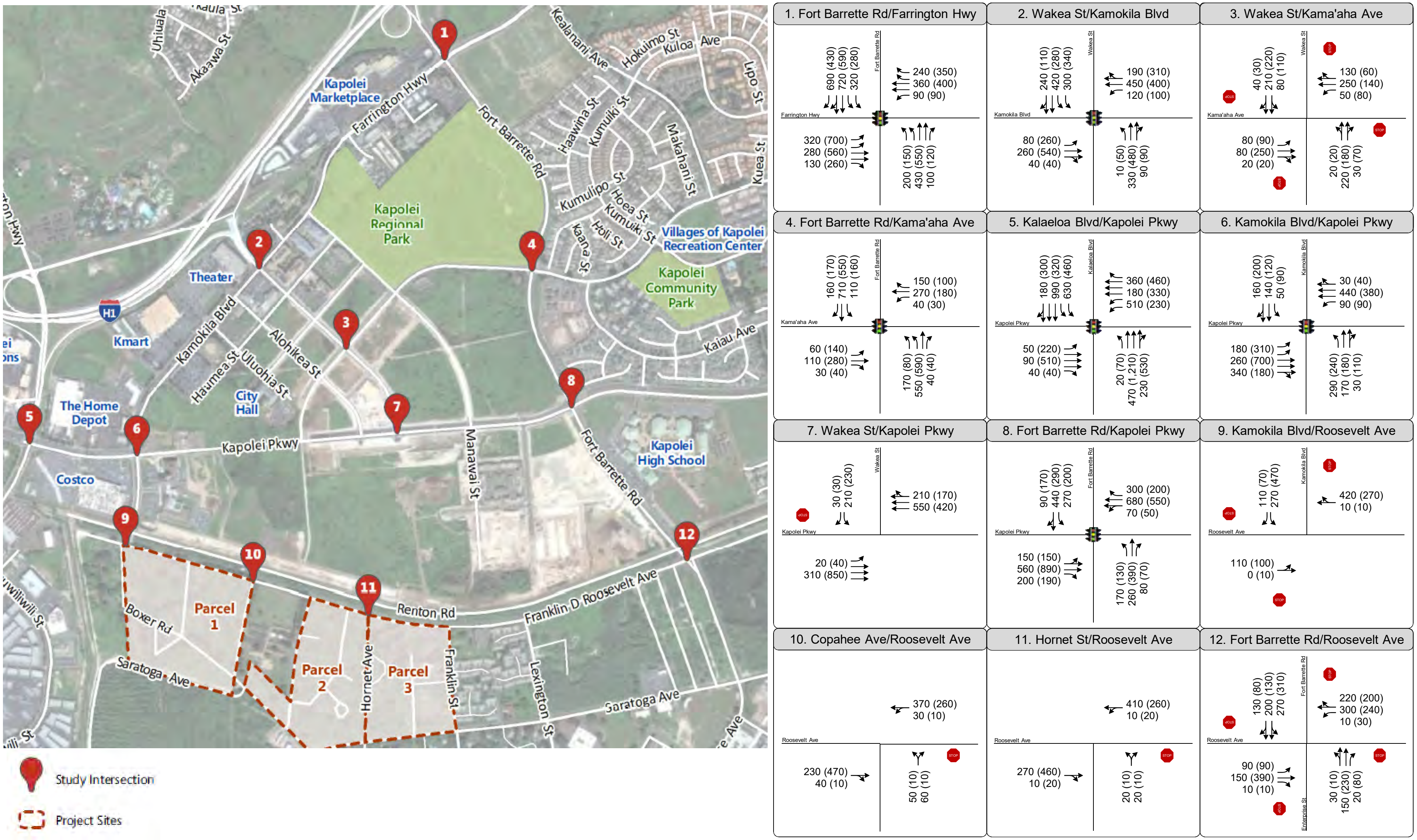



Figure 9

Peak Hour Traffic Volumes and Lane Configurations

Near Term (2020) Baseline Conditions

## 4.2 NEAR TERM (2020) BASELINE LEVELS OF SERVICE

Levels of service calculations were conducted to evaluate the operating levels of the study intersections under Near Term (2020) Baseline Conditions based on the projected growth in traffic and the anticipated roadway improvements. The results of the LOS analysis for the study intersections under Existing and Near Term (2020) Baseline Conditions are presented in **Table 6**. The corresponding LOS Calculation sheets are included in **Appendix C**.

**TABLE 5: EXISTING AND NEAR TERM (2020) BASELINE INTERSECTION LEVELS OF SERVICE**

| Intersection | Traffic Control | Peak Hour | Existing | | Near Term (2020) Baseline | |
|---|---|---|---|---|---|---|
| | | | Delay (sec/veh)[2] | LOS[3,4] | Delay (sec/veh)[2] | LOS[3,4] |
| 1. Farrington Hwy / Fort Barrette Rd | Signal | AM | 27.1 | C | 29 | C |
| | | PM | 31.6 | C | 35.8 | D |
| 2. Kamokila Blvd / Wakea St | Signal | AM | 21.5 | C | 26.2 | C |
| | | PM | 31.5 | C | 36.7 | D |
| 3 Wakea St / Kama'aha Ave | AWSC | AM | 13.5 | B | 19.1 | C |
| | | PM | 12.7 | B | 16.6 | C |
| 4. Fort Barrette Rd / Kama'aha Ave | Signal | AM | 30.4 | C | 37 | D |
| | | PM | 31.9 | C | 37.2 | D |
| 5. Kapolei Pkwy / Kalaeloa Blvd | Signal | AM | 24.4 | C | 26.3 | C |
| | | PM | **86.4** | **F** | **91.0** | **F** |
| 6. Kapolei Pkwy / Kamokila Blvd | Signal | AM | 23.8 | C | 27.6 | C |
| | | PM | 23.2 | C | 26.1 | C |
| 7. Kapolei Pkwy / Wakea St | SSSC | AM | 23.1 | C | **41.5** | **E** |
| | | PM | 20.5 | C | **44.1** | **E** |
| 8. Fort Barrette Rd / Kapolei Pkwy | Signal | AM | **162.5** | **F** | **140.4** | **F** |
| | | PM | **165.4** | **F** | **185.5** | **F** |

**TABLE 5: EXISTING AND NEAR TERM (2020) BASELINE INTERSECTION LEVELS OF SERVICE**

| Intersection | Traffic Control | Peak Hour | Existing | | Near Term (2020) Baseline | |
|---|---|---|---|---|---|---|
| | | | Delay (sec/veh)[2] | LOS[3,4] | Delay (sec/veh)[2] | LOS[3,4] |
| 9. Roosevelt Ave / Kamokila Blvd | AWSC | AM | 15.1 | C | 16.3 | C |
| | | PM | 21.8 | C | 23.9 | C |
| 10. Roosevelt Ave / Copahee Ave | SSSC | AM | 15.4 | C | 16.5 | C |
| | | PM | 13.9 | B | 14.1 | B |
| 11. Roosevelt Ave / Hornet St[4] | SSSC | AM | 14.3 | B | 13.7 | B |
| | | PM | 13.7 | B | 14.1 | B |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AWSC | AM | **77.3** | **F** | **95.2** | **F** |
| | | PM | **75.5** | **F** | **91.4** | **F** |

*Source: Fehr & Peers, 2017*

Notes:

[1]AWSC = All-way stop controlled; SSSC = Side-street stop controlled
[2] Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized and all-way stop-controlled intersections. The vehicular delay for the worst movement is reported for side-street stop-controlled intersections.

[3] LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. Other uncontrolled movements generally operate well with limited delay.

[4] Undesired LOS and corresponding seconds of delay per vehicle are highlighted in **bold.**

The analysis results indicate that eight (8) study intersections are forecasted to operate at LOS D or better under Near Term (2020) Baseline Conditions. The changes in operations are the result of the addition of ambient traffic growth, additional traffic from planned/approved projects, and the rerouting of traffic attributed to improvements at the Wakea Street interchange and the extension of Kama'aha Avenue,. The remaining four (4) study intersections are expected to operate at LOS E or F for at least one peak hour:

5. Kapolei Parkway / Kalaeloa Boulevard – LOS F (PM Peak Hour)
7. Kapolei Parkway / Wakea Street – LOS E (AM peak hour and PM peak hour)
8. Fort Barrette Road / Kapolei Parkway - LOS F (AM peak hour and PM peak hour)
12. Fort Barrette Road / Roosevelt Avenue –LOS F (AM peak hour and PM peak hour)

Similar to Existing Conditions, the majority of the poorly operating movements are left-turn movements. This is attributed by the signal timing allocating more green time to the through movements, which in most cases, will cause the left-turn movements to operate at LOS E or F in at least one of the peak hours. For left-turns operating poorly at unsignalized intersections, this is primarily due to the high traffic volume on the major streets (e.g. Kapolei Parkway) and limited number of gaps for vehicles at the stop-controlled movement to make left-turns.

# 5.0 PROJECT TRAFFIC PROJECTIONS

This chapter describes the anticipated number of vehicle trips and directionality of those trips that would result from implementation of the proposed project. Future traffic added to the roadway system by the project is estimated using a three-step process: (1) project trip generation, (2) trip distribution, and (3) trip assignment. The first step estimates the amount of project-generated traffic will be added to the roadway network by each development alternative. The second step estimates the direction of travel to and from the project site. The new trips are assigned to specific street segments and intersection turning movements during the third step. This process is described in more detail in the following sections.

## 5.1 PROJECT TRIP GENERATION ESTIMATES

Vehicle trip rates presented in the *Trip Generation Manual* (10th Edition, Institute of Transportation Engineers (ITE), 2017) were used to estimate the number of trips to and from the proposed project site for the 1,500 Residential Unit development alternative. The specific trip generation rates used and the estimated new number of trips generated for Parcels 1, 2, and 3 of the residential only alternative are summarized in **Table 6**.

For the Mixed-Use Development alternative, the trip generation was estimated using the *Trip Generation Manual* and the Fehr & Peers' mixed-use development (MXD+) methodology. The MXD+ trip generation methodology accurately captures the trip-reducing benefits of mixed-use development projects and is used throughout the United States to help developers, agencies, and the public to quantify these trip reductions. The MXD+ trip generation model is promoted by the United States Environmental Protection Agency (EPA) and has been adopted by numerous public entities including the San Diego Association of Governments (SANDAG), American Society of Civil Engineers (ASCE), American Planning Association (APA), as a recommended resource for trip generation of smart-growth developments. The MXD+ model uses ITE trip generation rates and applies additional variables to those rates. Some of the additional variables include:

- Employment
- (Population + Employment) per square mile
- Land area
- Total jobs / population diversity
- Retail jobs / population diversity
- Number of intersections per square mile
- Employment within a mile
- Employment within a 30-minute trip by transit
- Average household size

- Vehicles owned per capita

The trip generation estimation for the Mixed-Use Development alternative does not include a non-auto reduction to account for bicycle and pedestrian traffic to provide a conservative analysis. However, it is reasonable to assume a 5% non-auto reduction due to the close proximity to corresponding land uses and existing and planned bicycle and pedestrian facilities.

The ITE land use category for Clinic was used for the proposed VA Clinic on Parcel 1 under the Mixed-Use development alternative. The ITE Clinic rate is most likely overstating vehicle trips for the VA Clinic since it will not be open to the public and will have more limited patient base.

As shown in **Table 6**, under Parcel 1 conditions, the project would generate a total of 4,299 daily trips, including 274 trips during the AM peak hour (64 inbound/210 outbound) and 332 trips during the PM peak hour (209 inbound/123 outbound). Under Parcel 1 & 2 conditions, the project would generate a total of 7,764 daily trips, including 542 trips during the AM peak hour (131 inbound/411 outbound) and 689 trips during the PM peak hour (434 inbound/255 outbound). Under Parcel 1, 2, and 3 conditions, the project would generate a total of 12,259 daily trips, including 804 trips during the AM peak hour (191 inbound/613 outbound) and 980 trips during the PM peak hour (617 inbound/363 outbound).

It is likely that the project trip generation estimates developed using the ITE methodology underestimate the influence of nearby land uses (i.e. the elementary schools and retail centers nearby the project site and the future East Kapolei rail transit station located three miles away) on internal trip-making characteristics and non-motorized mode shifts. However, trip estimates in this analysis were not reduced for complimentary uses given that majority of uses are located more than half a mile away. Additionally, while some residents from the project are expected to use the future rail transit, it is anticipated that they will still drive their vehicle to the East Kapolei station. Therefore, for purposes of providing a more conservative analysis, no reductions related to non-motorized trips, such as transit, was assumed in this analysis.

**TABLE 6: PROJECT TRIP GENERATION ESTIMATES – 1,500 RESIDENTIAL UNITS**

| Land Use | Quantity | Units[1] | Daily[2] | AM Peak Hour[2] | | | PM Peak Hour[2] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | In | Out | Total | In | Out | Total |
| **Parcel 1** | | | | | | | | | |
| Single-Family Residential | 126 | du's | 1,286 | 23 | 71 | 94 | 80 | 47 | 127 |
| Apartment | 404 | du's | 3,013 | 41 | 139 | 180 | 129 | 76 | 205 |
| **Parcel 2** | | | | | | | | | |
| Single-Family Residential | 370 | du's | 3,465 | 67 | 201 | 268 | 225 | 132 | 357 |
| **Parcel 3** | | | | | | | | | |
| Apartment | 600 | du's | 4,495 | 60 | 202 | 262 | 183 | 108 | 291 |
| **TOTAL NEW VEHICLE TRIPS** | | | | | | | | | |
| **Parcel 1 Vehicle Trips** | | | **4,299** | **64** | **210** | **274** | **209** | **123** | **332** |
| **Parcel 1 & 2 Vehicle Trips** | | | **7,764** | **131** | **411** | **542** | **434** | **255** | **689** |
| **Parcels 1, 2, & 3 Vehicle Trips** | | | **12,259** | **191** | **613** | **804** | **617** | **363** | **980** |

*Source: Fehr & Peers, 2017*

Notes:

1 du's = Dwelling Units
2 Based on best fit equation rates from *ITE Trip Generation (*10th Edition)

As shown in **Table 7**, under Parcel 1 conditions with the Mixed-Use Development, the project would generate a total of 9,740 daily trips, including 647 trips during the AM peak hour (373 inbound/274 outbound) and 765 trips during the PM peak hour (351 inbound/414 outbound). Under Parcel 1 & 2 conditions, the project would generate a total of 14,880 daily trips, including 963 trips during the AM peak hour (503 inbound/460 outbound) and 1,139 trips during the PM peak hour (560 inbound/579 outbound). Under Parcel 1, 2, and 3 conditions, the project would generate a total of 22,454 daily trips, including 1,186 trips during the AM peak hour (582 inbound/604 outbound) and 1,702 trips during the PM peak hour (855 inbound/847 outbound).

## TABLE 7: PROJECT TRIP GENERATION ESTIMATES – MIXED-USE DEVELOPMENT

| Land Use | Units[1] | Daily[2] | AM Peak Hour[2] | | | PM Peak Hour[2] | | |
|---|---|---|---|---|---|---|---|---|
| | | | In | Out | Total | In | Out | Total |
| **Parcel 1** | | | | | | | | |
| Single-Family Residential | 82 du's | 866 | 16 | 47 | 63 | 53 | 31 | 84 |
| Multi-Family Housing | 351 du's | 2,614 | 36 | 121 | 157 | 114 | 67 | 181 |
| VA Clinic | 80 ksf | 3,054 | 230 | 65 | 295 | 76 | 186 | 262 |
| Retail | 51 ksf | 3,804 | 110 | 67 | 177 | 158 | 172 | 330 |
| | *Gross Total* | *10,338* | *392* | *300* | *692* | *401* | *456* | *857* |
| | *Internalization[3]* | *-598* | *-19* | *-26* | *-45* | *-50* | *-42* | *-92* |
| | *Net New Vehicle Trips (B)* | *9,740* | *373* | *274* | *647* | *351* | *414* | *765* |
| **Parcel 2** | | | | | | | | |
| Single-Family Residential | 57 du's | 620 | 11 | 34 | 45 | 37 | 22 | 59 |
| Multi-Family Housing | 345 du's | 2,568 | 36 | 119 | 155 | 112 | 66 | 178 |
| Retail | 28 ksf | 2,530 | 103 | 63 | 166 | 102 | 110 | 212 |
| | *Gross Total* | *5,718* | *150* | *216* | *366* | *251* | *198* | *449* |
| | *Internalization[3]* | *-578* | *-20* | *-30* | *-50* | *-42* | *-33* | *-75* |
| | *Net New Vehicle Trips (C)* | *5,140* | *130* | *186* | *316* | *209* | *165* | *374* |
| **Parcel 3** | | | | | | | | |
| Multi-Family Housing | 414 du's | 3,090 | 42 | 142 | 184 | 132 | 77 | 209 |
| Retail | 90 ksf | 5,596 | 53 | 32 | 85 | 241 | 262 | 503 |
| | *Gross Total* | *8,686* | *95* | *174* | *269* | *373* | *339* | *712* |
| | *Internalization[3]* | *-1,112* | *-16* | *-30* | *-46* | *-78* | *-71* | *-149* |
| | *Net New Vehicle Trips (D)* | *7,574* | *79* | *144* | *223* | *295* | *268* | *563* |
| **TOTAL NEW VEHICLE TRIPS** | | | | | | | | |

**TABLE 7: PROJECT TRIP GENERATION ESTIMATES – MIXED-USE DEVELOPMENT**

| Land Use | Units[1] | Daily[2] | AM Peak Hour[2] | | | PM Peak Hour[2] | | |
|---|---|---|---|---|---|---|---|---|
| | | | In | Out | Total | In | Out | Total |
| **Parcel 1 Vehicle Trips** | | **9,740** | **373** | **274** | **647** | **351** | **414** | **765** |
| **Parcel 1 & 2 Vehicle Trips** | | **14,880** | **503** | **460** | **963** | **560** | **579** | **1,139** |
| **Parcels 1, 2, & 3 Vehicle Trips** | | **22,454** | **582** | **604** | **1,186** | **855** | **847** | **1,702** |

*Source: Fehr & Peers, 2017*
Notes:
[1] du's = Dwelling Unit; ksf = 1,000 square feet
[2] Single-Family Residential uses Single-Family Detached Housing Best Fit equation
Daily: Ln(T) = 0.92Ln(X) + 2.71; AM: T = 0.71(X) + 4.80; PM: Ln(T) = 0.96Ln(X)+0.20
Multi-Family Housing uses Multifamily Housing (Low-Rise) Best Fit equation
Daily: T = 7.56(X) – 40.86; AM: Ln(T) = 0.95Ln(X) – 0.51; PM: Ln(T) = 0.89Ln(X) – 0.02
VA Clinic uses Clinic Average Rates
Daily: 38.16; AM: 3.69; PM: 3.28
Retail uses Shopping Center Best Fit Equation (Daily and PM) and Average Rates (AM)
Daily: Ln(T) = 0.68Ln(X)+5.57; AM: 0.94; PM: Ln(T) = 0.74Ln(X) = 2.89
[3] The MXD model (MXD+) was used to obtain these non-auto-oriented and internalization trip reduction.
Parcel 1 – Daily: 8%; AM: 11%; PM: 16%
Parcel 2 – Daily: 10%; AM: 14%; PM: 17%
Parcel 3 – Daily: 13%; AM: 17%; PM: 21%

## 5.2 PROJECT TRIP DISTRIBUTION

An initial trip distribution estimate was based on a "select zone" analysis using the OahuMPO Regional Travel Demand Forecasting Model (TDFM). This process identifies the number of trips on each roadway segment included in the model that is generated by the single traffic analysis zone (TAZ) representing the project area. The distribution was further refined and adjusted based on:

- Existing traffic volumes
- The level of accessibility of route to and from the project site
- The location of complementary land uses (retail centers and schools from which residents would be drawn)
- Locations of other similar land uses

Based on these factors, the vehicle trip distribution of the project-generated traffic under Near Term (2020) Conditions for residential land uses is estimated to be:

- 30% to/from the East (to/from Town) along H-1
- 5% to/from the West (to/from the Leeward Coast) along H-1
- 5% to/from the West along Kapolei Parkway
- 15% to/from the South along Kalaeloa Boulevard
- 2% to/from the East along Farrington Highway
- 15% to/from the East along Kapolei Parkway
- 10% to/from the East along Roosevelt Avenue
- 18% to/from nearby developments within the Kapolei Community, located mauka of the project site

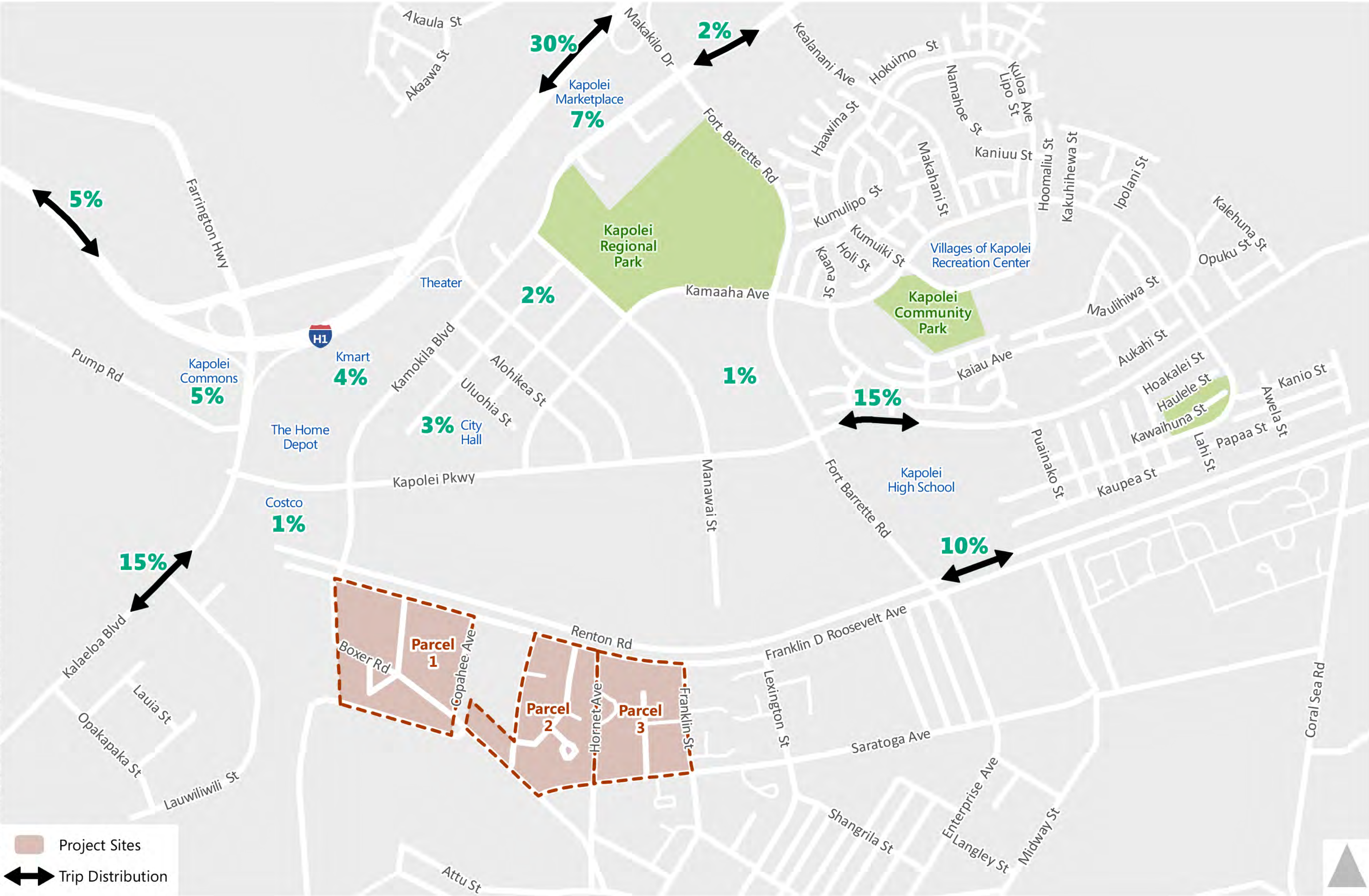
The vehicle trip distribution of the project-generated traffic under Near Term (2020) Conditions for the retail land use is estimated to be:

- 5% to/from the East (to/from Town) along H-1
- 20% to/from the West (to/from the Leeward Coast) along H-1
- 1% to/from the West along Kapolei Parkway
- 2% to/from the South along Kalaeloa Boulevard
- 7% to/from the East along Farrington Highway
- 30% to/from the East along Kapolei Parkway
- 20% to/from the East along Roosevelt Avenue
- 15% to/from nearby developments within the Kapolei Community, located mauka of the project site

The vehicle trip distribution of the project-generated traffic under Near Term (2020) Conditions for the VA Clinic land use is estimated to be:

- 40% to/from the East (to/from Town) along H-1
- 15% to/from the West (to/from the Leeward Coast) along H-1
- 0% to/from the West along Kapolei Parkway
- 0% to/from the South along Kalaeloa Boulevard
- 8% to/from the East along Farrington Highway
- 28% to/from the East along Kapolei Parkway
- 5% to/from the East along Roosevelt Avenue
- 4% to/from nearby developments within the Kapolei Community, located mauka of the project site

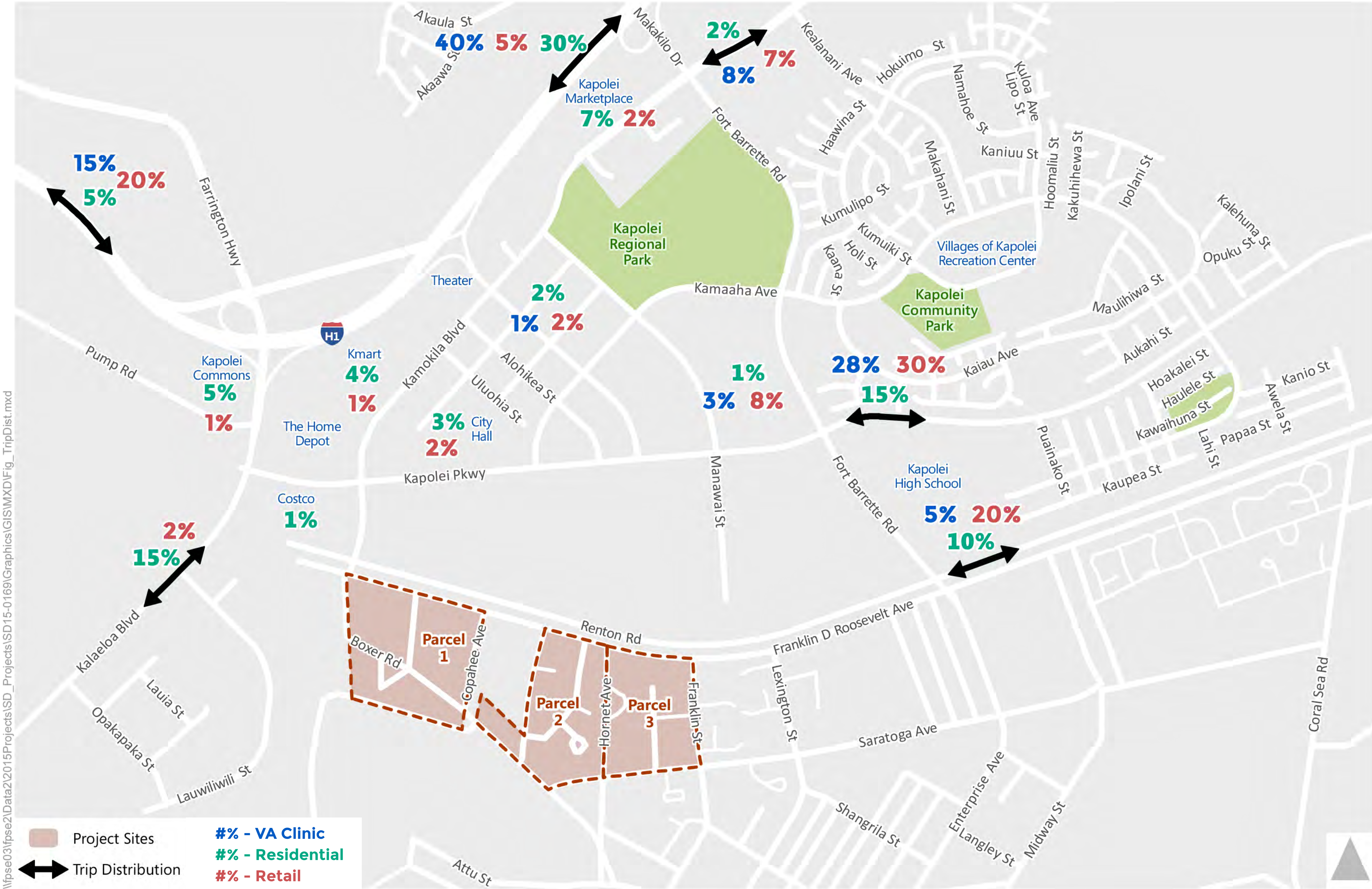
**Figure 10** and **Figure 11** illustrates the project trip distribution pattern described above for the 1,500 Residential Units and Mixed-Use Development alternatives, respectively.




\\fpse03\fpse2\Data2\2015Projects\SD_Projects\SD15-0169\Graphics\GIS\MXD\Fig_TripDist.mxd

Figure 10

# Residential Project Trip Distribution




\\fpse03\fpse2\Data2\2015Projects\SD_Projects\SD15-0169\Graphics\GIS\MXD\Fig_TripDist.mxd

Figure 11

## Mixed-Use Project Trip Distribution

## 5.3 PROJECT TRIP ASSIGNMENT

Using the estimated trip generation and the distribution patterns discussed, the traffic generated by the proposed project under Near Term (2020) Baseline Conditions was assigned to the study intersections based on the characteristics of the streets within the study area, anticipated congestion, and directness of route. **Figures 12, 13, and 14** shows the assignment of trips generated by the project for Parcel 1, Parcels 1 and 2, and Parcels 1, 2, and 3, respectively, for the 1,500 Residential Unit alternative. **Figures 15, 16, and 17** shows the assignment of trips generated by the project for Parcel 1, Parcels 1 and 2, and Parcels 1, 2, and 3, respectively, for the Mixed-Use Development alternative.

## 5.4 PROPOSED PROJECT ROADWAY MODIFICATIONS

The proposed project plans to construct the Kamokila Boulevard extension from Roosevelt Avenue to Saratoga Avenue and the Saratoga Avenue realignment/extension from Boxer Road to Kamokila Boulevard. Kamokila Boulevard will border the ewa-side of Parcel 1, and Saratoga Avenue will border the makai side of Parcels 1, 2, and 3. With these two new roadway extensions, the project also proposes to remove Boxer Road from Kamokila Boulevard to Tulagi Avenue; thus, Roosevelt Avenue's ewa terminus will be at Kamokila Boulevard in the future.

The new segment of Kamokila Boulevard will extend approximately 1,200 feet makai of Roosevelt Avenue to connect to Saratoga Avenue and will include two travel lanes. With the removal of Boxer Road, the Kamokila Boulevard/Roosevelt Avenue will be a T-intersection with no ewa intersection leg and is expected to initially remain as an unsignalized all-way stop controlled intersection. The new Kamokila Boulevard/Saratoga Avenue will be a two-legged intersection (mauka and Diamond Head intersection legs only) and will also be unsignalized with free turning-movements for both approaches. Access to Parcel 1 will be provided via an unsignalized intersection on Kamokila Boulevard, approximately 600 feet makai of Roosevelt Avenue.

Saratoga Avenue will extend from Tulagi Avenue in the Diamond Head side to the new Kamokila Boulevard extension. This segment will provide two-travel lanes and will intersect with Copahee Avenue, Tulagi Avenue, and Hornet Avenue. Access to Parcel 2 and 3 will be provided via the Saratoga Avenue/Tulagi Avenue intersection and the Saratoga Avenue/Wakea Street intersection, respectively.

Roosevelt Avenue will remain as a two-lane roadway with unsignalized intersections at Kamokila Boulevard, Copahee Avenue, and Tulagi Avenue. The project proposes to eliminate the Roosevelt Avenue/Hornet Avenue intersection, where Hornet Avenue will remain as roadway, but will be closed off at Roosevelt

Avenue. Hornet Avenue will still provide access to Parcel 3 via the two existing driveways, and will intersect with Saratoga Avenue in the makai side. The Wakea Street extension between Kapolei Parkway and Roosevelt Avenue is not part of the proposed project and thus, was not assumed in the analysis.

**Figure 18** illustrates the overall development plan and new roadway alignments. Please note, that the figure shows the Wakea Street extension, but as stated above, this was not included as part of the proposed project.

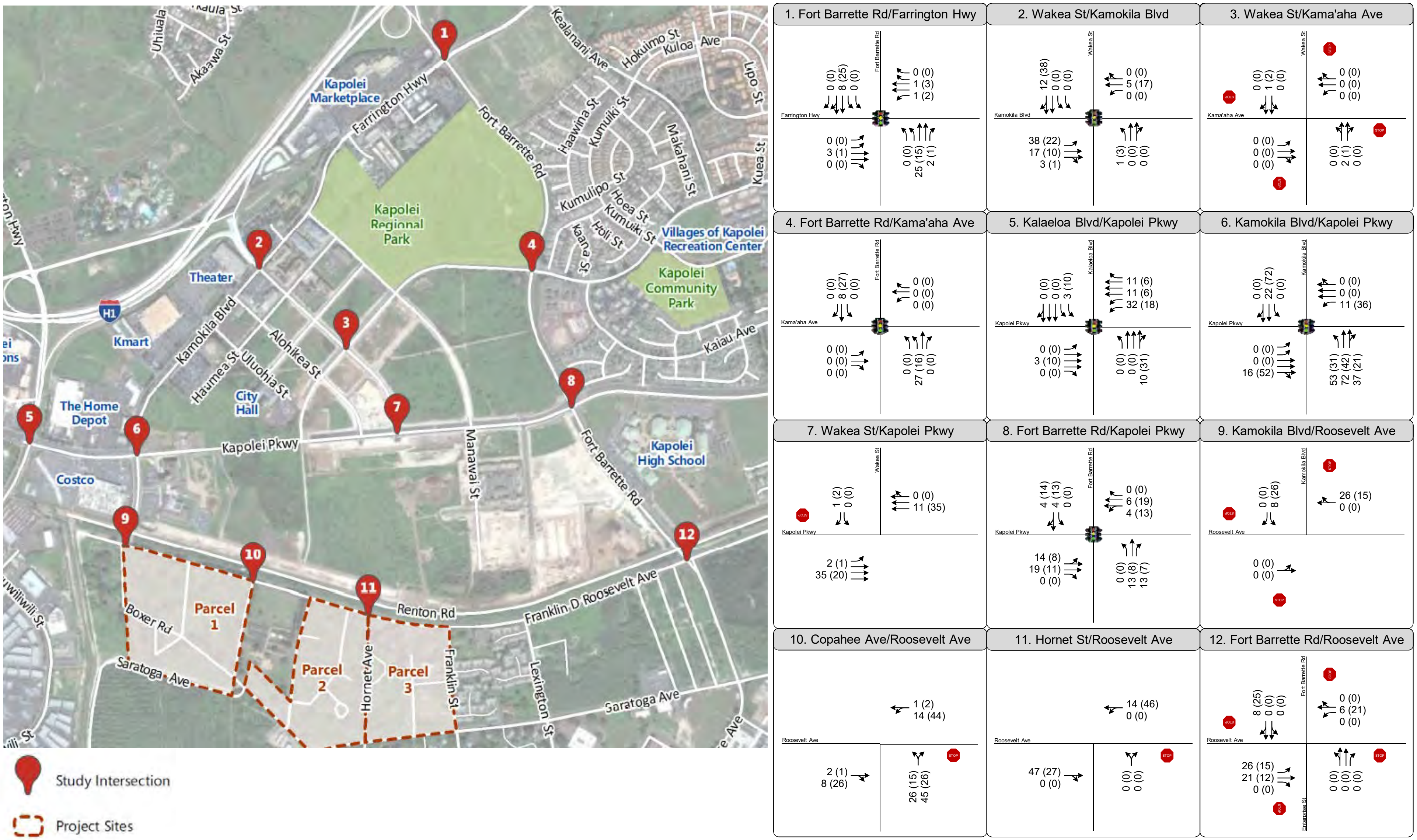



Figure 12
Peak Hour Traffic Volumes and Lane Configurations
1,500 Residential Unit - Parcel 1 Trip Assignment

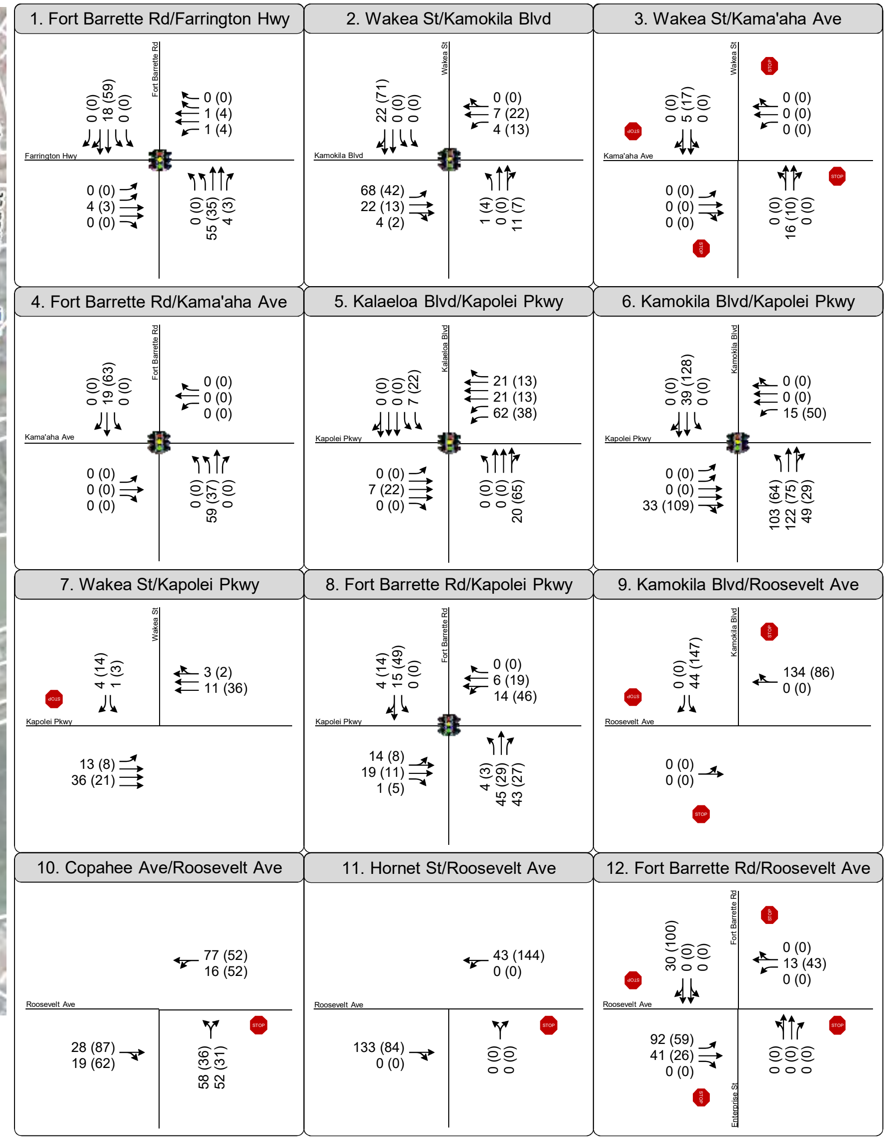




Figure 13
Peak Hour Traffic Volumes and Lane Configurations
1,500 Residential Unit - Parcels 1 & 2 Trip Assignment

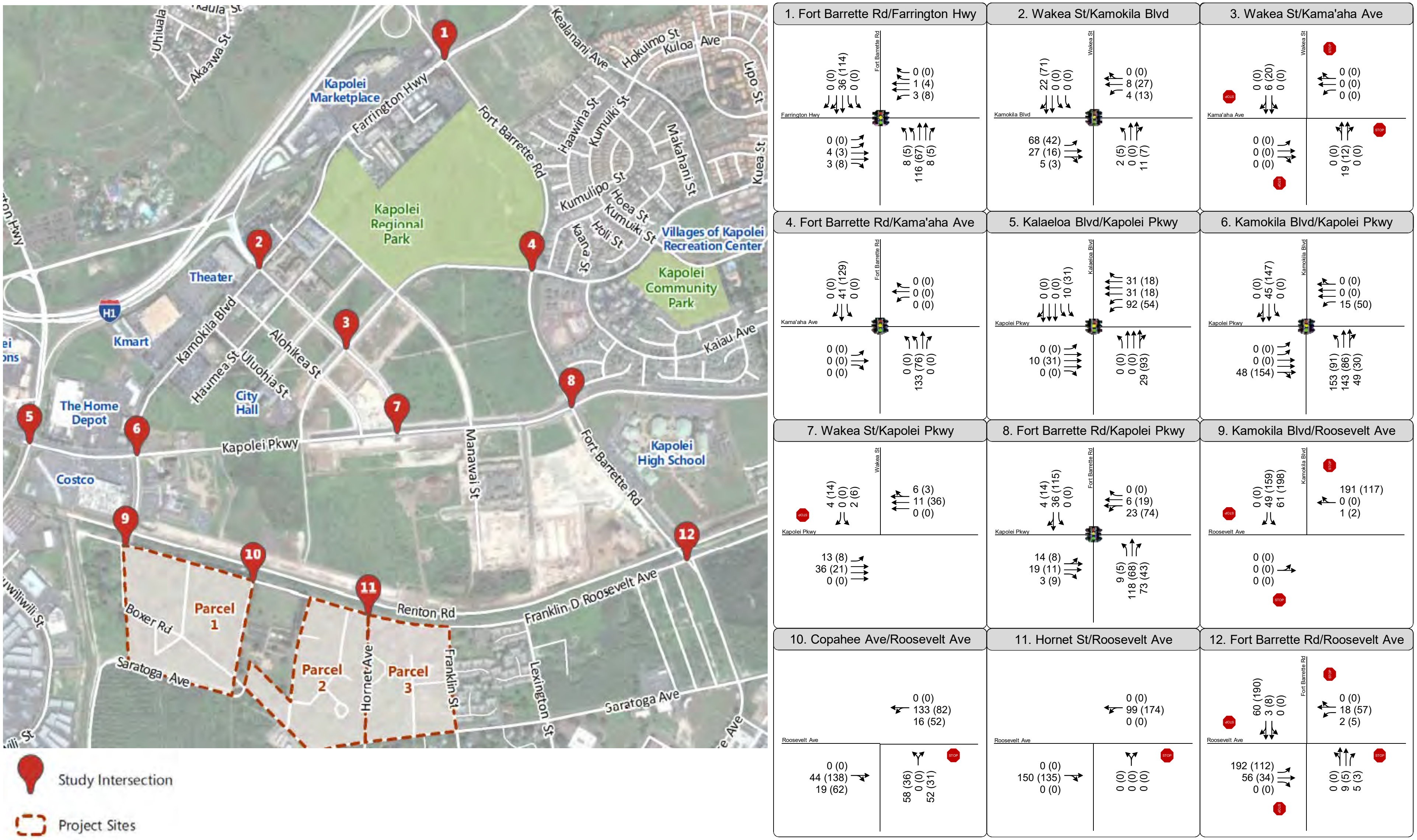



Figure 14
Peak Hour Traffic Volumes and Lane Configurations
1,500 Residential Unit - Parcels 1, 2, & 3 Trip Assignment

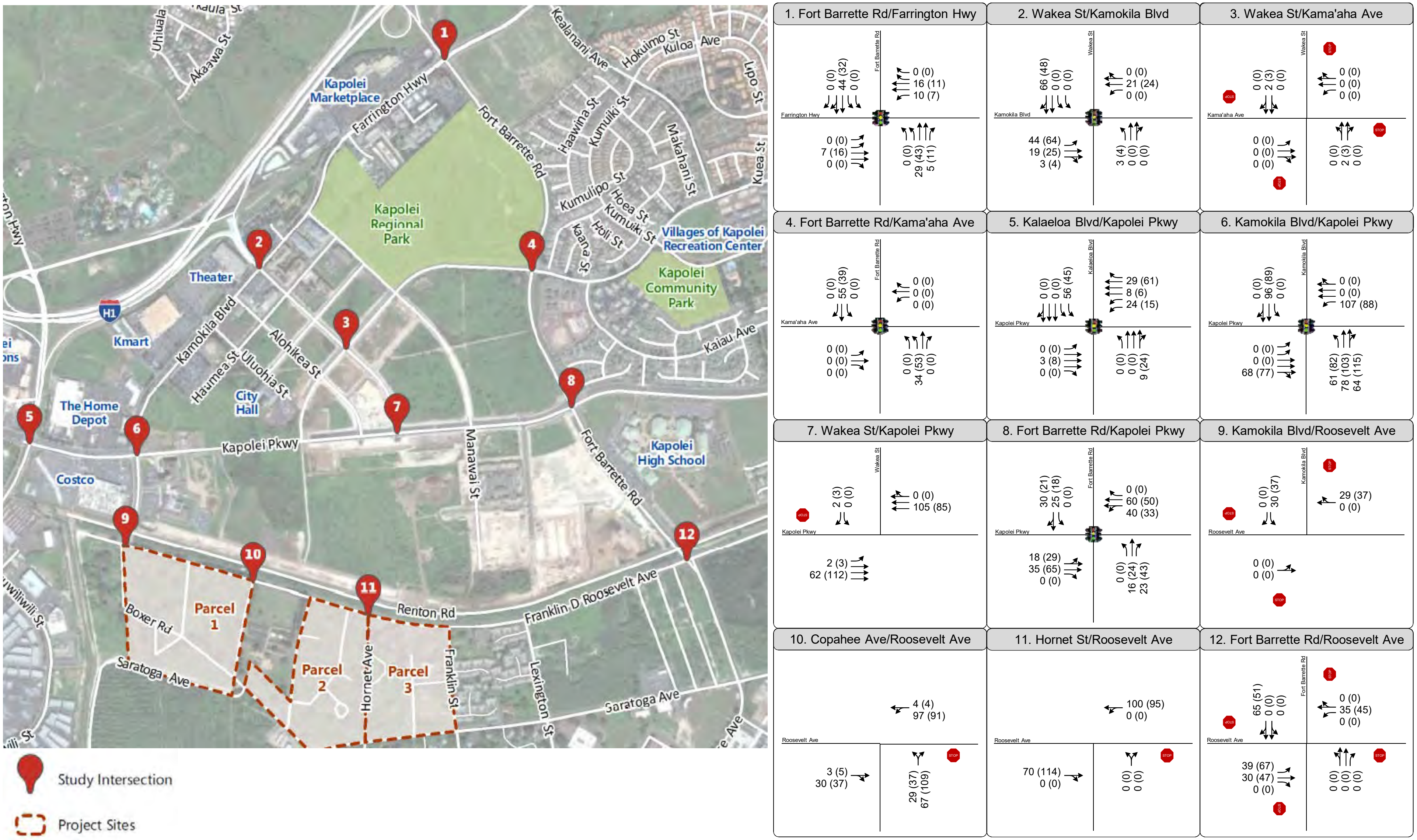



Figure 15
Peak Hour Traffic Volumes and Lane Configurations
Mixed-Use Development - Parcel 1 Trip Assignment

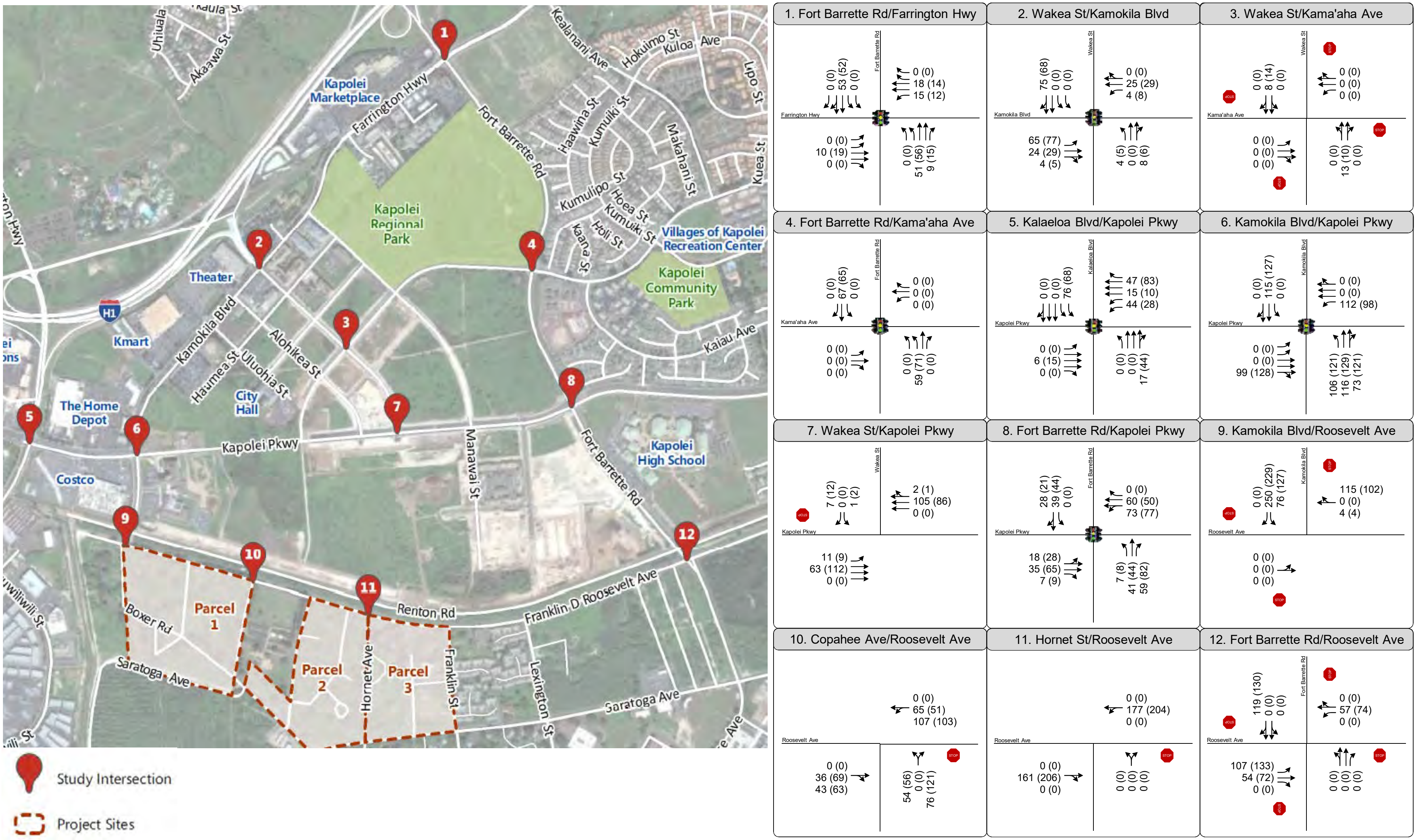



Figure 16
Peak Hour Traffic Volumes and Lane Configurations
Mixed-Use Development - Parcels 1 & 2 Trip Assignment

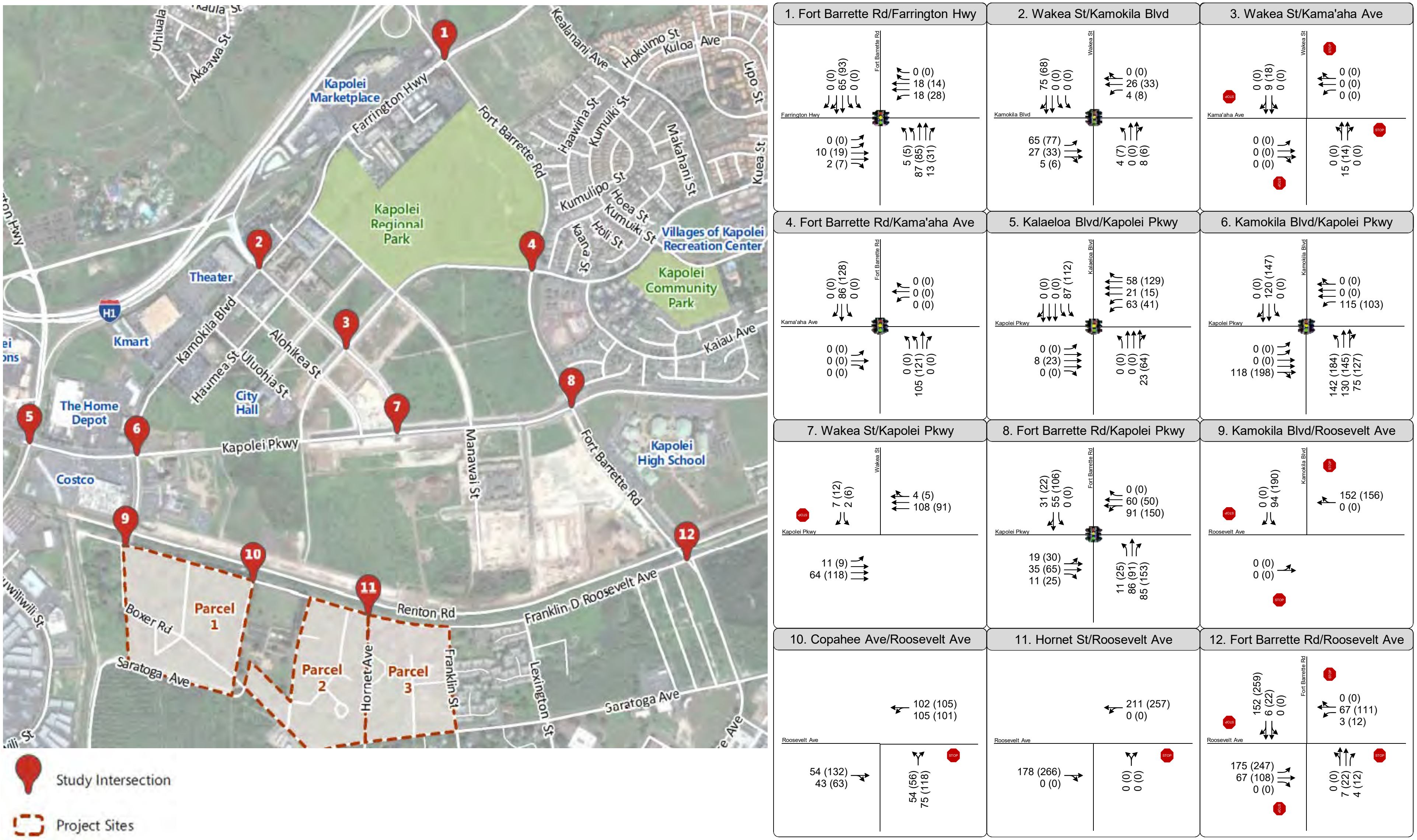



Figure 17
Peak Hour Traffic Volumes and Lane Configurations
Mixed-Use Development - Parcels 1, 2, & 3 Trip Assignment


**Source: Belt Collins**

Figure 18

Project Development Plan and New Roadway Alignments

# 6.0 NEAR TERM (2020) PLUS PROJECT CONDITIONS

This chapter summarizes and presents an analysis of the potential impacts on the roadway system due to projected increases in traffic, including traffic generated by the project in 2020. The Near Term (2020) Plus Project Conditions roadway network is the same network assumed under the baseline scenario, except for the addition of the site driveways that is discussed in Chapter 5. The analysis compares the projected levels of service at each study intersection under future baseline (or "No Project") conditions against the three "Plus Project" scenarios (i.e., Parcel 1, Parcels 1 and 2, and Parcels 1, 2, and 3) to determine potential Near Term impacts.

## 6.1 NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVEL OF SERVICE

This section presents an analysis of potential future traffic conditions projected for Near Term (2020) Plus Project Conditions. To forecast the peak hour operating conditions at each study intersection, the project trip assignment for Parcel 1, Parcels 1 and 2, and Parcels 1, 2, and 3 conditions were superimposed on Near Term (2020) Baseline traffic volumes to yield Near Term (2020) Plus Project for the two project alternatives. **Figures 19, 20, and 21** presents the anticipated lane configurations and projected Near Term (2020) Plus Project AM and PM peak hour volumes for each parcel scenario under the 1,500 Residential Units alternative. **Figures 22, 23, and 24** presents the anticipated lane configurations and projected Near Term (2020) Plus Project AM and PM peak hour volumes for each parcel scenario, under the Mixed-Use Development alternative. The results for each development alternative are presented below.

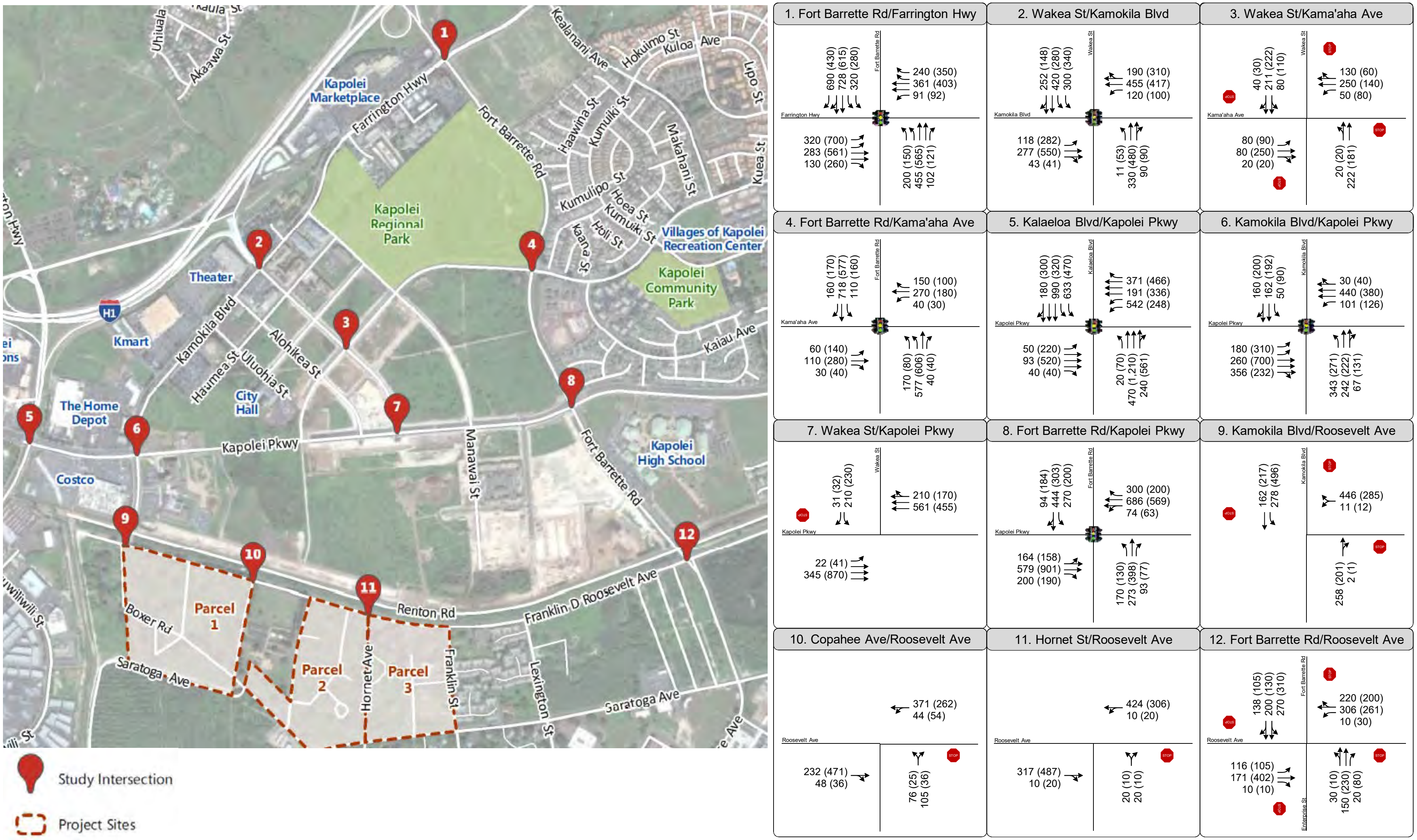



Figure 19
Peak Hour Traffic Volumes and Lane Configurations
1,500 Residential Unit - Near Term (2020) Plus Parcel 1 Conditions

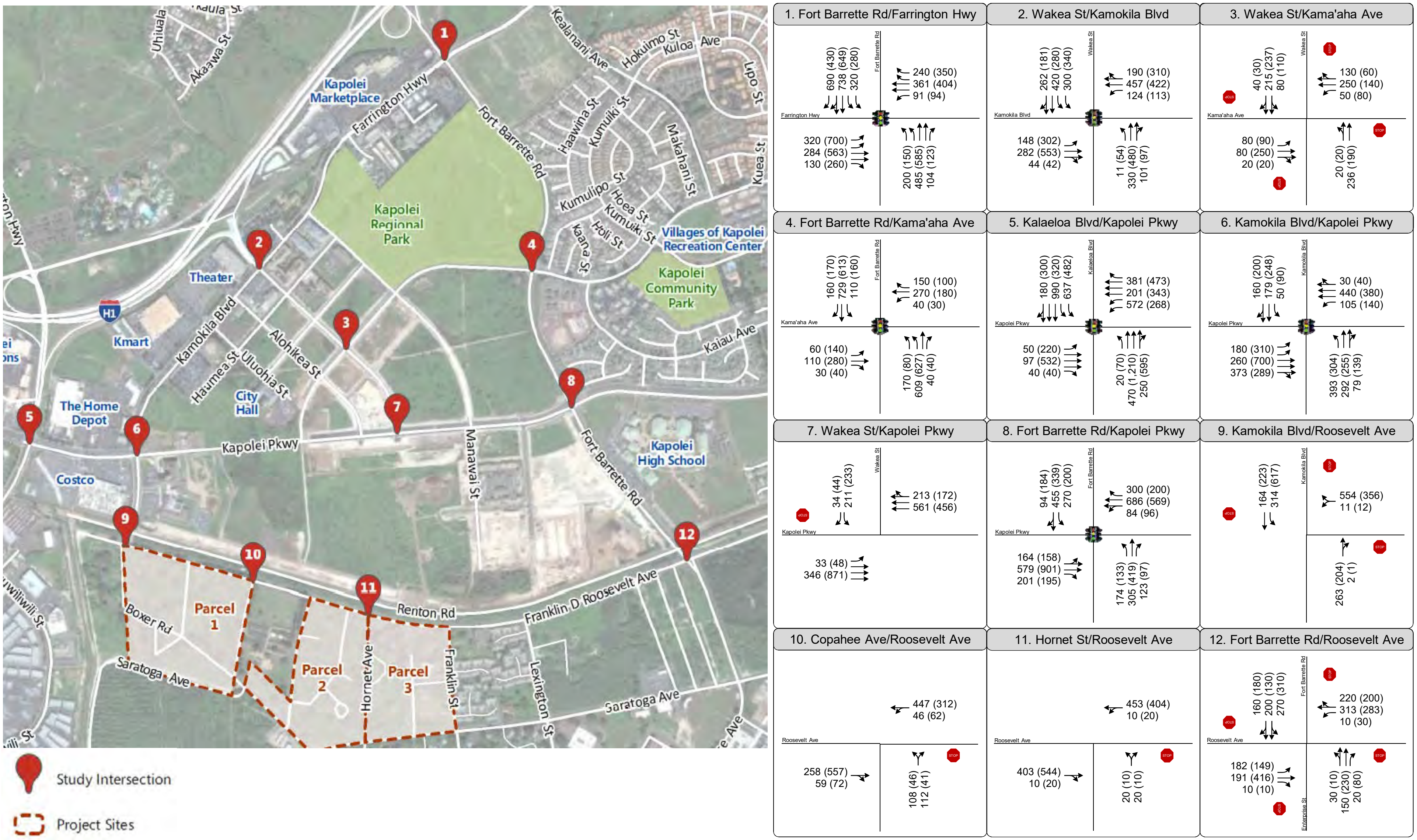



Figure 20
Peak Hour Traffic Volumes and Lane Configurations
1,500 Residential Unit - Near Term (2020) Plus Parcels 1 & 2 Conditions

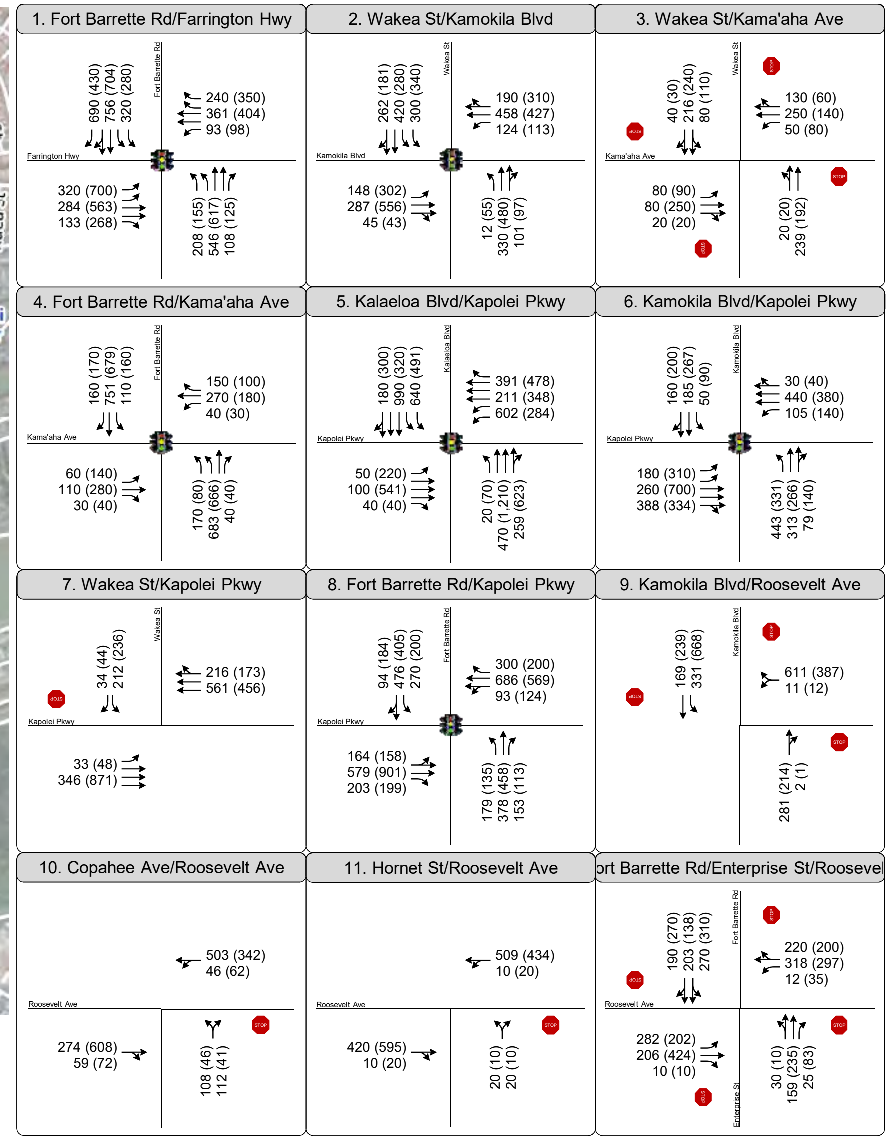




Figure 21
Peak Hour Traffic Volumes and Lane Configurations
1,500 Residential Unit - Near Term (2020) Plus Parcels 1, 2, & 3 Conditions

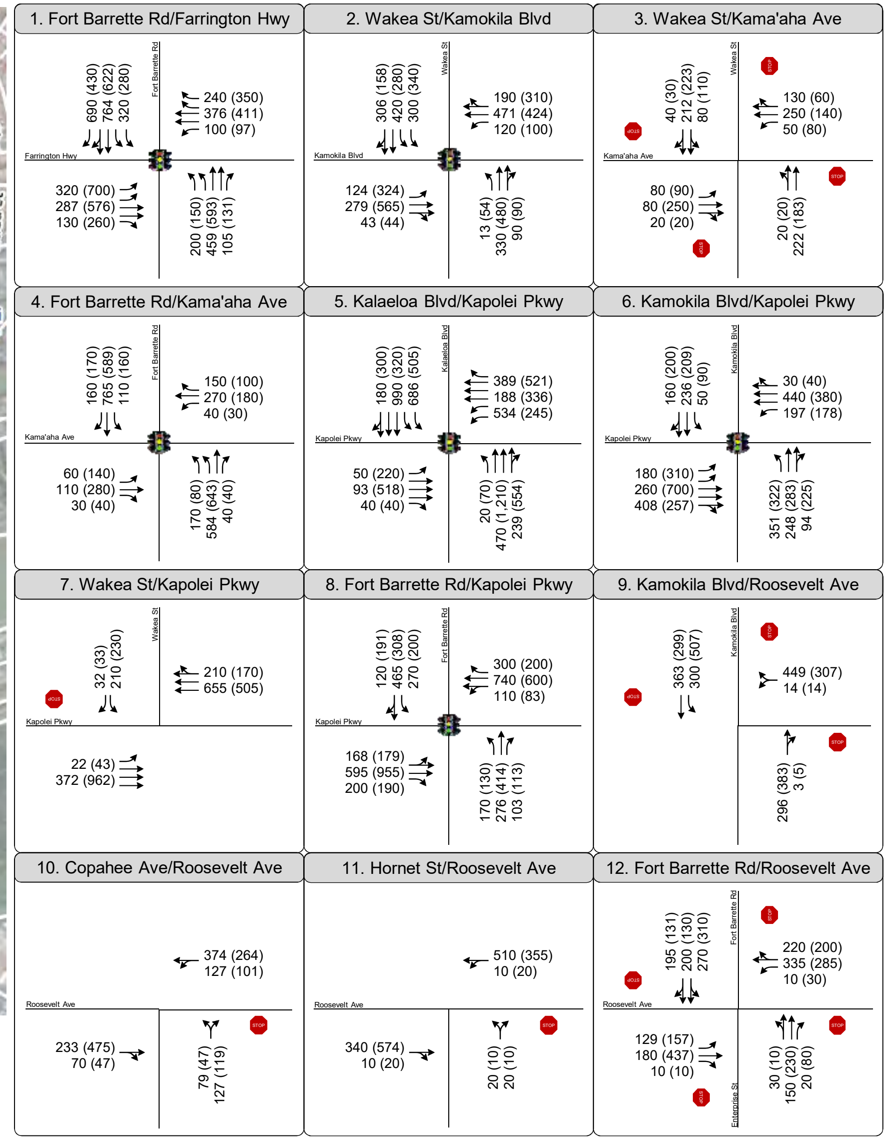




Figure 22
Peak Hour Traffic Volumes and Lane Configurations
Mixed-Use Development - Near Term (2020) Plus Parcel 1 Conditions

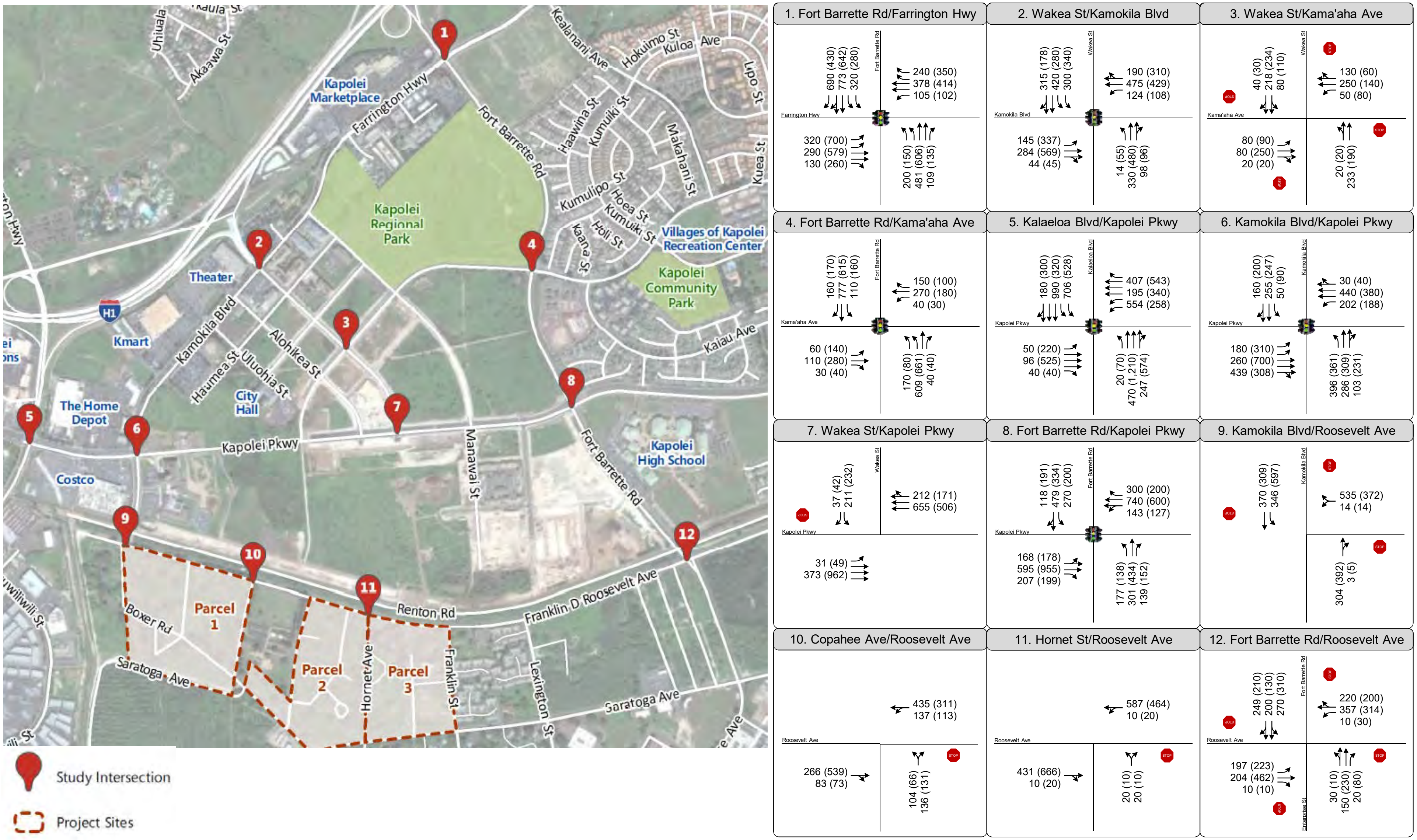



Figure 23
Peak Hour Traffic Volumes and Lane Configurations
Mixed-Use Development - Near Term (2020) Plus Parcels 1 & 2 Conditions

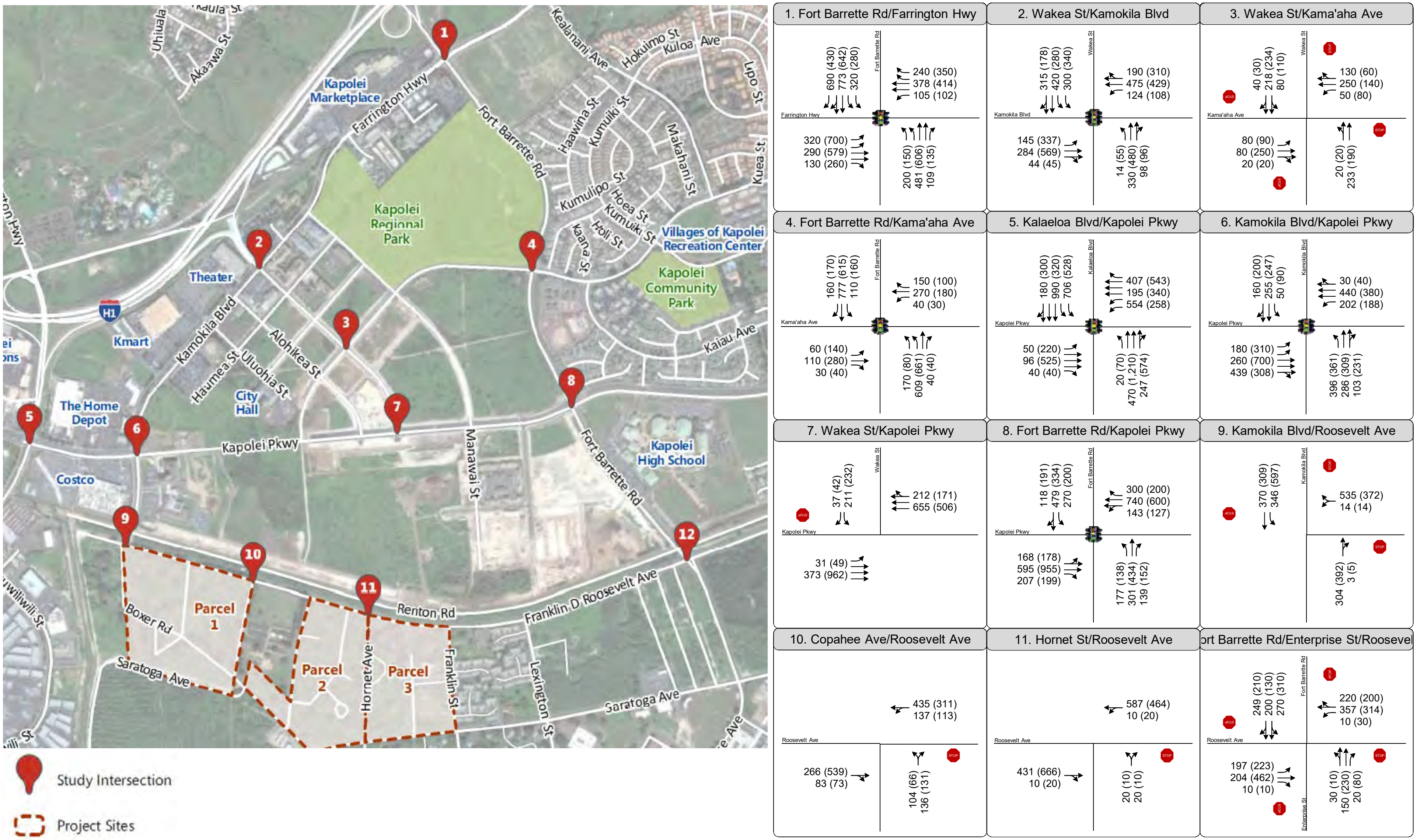



Figure 24
Peak Hour Traffic Volumes and Lane Configurations
Mixed-Use Development - Near Term (2020) Plus Parcels 1, 2, & 3 Conditions

### 6.1.1 1,500 RESIDENTIAL UNIT RESULTS

**Table 8** presents the intersection operating conditions and traffic impacts under the three Near Term (2020) Plus Project Conditions scenarios for the 1,500-unit Residential Development and compares the projected levels of service at each study intersection under Near Term (2020) Baseline Conditions. The corresponding LOS Calculation sheets are included in **Appendix C.**

According to the results in **Table 8,** the three Plus Project scenarios would result in the following impacts:

<u>Parcel 1 Conditions</u>

The addition of Parcel 1 project trips would cause a total of four (4) significant impacts to study intersections. Under this scenario, the Parcel 1 project would contribute to cumulative impacts (exacerbating baseline LOS E or F operations) during one or both peak hours at the following four (4) study intersections:

5. Kapolei Parkway / Kalaeloa Boulevard (LOS F – PM peak hour)
7. Kapolei Parkway / Wakea Street (LOS E – AM peak hour, LOS F – PM peak hour)
8. Fort Barrette Road / Kapolei Parkway (LOS F – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)

<u>Parcels 1 and 2 Conditions</u>

The addition of Parcels 1 and 2 project trips would cause a total of six (6) significant impacts to study intersections. Under this scenario, the Parcels 1 and 2 project would contribute to cumulative impacts (exacerbating baseline LOS E or F operations) during one of both peak hours at the following four (4) study intersections:

5. Kapolei Parkway / Kalaeloa Boulevard (LOS F – PM peak hour)
7. Kapolei Parkway / Wakea Street (LOS F – AM and PM peak hours)
8. Fort Barrette Road / Kapolei Parkway (LOS F – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)

**TABLE 8: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE – 1,500 RESIDENTIAL UNITS**

| Intersection | Traffic Control[1] | Peak Hour | Near Term Baseline | | Near Term Plus Parcel 1 | | | Near Term Plus Parcels 1 & 2 | | | Near Term Plus Parcels 1, 2, & 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Delay (sec/veh)[2] | LOS[3,4] | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line |
| 1. Farrington Hwy / Fort Barrette Rd | Signal | AM | 29.0 | C | 29.1 | C | 0.1 | 29.2 | C | 0.2 | 29.6 | C | 0.6 |
| | | PM | 35.8 | D | 36.5 | D | 0.7 | 37.3 | D | 1.5 | 38.6 | D | 2.8 |
| 2. Kamokila Blvd / Wakea St | Signal | AM | 26.2 | C | 28.5 | C | 2.3 | 30.5 | C | 4.3 | 30.6 | C | 4.4 |
| | | PM | 36.7 | D | 38.7 | D | 2.0 | 40.7 | D | 4.0 | 40.9 | D | 4.2 |
| 3 Wakea St / Kama'aha Ave | AWSC | AM | 19.1 | C | 19.2 | C | 0.1 | 19.8 | C | 0.7 | 19.9 | C | 0.8 |
| | | PM | 16.6 | C | 16.7 | C | 0.1 | 17.2 | C | 0.6 | 17.3 | C | 0.7 |
| 4. Fort Barrette Rd / Kama'aha Ave | Signal | AM | 37.0 | D | 38.4 | D | 1.4 | 40.6 | D | 3.6 | 47.3 | D | 10.3 |
| | | PM | 37.2 | D | 38.7 | D | 1.5 | 40.8 | D | 3.6 | 45.0 | D | 7.8 |
| 5. Kapolei Pkwy / Kalaeloa Blvd | Signal | AM | 26.3 | C | 27.1 | C | 0.8 | 28.0 | C | 1.7 | 28.8 | C | 2.5 |
| | | PM | **91.0** | **F** | ***91.8*** | ***F*** | 0.8 | ***92.9*** | ***F*** | 1.9 | ***93.7*** | ***F*** | 2.7 |
| 6. Kapolei Pkwy / Kamokila Blvd | Signal | AM | 27.6 | C | 40.3 | D | 12.7 | ***56.9*** | ***E*** | 29.3 | ***76.4*** | ***E*** | 48.8 |
| | | PM | 26.1 | C | 32.9 | C | 6.8 | 39.7 | D | 13.6 | 43.2 | D | 17.1 |
| 7. Kapolei Pkwy / Wakea St | SSSC | AM | **41.5** | **E** | ***46.8*** | ***E*** | 5.3 | ***55.7*** | ***F*** | 14.2 | ***56.3*** | ***F*** | 14.8 |
| | | PM | **44.1** | **E** | ***52.0*** | ***F*** | 7.9 | ***58.9*** | ***F*** | 14.8 | ***60.7*** | ***F*** | 16.6 |
| 8. Fort Barrette Rd / Kapolei Pkwy | Signal | AM | **140.4** | **F** | ***168.4*** | ***F*** | 28.0 | ***169.9*** | ***F*** | 29.5 | ***171.8*** | ***F*** | 31.4 |
| | | PM | **185.5** | **F** | ***191.5*** | ***F*** | 6.0 | ***192.1*** | ***F*** | 6.6 | ***192.0*** | ***F*** | 6.5 |

**TABLE 8: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE – 1,500 RESIDENTIAL UNITS**

| Intersection | Traffic Control[1] | Peak Hour | Near Term Baseline | | Near Term Plus Parcel 1 | | | Near Term Plus Parcels 1 & 2 | | | Near Term Plus Parcels 1, 2, & 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Delay (sec/veh)[2] | LOS[3,4] | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line |
| 9. Roosevelt Ave / Kamokila Blvd | AWSC | AM | 16.3 | C | 23.2 | C | 6.9 | ***47.9*** | ***E*** | 31.6 | ***72.9*** | ***F*** | 56.6 |
| | | PM | 23.9 | C | 26.5 | D | 2.6 | ***66.3*** | ***F*** | 42.4 | ***90.6*** | ***F*** | 66.7 |
| 10. Roosevelt Ave / Copahee Ave | SSSC | AM | 16.5 | C | 17.7 | C | 1.2 | 27.4 | D | 10.9 | 32.9 | D | 16.4 |
| | | PM | 14.1 | B | 16.3 | C | 2.2 | 24.3 | C | 10.2 | 27.9 | D | 13.8 |
| 11. Roosevelt Ave / Hornet St | SSSC | AM | 13.7 | B | 14.6 | B | 0.9 | 16.6 | C | 2.9 | 17.8 | C | 4.1 |
| | | PM | 14.1 | B | 16.1 | C | 2.0 | 16.9 | C | 2.8 | 18.3 | C | 4.2 |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AWSC | AM | **95.2** | **F** | ***100.0*** | ***F*** | 4.8 | ***112.5*** | ***F*** | 17.3 | ***135.3*** | ***F*** | 40.1 |
| | | PM | **91.4** | **F** | ***102.5*** | ***F*** | 11.1 | ***117.5*** | ***F*** | 26.1 | ***136.3*** | ***F*** | 44.9 |

*Source: Fehr & Peers, 2017*

Notes:

[1] Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized and all-way stop-controlled intersections. The vehicular delay for the worst movement is reported for side-street stop-controlled intersections.

[2] LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. Other uncontrolled movements generally operate well with limited delay.

[3&4] Undesired LOS and corresponding seconds of delay per vehicle are highlighted in **bold.** ***LOS*** represent project impact.

Additionally, project-specific impacts were identified at two (2) study intersections where the addition of Parcel 1 and 2-generated traffic would cause their overall intersection operations to degrade below LOS D in the peak hours for the 1,500-unit Residential Development. The project-specific impacts are:

6. Kapolei Parkway / Kamokila Boulevard (LOS E – AM peak hour)

    - The high vehicular delay at this intersection is primarily attributed to the one mauka-bound left-turn lane, which increases considerably with the Parcels 1 and 2 project (i.e. 103 project trips in the AM peak hour). This signalized intersection serves a mauka-bound left-turn volume of 393 vehicles in the AM peak hour. The high vehicle delay is caused by a combination of the high turning volume in one travel lane and a short allocation of green-time in the signal timing for the mauka-bound left-turn movement.

9. Roosevelt Avenue / Kamokila Boulevard (LOS E – AM peak hour, LOS F - PM peak hour)

    - This unsignalized all-way stop controlled intersection serves all project traffic traveling to and from the ewa-side of Kapolei. This intersection serves 554 ewa-bound right-turn vehicles in the AM peak hour and 617 makai-bound left-turn vehicles in the PM peak hour. The high turning volumes and intersection traffic control results in high vehicular delay from constant stop and go traffic at the intersection.

<u>Parcels 1, 2, and 3 Conditions</u>

The addition of Parcels 1, 2, and 3 project trips would cause a total of six (6) significant impacts to study intersections for the 1,500-unit Residential Development. Under this scenario, the Parcels 1, 2, and 3 project would contribute to cumulative impacts (exacerbating baseline LOS E or F operations) during one of both peak hours at four (4) study intersections:

5. Kapolei Parkway / Kalaeloa Boulevard (LOS F – PM peak hour)
7. Kapolei Parkway / Wakea Street (LOS F – AM and PM peak hours)
8. Fort Barrette Road / Kapolei Parkway (LOS F – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)

Additionally, project-specific impacts were identified at two (2) study intersections where the addition of project-generated traffic would cause their overall intersection operations to degrade below LOS D in the peak hours for the 1,500-unit Residential Development. The project-specific impacts are:

6. Kapolei Parkway / Kamokila Boulevard (LOS E – AM PM peak hour)

- The high vehicular delay at this intersection is primarily attributed to the one mauka-bound left-turn lane, which increases considerably with the Parcels 1, 2, and 3 project (i.e. 153 project trips in the AM peak hour. This signalized intersection serves a mauka-bound left-turn volume of 443 vehicles in the AM peak hour. The high vehicle delay is caused by a combination of the high turning volume in one travel lane and a short allocation of green-time in the signal timing for the mauka-bound left-turn movement.

9. Roosevelt Avenue / Kamokila Boulevard (LOS F – AM and PM peak hours)

- This unsignalized all-way stop controlled intersection serves all project traffic traveling to and from the ewa-side of Kapolei. This intersection serves 611 ewa-bound right-turn vehicles in the AM peak hour and 668 makai-bound left-turn vehicles in the PM peak hour. The high turning volumes and intersection traffic control results in high vehicular delay from constant stop and go traffic at the intersection.

### 6.1.2 MIXED-USE RESULTS

**Table 9** presents the intersection operating conditions and traffic impacts under the three Near Term (2020) Plus Project Conditions scenarios for the Mixed-Use Development and compares the projected levels of service at each study intersection under Near Term (2020) Baseline Conditions. The corresponding LOS Calculation sheets are included in **Appendix C.**

According to the results in **Table 9,** the three Plus Project scenarios would result in the following impacts:

<u>Parcel 1 Conditions</u>

The addition of Parcel 1 project trips would cause a total of five (5) significant impacts to study intersections. Under this scenario, the Parcel 1 project would contribute to cumulative impacts (exacerbating baseline LOS E or F operations) during one or both peak hours at the following five (5) study intersections:

5. Kapolei Parkway / Kalaeloa Boulevard (LOS F – PM peak hour)
7. Kapolei Parkway / Wakea Street (LOS F – AM and PM peak hours)
8. Fort Barrette Road / Kapolei Parkway (LOS F – AM and PM peak hours)
9. Roosevelt Avenue / Kamokila Boulevard (LOS E – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)

**TABLE 9: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE – MIXED-USE DEVELOPMENT**

| Intersection | Traffic Control[1] | Peak Hour | Near Term Baseline | | Near Term Plus Parcel 1 | | | Near Term Plus Parcels 1 & 2 | | | Near Term Plus Parcels 1, 2, & 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Delay (sec/veh)[2] | LOS[3,4] | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line |
| 1. Farrington Hwy / Fort Barrette Rd | Signal | AM | 29.0 | C | 29.8 | C | 0.8 | 30.0 | C | 1 | 30.3 | C | 1.3 |
| 1. Farrington Hwy / Fort Barrette Rd | Signal | PM | 35.8 | D | 37.5 | D | 1.7 | 38.1 | D | 2.3 | 39.4 | D | 3.6 |
| 2. Kamokila Blvd / Wakea St | Signal | AM | 26.2 | C | 29.5 | C | 3.3 | 31.1 | C | 4.9 | 31.1 | C | 4.9 |
| 2. Kamokila Blvd / Wakea St | Signal | PM | 36.7 | D | 41.7 | D | 5.0 | 43.1 | D | 6.4 | 43.3 | D | 6.6 |
| 3 Wakea St / Kama'aha Ave | AWSC | AM | 19.1 | C | 19.2 | C | 0.1 | 19.8 | C | 0.7 | 19.9 | C | 0.8 |
| 3 Wakea St / Kama'aha Ave | AWSC | PM | 16.6 | C | 16.7 | C | 0.1 | 17.2 | C | 0.6 | 17.3 | C | 0.7 |
| 4. Fort Barrette Rd / Kama'aha Ave | Signal | AM | 37.0 | D | 45.2 | D | 8.2 | 47.8 | D | 10.8 | 53.1 | D | 16.1 |
| 4. Fort Barrette Rd / Kama'aha Ave | Signal | PM | 37.2 | D | 41.9 | D | 4.7 | 43.8 | D | 6.6 | 49.3 | D | 12.1 |
| 5. Kapolei Pkwy / Kalaeloa Blvd | Signal | AM | 26.3 | C | 27.6 | C | 1.3 | 28.3 | C | 2.0 | 29.0 | C | 2.7 |
| 5. Kapolei Pkwy / Kalaeloa Blvd | Signal | PM | **91.0** | **F** | ***93.8*** | ***F*** | 2.8 | ***95.8*** | ***F*** | 4.8 | ***100.2*** | ***F*** | 9.2 |
| 6. Kapolei Pkwy / Kamokila Blvd | Signal | AM | 27.6 | C | 53.9 | D | 26.3 | ***73.3*** | ***E*** | 45.7 | ***90.9*** | ***F*** | 63.3 |
| 6. Kapolei Pkwy / Kamokila Blvd | Signal | PM | 26.1 | C | 42.5 | D | 16.4 | 49.8 | D | 23.7 | ***58.7*** | ***E*** | 32.6 |
| 7. Kapolei Pkwy / Wakea St | SSSC | AM | **41.5** | **E** | ***73.3*** | ***F*** | 31.8 | ***87.6*** | ***F*** | 46.1 | ***89.8*** | ***F*** | 48.3 |
| 7. Kapolei Pkwy / Wakea St | SSSC | PM | **44.1** | **E** | ***74.2*** | ***F*** | 30.1 | ***83.4*** | ***F*** | 39.3 | ***90.5*** | ***F*** | 46.4 |
| 8. Fort Barrette Rd / Kapolei Pkwy | Signal | AM | **140.4** | **F** | ***186.5*** | ***F*** | 46.1 | ***189.7*** | ***F*** | 49.3 | ***192.9*** | ***F*** | 52.5 |
| 8. Fort Barrette Rd / Kapolei Pkwy | Signal | PM | **185.5** | **F** | ***214.5*** | ***F*** | 29.0 | ***218.9*** | ***F*** | 33.4 | ***230.4*** | ***F*** | 44.9 |

**TABLE 9: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE – MIXED-USE DEVELOPMENT**

| Intersection | Traffic Control[1] | Peak Hour | Near Term Baseline | | Near Term Plus Parcel 1 | | | Near Term Plus Parcels 1 & 2 | | | Near Term Plus Parcels 1, 2, & 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Delay (sec/veh)[2] | LOS[3,4] | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line | Delay (sec/veh)[2] | LOS[3,4] | Δ from Base-line |
| 9. Roosevelt Ave / Kamokila Blvd | AWSC | AM | 16.3 | C | ***35.8*** | ***E*** | 19.5 | ***58.2*** | ***F*** | 41.9 | ***73.9*** | ***F*** | 57.6 |
| | | PM | 23.9 | C | ***36.7*** | ***E*** | 12.8 | ***70.5*** | ***F*** | 46.6 | ***106.3*** | ***F*** | 82.4 |
| 10. Roosevelt Ave / Copahee Ave | SSSC | AM | 16.5 | C | 33.2 | D | 16.7 | ***61.0*** | ***F*** | 44.5 | ***76.7*** | ***F*** | 60.2 |
| | | PM | 14.1 | B | 22.8 | C | 8.7 | ***57.8*** | ***F*** | 43.7 | ***61.8*** | ***F*** | 47.7 |
| 11. Roosevelt Ave / Hornet St | SSSC | AM | 13.7 | B | 16.1 | C | 2.4 | 19.5 | C | 5.8 | 20.7 | C | 7.0 |
| | | PM | 14.1 | B | 16.8 | C | 2.7 | 20.5 | C | 6.4 | 23.0 | C | 8.9 |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AWSC | AM | **95.2** | **F** | ***119.9*** | ***F*** | 24.7 | ***144.0*** | ***F*** | 48.8 | ***171.4*** | ***F*** | 76.2 |
| | | PM | **91.4** | **F** | ***122.2*** | ***F*** | 30.8 | ***146.3*** | ***F*** | 54.9 | ***207.5*** | ***F*** | 116.1 |

*Source: Fehr & Peers, 2017*

Notes:

[1] Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized and all-way stop-controlled intersections. The vehicular delay for the worst movement is reported for side-street stop-controlled intersections.

[2] LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. Other uncontrolled movements generally operate well with limited delay.

[3&4] Undesired LOS and corresponding seconds of delay per vehicle are highlighted in **bold.** ***LOS*** represent project impact.

<u>Parcels 1 and 2 Conditions</u>

The addition of Parcels 1 and 2 project trips would cause a total of seven (7) significant impacts to study intersections. Under this scenario, the Parcels 1 and 2 project would contribute to cumulative impacts (exacerbating baseline LOS E or F operations) during one of both peak hours at the following four (4) study intersections:

5. Kapolei Parkway / Kalaeloa Boulevard (LOS F – PM peak hour)
7. Kapolei Parkway / Wakea Street (LOS F – AM and PM peak hours)
8. Fort Barrette Road / Kapolei Parkway (LOS F – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)

Additionally, project-specific impacts were identified at three (3) study intersections where the addition of Parcel 1 and 2-generated traffic would cause their overall intersection operations to degrade below LOS D in the peak hours for the Mixed-Use Development. The project-specific impacts are:

6. Kapolei Parkway / Kamokila Boulevard (LOS E – AM peak hour)

- The high vehicular delay at this intersection is primarily attributed to the one mauka-bound left-turn lane, which increases considerably with the Parcels 1 and 2 project (i.e. 106 project trips in the AM peak hour). This signalized intersection serves a mauka-bound left-turn volume of 396 vehicles in the AM peak hour. The high vehicle delay is caused by a combination of the high turning volume in one travel lane and a short allocation of green-time in the signal timing for the mauka-bound left-turn movement.

9. Roosevelt Avenue / Kamokila Boulevard (LOS F – AM and PM peak hours)

- This unsignalized all-way stop controlled intersection serves all project traffic traveling to and from the ewa-side of Kapolei. This intersection serves 535 ewa-bound right-turn vehicles in the AM peak hour and 597 makai-bound left-turn vehicles in the PM peak hour. The high turning volumes and intersection traffic control results in high vehicular delay from constant stop and go traffic at the intersection.

10. Roosevelt Avenue / Copahee Avenue (LOS F – AM and PM peak hours)

- This unsignalized two-way stop controlled intersection is one of the project driveway that serves Parcels 1 and 2 project trips. The increased traffic on Copahee Avenue and

Roosevelt Avenue results in higher delay on the side-street (Copahee Avenue) caused by limited gaps in through traffic on Roosevelt Avenue.

Parcels 1, 2, and 3 Conditions

The addition of Parcels 1, 2, and 3 project trips would cause a total of seven (7) significant impacts to study intersections for the Mixed-Use Development. Under this scenario, the Parcels 1, 2, and 3 project would contribute to cumulative impacts (exacerbating baseline LOS E or F operations) during one of both peak hours at four (4) study intersections:

5. Kapolei Parkway / Kalaeloa Boulevard (LOS F – PM peak hour)
7. Kapolei Parkway / Wakea Street (LOS F – AM and PM peak hours)
8. Fort Barrette Road / Kapolei Parkway (LOS F – AM and PM peak hours)
12. Fort Barrette Road-Enterprise Street / Roosevelt Avenue (LOS F – AM and PM peak hours)

Additionally, project-specific impacts were identified at three (3) study intersections where the addition of Parcels 1, 2, and 3-generated traffic would cause their overall intersection operations to degrade below LOS D in the peak hours for the Mixed-Use Development. The project-specific impacts are:

6. Kapolei Parkway / Kamokila Boulevard (LOS F – AM peak hour, LOS E – PM peak hour)

   - The high vehicular delay at this intersection is primarily attributed to the one mauka-bound left-turn lane, which increases considerably with the Parcels 1, 2, and 3 project (i.e. 142 project trips in the AM peak hour and 184 project trips in the PM peak hour). This signalized intersection serves a mauka-bound left-turn volume of 396 vehicles in the AM peak hour and 361 vehicles in the PM peak hour. The high vehicle delay is caused by a combination of the high turning volume in one travel lane and a short allocation of green-time in the signal timing for the mauka-bound left-turn movement.

9. Roosevelt Avenue / Kamokila Boulevard (LOS F – AM and PM peak hours)

   - This unsignalized all-way stop controlled intersection serves all project traffic traveling to and from the ewa-side of Kapolei. This intersection serves 535 ewa-bound right-turn vehicles in the AM peak hour and 597 makai-bound left-turn vehicles in the PM peak hour. The high turning volumes and intersection traffic control results in high vehicular delay from constant stop and go traffic at the intersection.

10. Roosevelt Avenue / Copahee Avenue (LOS F – AM and PM peak hours)

- This unsignalized two-way stop controlled intersection is one of the project driveway that serves Parcels 1, 2, and 3 project trips. The increased traffic on Copahee Avenue and Roosevelt Avenue results in higher delay on the side-street (Copahee Avenue) caused by limited gaps in through traffic on Roosevelt Avenue.

In addition to evaluating overall intersection operations, DPP and HDOT typically requires that a review be conducted of the individual turning movements at each intersection to determine whether any movements are operating below LOS D. The majority of the poorly operating movements are left-turns. This is attributed to the signal timing allocating more green time to the through movements, which in most cases has caused the left-turn movements to operate at LOS E or F in at least one of the peak hours. For left-turns operating poorly at unsignalized intersections, this is primarily due to the high traffic volume on the major streets (e.g. Kapolei Parkway) and limited number of gaps for vehicles at the stop-controlled movement to make left-turns.

## 6.2 POTENTIAL TRAFFIC IMPROVEMENTS

Potential traffic improvements were developed to increase the capacity and/or efficiency of the roadway system at the locations where the addition of project-related traffic would cause or contribute to poor operating conditions. The emphasis was to identify physical and/or operational improvements that could be implemented within the existing or planned roadway rights-of-way.

The potential measures to address the identified traffic impacts are described in this chapter. Each of the initially identified impacts would be reduced such that future operations would be at the minimum desired LOS (LOS D) for the overall intersection with the project in place, or better than the Near Term (2020) Baseline Conditions if LOS D cannot be obtained with significant Right-of-Way (ROW) impacts to the roadway. Although TRB and HDOT strive to maintain LOS D or better conditions at the movement level, measures to improve turning movement operations are only proposed where feasible and appropriate from a traffic engineering perspective since adding lanes or signal control just to achieve the desired LOS for a particular movement also has secondary negative impacts to the environment and to active transportation modes.

The full range of improvements that address both project-related and/or cumulative traffic impacts are discussed in detail below.

### INTERSECTION 5: KAPOLEI PARKWAY / KALAELOA BOULEVARD (CUMULATIVE IMPACT)

*Significantly impacted with any development on Parcels 1, 2, or 3*

This intersection operates at LOS F in the PM peak hour under Existing and Near Term (2020) Baseline Conditions. The addition of project trips (Parcel 1, Parcels 1 and 2, and Parcels 1, 2, and 3) would exacerbate LOS F operations under all six project scenarios (i.e. Residential Parcel 1, Residential Parcels 1 and 2,Residential Parcels 1, 2, and 3, Mixed-Use Parcel 1, Mixed-Use Parcels 1 and 2, and Mixed-Use Parcels 1, 2, and 3).

<u>Recommended Improvement:</u> Construct a second Diamond Head bound left-turn lane on Kapolei Parkway and optimize signal cycle length and splits.

The existing roadway width on Kapolei Parkway is sufficient to add a second Diamond Head bound left-turn lane. This would be achieved by removing the existing landscaped median on the ewa and repaving a new left turn lane. The additional capacity for the Diamond Head approach would improve operations to

LOS E in the PM peak hour under all six project scenarios, which does not meet the LOS D requirement, but is an improvement from Existing and Near Term (2020) Baseline Conditions.

**Figure 25** shows a schematic of the proposed mitigations at this intersection.

## INTERSECTION 6: KAPOLEI PARKWAY / KAMOKILA BOULEVARD (PROJECT-SPECIFIC IMPACT)

*Significantly impacted under Parcel 1 and 2 conditions and Parcel 1, 2, and 3 conditions.*

This intersection operates at LOS C in both AM and PM peak hours, under Near Term (2020) Baseline Conditions. The addition of Parcels 1 and 2project trips would degrade operations to undesirable LOS E during the AM peak hours.

Recommended improvement: Optimize signal cycle length and splits to accommodate for new demand volumes at the intersection.

Parcels 1 and 2add 274vehicle trips in the AM peak hour to the mauka-bound approach at the Kapolei Parkway/Kamokila Boulevard intersection with the 1,500-unit Residential Development and 295 vehicle trips with the Mixed-Use Development. The addition of project traffic exacerbates the poor mauka-bound left movement, and degrades the overall intersection operations to undesirable LOS E for both the Residential and Mixed-Use developments. Re-optimizing the signal is recommended to increase the cycle length and re-distribute splits to accommodate the additional vehicle demand and ameliorate vehicle delay at this intersection to LOS C in the AM PM peak hour for the Residential Development and LOS D for both AM and PM peak hours for the Mixed-Use Development.

**Figure 26** shows a schematic of the proposed mitigations at this intersection.

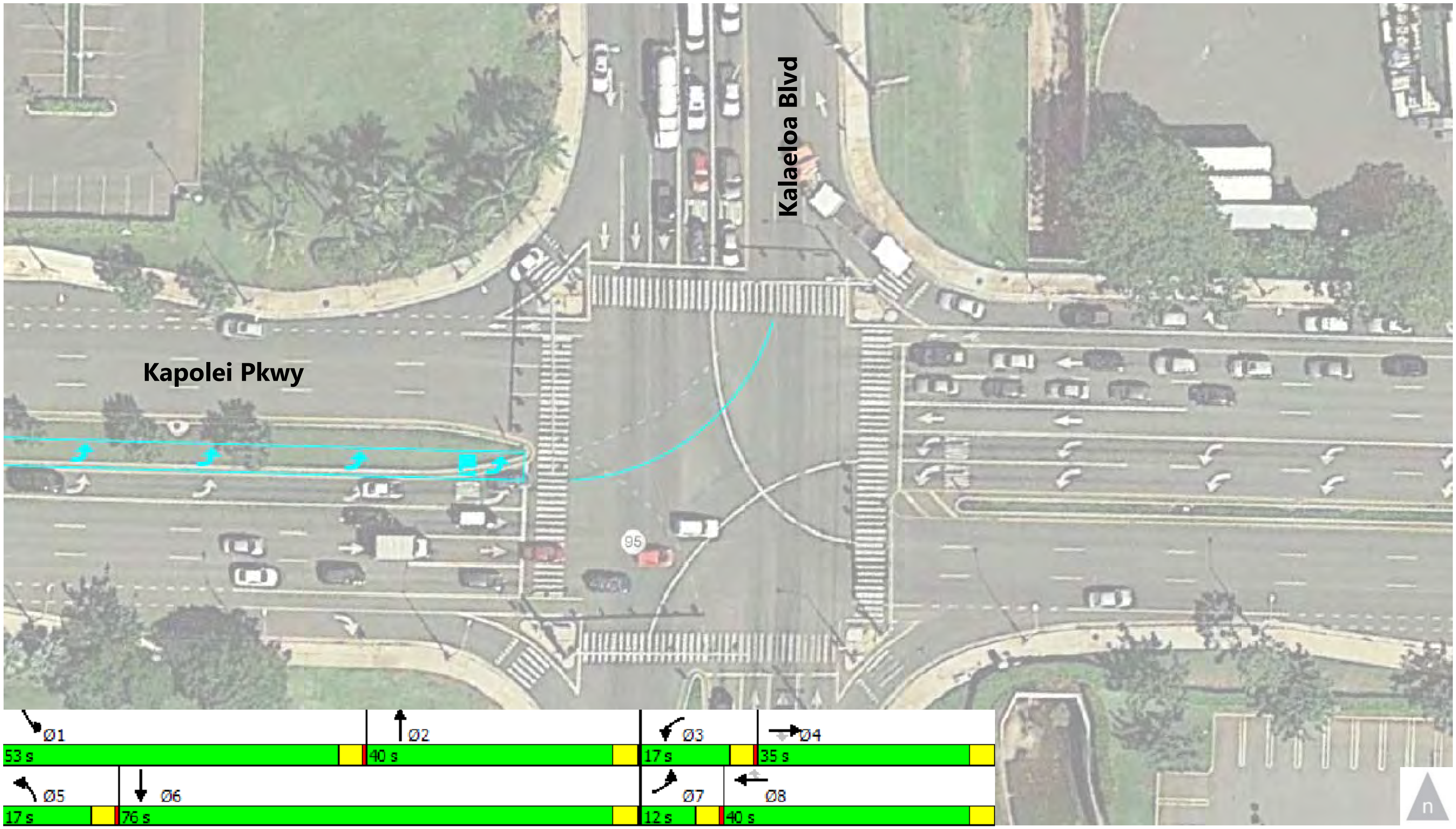
## INTERSECTION 7: KAPOLEI PARKWAY / WAKEA STREET (CUMULATIVE IMPACT)

*Significantly impacted with any development on Parcels 1, 2, or 3.*

This intersection operates at LOS E in both AM and PM peak hours, under Near Term (2020) Baseline Conditions. The addition of Residential project trips in Parcel 1 would exacerbate LOS E and F operations in the AM and PM peak hours, respectively. The addition of Parcels 1 and 2, Parcels 1, 2, and 3 for the Residential Development would exacerbate LOS F operations for both AM and PM peak hours. For the Mixed-Use Development, the addition of project trips (Parcel 1, Parcels 1 and 2, Parcels 1, 2, and 3) would exacerbate LOS F operations in both AM and PM peak hours.

## CONSTRUCT A SECOND DIAMOND HEAD-BOUND LEFT TURN LANE ON KAPOLEI PKWY AND OPTIMIZE SIGNAL TIMING AND CYCLE LENGTH

*Impacted w/ any development of Parcels 1, 2, or 3 under both the Residential and Mixed-Use project alternatives*




*Conceptual plan only – not for construction*

Figure 25

5. Kapolei Parkway/Kalaeloa Boulevard Mitigation

# CONSTRUCT A SECOND MAUKA-BOUND LEFT TURN LANE ON KAMOKILA BLVD AND OPTIMIZE SIGNAL TIMING AND CYCLE LENGTH

*Impacted w/ development of Parcels 2 or 3 under both the Residential and Mixed-Use project alternatives*

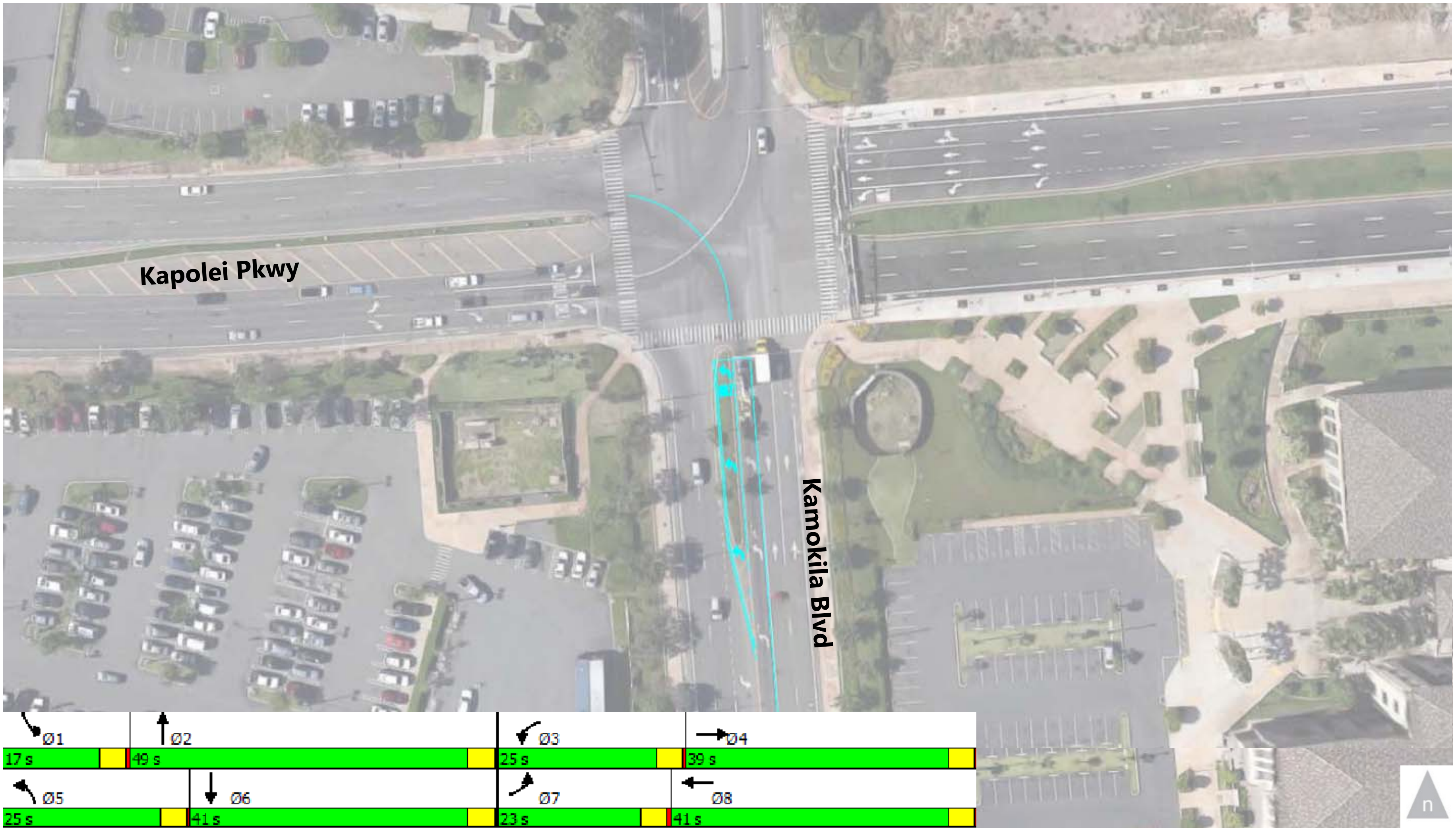



Figure 26

6. Kapolei Parkway/Kamokila Boulevard Mitigation

Recommended improvement: Install a traffic signal.

A preliminary traffic signal warrant analysis was evaluated at this intersection. The 2009 edition of the *Manual of Uniform Traffic Control Devices* (MUTCD, Federal Highway Association) identifies several warrants by which the need for a traffic signal can be evaluated. The MUTCD signal warrant 3 (Peak hour) is satisfied for the Kapolei Parkway/Wakea Street intersection in the PM peak hour under all six project scenarios. However, even when a peak-hour signal warrant is satisfied, the decision to install a signal should not be based solely upon this factor. The City & County of Honolulu Department of Transportation Services (DTS) should regularly monitor traffic conditions and accident data, and evaluate the full set of warrants to prioritize and program this intersection for signalization. Installing a traffic signal at this intersection would improve operations to LOS A in the AM and PM peak hours under all six project scenarios.

**Figure 27** shows a schematic of the proposed mitigations at this intersection.

## INTERSECTION 8: KAPOLEI PARKWAY / FORT BARRETTE ROAD (CUMULATIVE IMPACT)

*Significantly impacted with any development on Parcels 1, 2, or 3.*

This intersection operates at LOS F in both AM and PM peak hours, under Existing and Near Term (2020) Baseline Conditions. The addition of project trips (Parcel 1, Parcels 1 and 2, Parcels 1, 2, and 3) would exacerbate operations to LOS F during both the AM and PM peak hours for both the 1,500-unit Residential Development and the Mixed-Use Development.

Recommended improvement: Restripe Kapolei Parkway to provide a separate left-turn lane and second through lane on both the ewa-bound and Diamond Head-bound approaches, and modify the signal (including optimization) to provide protected left-turn phasing on Kapolei Parkway.

The existing roadway width is sufficient to add a second through lane for the ewa-bound and Diamond Head-bound approaches on Kapolei Parkway, which would increase vehicle throughput this facility and improve intersection operations. Additionally, in lieu of the existing split phasing on Kapolei Parkway, protected left-turn phasing would improve signal operations by more efficiently distributing green time amongst all approaches. This modification would improve operations to LOS E in the AM and PM peak hours under all six project scenarios, which does not meet the LOS D requirement, but is an improvement from Existing and Near Term (2020) Baseline Conditions.

**Figure 28** shows a schematic of the proposed mitigations at this intersection.

# INSTALL A TRAFFIC SIGNAL

*Impacted w/ any development of Parcels 1, 2, or 3 under both the Residential and Mixed-Use project alternatives*

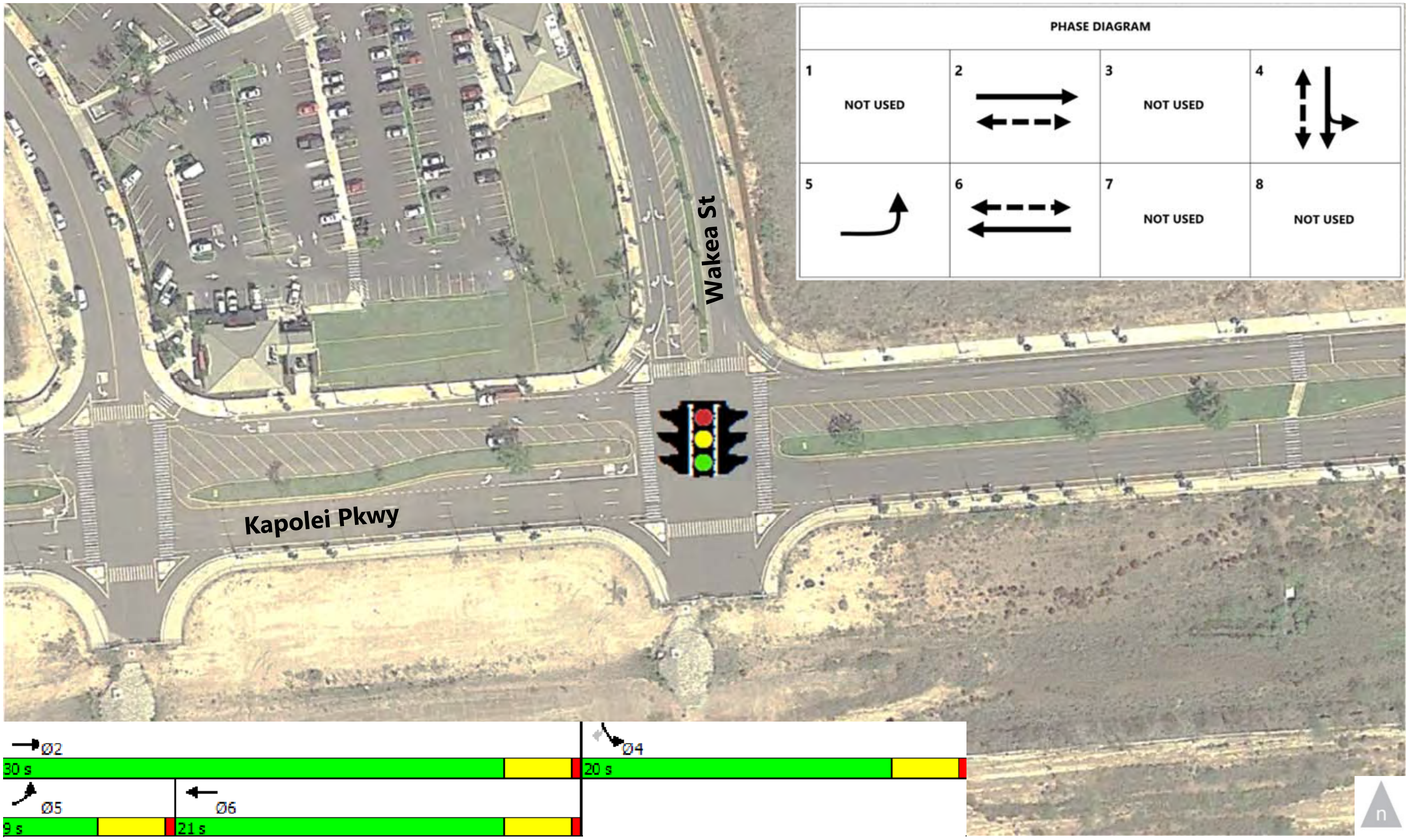
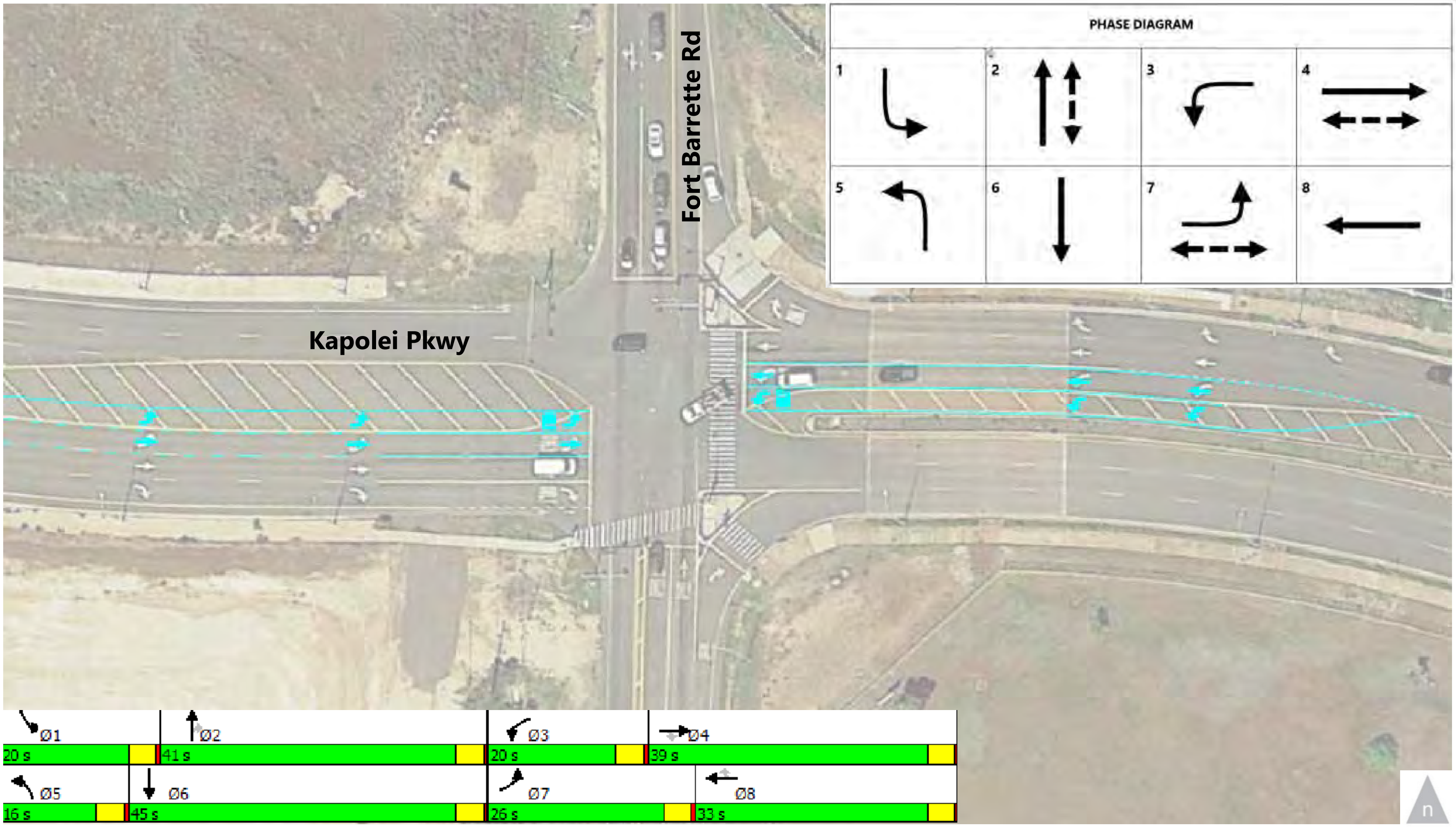



Figure 27

7. Kapolei Parkway/Wakea Street Mitigation

# RESTRIPE EWA-BOUND AND DH-BOUND ON KAPOLEI PKWY. PROVIDE LEFT-TURN PROTECTED SIGNAL PHASING ON KAPOLEI PKWY AND OPTIMIZE SIGNAL TIMING.

*Impacted w/ any development of Parcels 1, 2, or 3 under both the Residential and Mixed-Use project alternatives*




*Conceptual plan only – not for construction*

Figure 28

## 8. Kapolei Parkway/Fort Barrette Road Mitigation

## INTERSECTION 9: ROOSEVELT AVENUE / KAMOKILA BOULEVARD (PROJECT-SPECIFIC IMPACT)

*Significantly impacted under Parcel 1 and 2 and Parcel 1, 2, and 3 conditions for the 1,500-unit Residential Development, and with any development on Parcels 1, 2, and 3 for the Mixed-Use Development.*

This intersection operates at LOS C in the AM and PM peak hours under Near Term (2020) Baseline Conditions. The addition of the Residential Development Parcels 1 and 2 would degrade operations to LOS E and LOS F in the AM peak hour and PM peak hour, respectively, and the addition of the Residential Development Parcels 1, 2, and 3 project trips would degrade operations to LOS F in the AM and PM peak hours. The addition of the Mixed-Use Development Parcel 1 would degrade operations to LOS E in the AM and PM peak hours, and the addition of the Mixed-Use Development Parcels 1 and 2, and Parcels 1, 2, and 3 project trips would degrade operations to LOS F in the AM and PM peak hours.

Recommended Improvement: Install a traffic signal.

A preliminary traffic signal warrant analysis was evaluated at this intersection. The 2009 edition of the *Manual of Uniform Traffic Control Devices* (MUTCD, Federal Highway Association) identifies several warrants by which the need for a traffic signal can be evaluated. The MUTCD signal warrant 3 (Peak hour) is satisfied for the Roosevelt Avenue/Kamokila Boulevard intersection in the AM peak hour under all six project scenarios and in the PM peak hour under five project scenarios (all except for Residential Parcel 1). However, even when a peak-hour signal warrant is satisfied, the decision to install a signal should not be based solely upon this factor. The City & County of Honolulu Department of Transportation Services (DTS) should regularly monitor traffic conditions and accident data, and evaluate the full set of warrants to prioritize and program this intersection for signalization.

Installing a traffic signal at this intersection would improve operations to LOS C or better in the AM and PM peak hours under Parcels 1, 2, and 3 conditions

**Figure 29** shows a schematic of the proposed mitigations at this intersection.

## INSTALL A TRAFFIC SIGNAL

*Impacted w/ any development of Parcels 1, 2, or 3 under both Mixed-Use and Residential project alternatives*

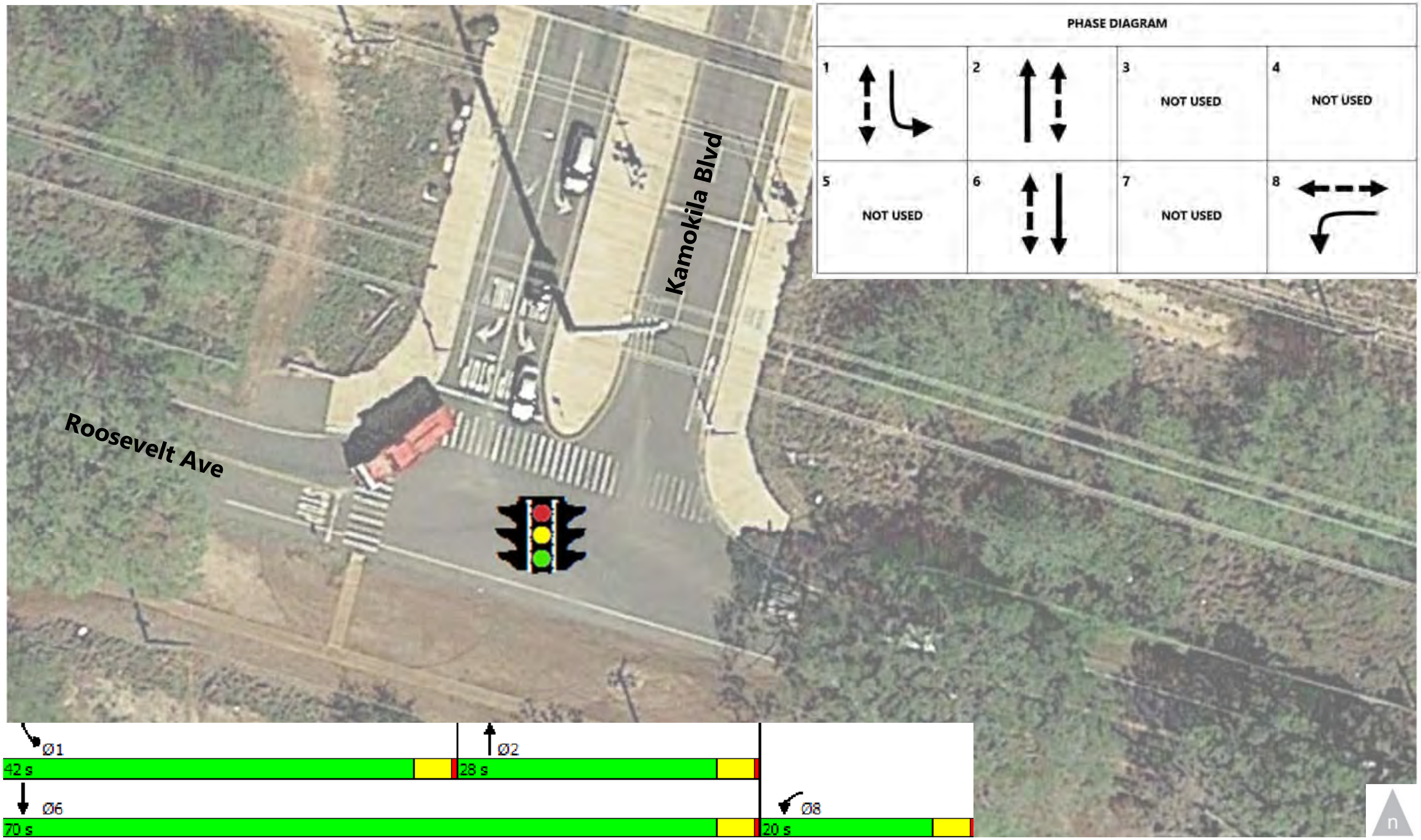



Figure 29

9. Roosevelt Avenue/Kamokila Boulevard Mitigation

## INTERSECTION 10: ROOSEVELT AVENUE / COPAHEE AVENUE (PROJECT-SPECIFIC IMPACT)

*Significantly impacted under Parcels 1 and 2, and Parcels 1, 2, and 3 conditions for only the Mixed-Use Development.*

This mauka-bound left-turn movement at this unsignalized intersection operates at LOS C and B in the AM and PM peak hour, respectively, under Near Term (2020) Baseline Conditions. The addition of Parcels 1 and 2 and Parcels 1, 2, and 3 project trips would degrade operations to LOS F in the AM and PM peak hours for the Mixed-Use Development.

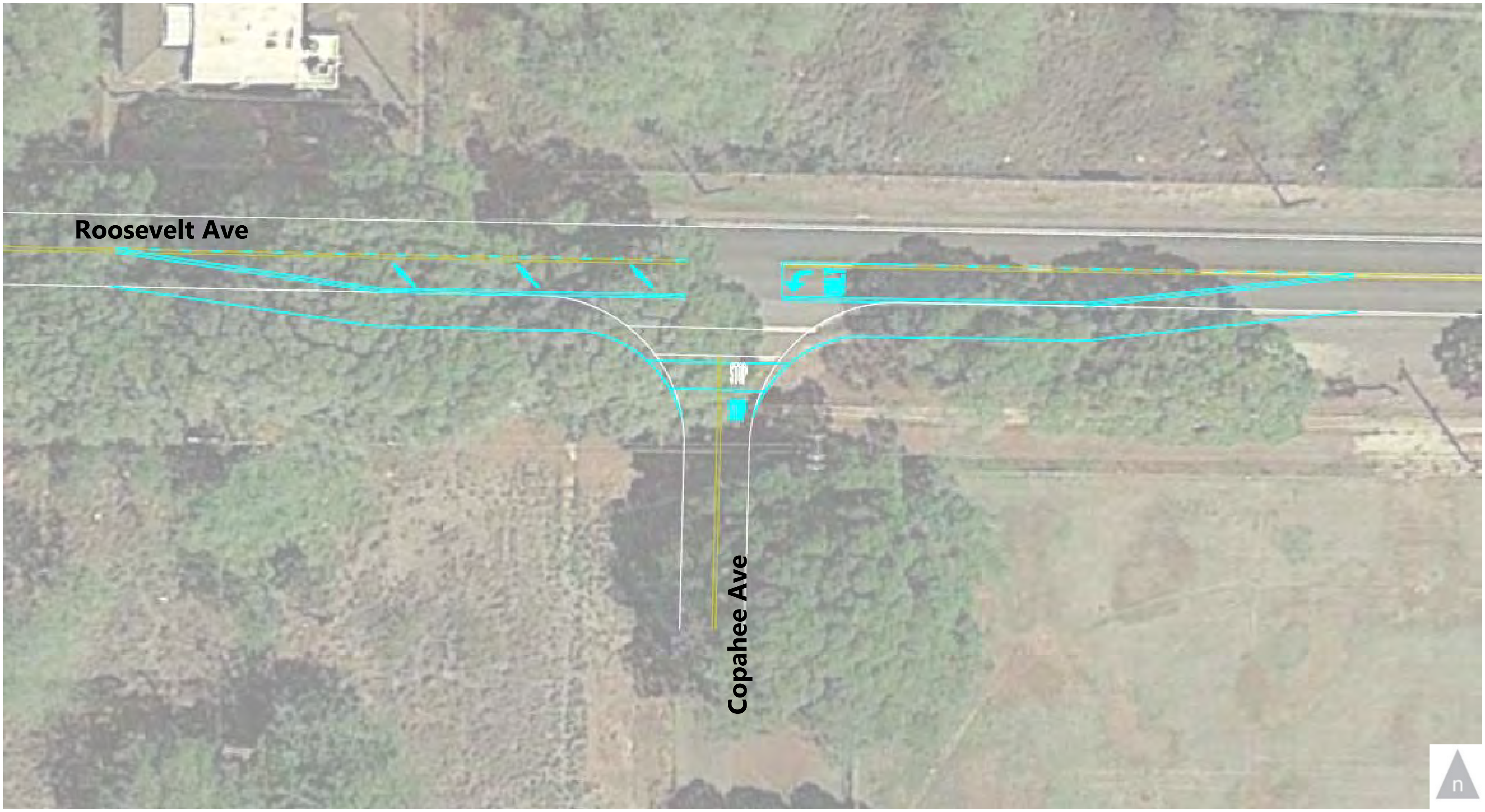
Recommended Improvement: Widen Roosevelt Avenue to provide a refuge island median for the mauka-bound left-turn storage and an ewa-bound merge lane.

A preliminary traffic signal warrant analysis was evaluated at this intersection. The MUTCD signal warrant 3 (peak hour) is satisfied for the Roosevelt Avenue / Copahee Avenue intersection in the AM and PM peak hours under the Mixed-Use Development Parcels 1 and 2 scenario and the Mixed-Use Development Parcels 1, 2, and 3 scenario. However, analysis implies that without installing a signal at this intersection, a refuge area will allow vehicles on the minor street yielding movement (i.e. Copahee Avenue mauka-bound left-turn) to only have to wait for gaps in one direction of traffic at a time, thus reducing overall delay for that approach. Therefore, adding a refuge island median on Roosevelt Avenue would improve the side-street operations to LOS D in the AM and PM peak hours for the Mixed-Use Parcels 1, 2, and 3 conditions. This improvement would be similar to the configuration at the Roosevelt Avenue/Coral Sea Road intersection.

**Figure 30** shows a schematic of the proposed mitigations at this intersection.

## WIDEN ROOSEVELT AVENUE EWA OF COPAHEE AVE TO PROVIDE A REFUGE ISLAND MEDIAN FOR THE MAUKA-BOUND LEFT-TURN MOVEMENT

*Impacted w/ development of Parcels 2 or 3 under the Mixed-Use project alternatives*




*Conceptual plan only – not for construction*

Figure 30

10. Roosevelt Avenue/Copahee Avenue Mitigation

## INTERSECTION 12: FORT BARRETTE ROAD-ENTERPRISE STREET / ROOSEVELT AVENUE (CUMULATIVE IMPACT)

*Significantly impacted with any development on Parcels 1, 2, or 3.*

This intersection operates at LOS F in the AM and PM peak hours, under Near Term (2020) Baseline Conditions. The addition of project trips (Parcel 1, Parcels 1 and 2, Parcels 1, 2, and 3) would degrade operations to LOS F in the AM and PM peak hours under all six project scenarios.

Recommended Improvements: Install a signal.

A preliminary traffic signal warrant analysis was evaluated at this intersection. The 2009 edition of the *Manual of Uniform Traffic Control Devices* (MUTCD, Federal Highway Association) identifies several warrants by which the need for a traffic signal can be evaluated. The MUTCD signal warrant 3 (Peak hour) is satisfied for the Fort Barrette Road-Enterprise Street/Roosevelt Avenue intersection in the AM and PM peak hours under all six project scenarios. However, even when a peak-hour signal warrant is satisfied, the decision to install a signal should not be based solely upon this factor. The City & County of Honolulu Department of Transportation Services (DTS) should regularly monitor traffic conditions and accident data, and evaluate the full set of warrants to prioritize and program this intersection for signalization.

Installing a traffic signal at this intersection would improve operations to LOS D or better in the AM and PM peak hours under Parcels 1, 2, and 3 conditions for both the 1,500-unit Residential Development and the Mixed-Use Development.

**Figure 31** shows a schematic of the proposed mitigations at this intersection.

**Table 10** summarizes the impacted intersection LOS and the LOS with proposed recommendations.

As noted in Chapter 5.4, the Kamokila Boulevard extension, makai of Roosevelt Avenue, and Roosevelt Avenue Diamond Head of Kamokila Boulevard was assumed to be two-lane roadways with the proposed projects. Project traffic is expected to be accommodated on these two-lane roadways, but are constrained at the adjacent intersections (i.e., Roosevelt Avenue/Kamokila Boulevard and Fort Barrette Road-Enterprise Street/Roosevelt Avenue). However, the project mitigations identified above (installing traffic signals) would improve operations on Kamokila Boulevard, Roosevelt Avenue, and Fort Barrette Road and enhance vehicular flow around the project site.

# INSTALL A TRAFFIC SIGNAL

*Impacted w/ any development of Parcels 1, 2, or 3 under both Mixed-Use and Residential project alternatives*

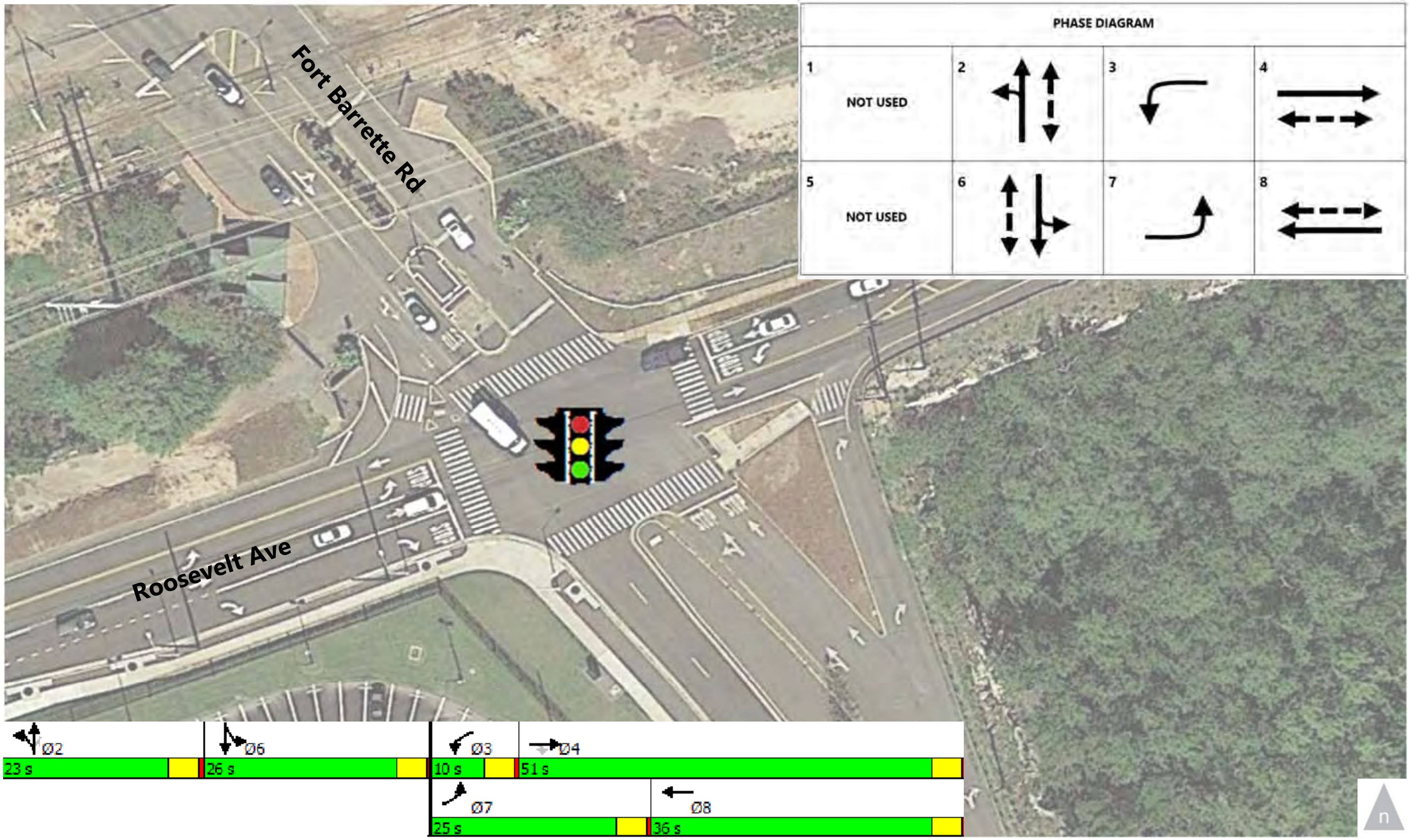



Figure 31

## 12. Fort Barrette Road/Roosevelt Avenue Mitigation

## TABLE 10: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE

| Intersection | Peak Hour | Near Term Baseline | | Near Term Plus Parcel 1[1] | | Near Term Plus Parcel 1 w/ Mitigations[1] | | Near Term Plus Parcels 1 & 2[1] | | Near Term Plus Parcels 1 & 2 w/ Mitigations[1] | | Near Term Plus Parcels 1, 2, & 3[1] | | Near Term Plus Parcels 1, 2, and 3 w/ Mitigations[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] |
| 5. Kapolei Pkwy / Kalaeloa Blvd | AM | 26.3 | C | 27.6 | C | 27.3 | C | 28.3 | C | 28.1 | C | 29.0 | C | 28.7 | C |
| | PM | **91.0** | **F** | ***93.8*** | ***F*** | 65.6 | **E** | ***95.8*** | ***F*** | 67.9 | **E** | ***100.2*** | ***F*** | 72.8 | **E** |
| 6. Kapolei Pkwy / Kamokila Blvd | AM | 27.6 | C | 53.9 | D | N/A | | ***73.3*** | ***E*** | 26.9 | C | ***90.9*** | ***F*** | 28.6 | C |
| | PM | 26.1 | C | 42.5 | D | | | 49.8 | D | 32.2 | C | ***58.7*** | ***E*** | 35.5 | D |
| 7. Kapolei Pkwy / Wakea St | AM | **41.5** | **E** | ***73.3*** | ***F*** | 7.5 | A | ***87.6*** | ***F*** | 7.7 | A | ***89.8*** | ***F*** | 7.7 | A |
| | PM | **44.1** | **E** | ***74.2*** | ***F*** | 6.7 | A | ***83.4*** | ***F*** | 6.8 | A | ***90.5*** | ***F*** | 6.9 | A |
| 8. Fort Barrette Rd / Kapolei Pkwy | AM | **140.4** | **F** | ***186.5*** | ***F*** | 74.0 | **E** | ***189.7*** | ***F*** | 77.0 | **E** | ***192.9*** | ***F*** | 79.4 | **E** |
| | PM | **185.5** | **F** | ***214.5*** | ***F*** | 51.5 | D | ***218.9*** | ***F*** | 59.0 | **E** | ***230.4*** | ***F*** | 75.6 | **E** |
| 9. Roosevelt Ave / Kamokila Blvd | AM | 16.3 | C | ***35.8*** | ***E*** | 14.7 | B | ***58.2*** | ***F*** | 16.6 | B | ***73.9*** | ***F*** | 18.9 | B |
| | PM | 23.9 | C | ***36.7*** | ***E*** | 20.6 | C | ***70.5*** | ***F*** | 24.3 | C | ***106.3*** | ***F*** | 28.3 | C |
| 10. Roosevelt Ave / Copahee Ave | AM | 16.5 | C | 33.2 | D | N/A | | ***61.0*** | ***F*** | 24.9 | C | ***76.7*** | ***F*** | 26.7 | D |
| | PM | 14.1 | B | 22.8 | C | | | ***57.8*** | ***F*** | 23.4 | C | ***61.8*** | ***F*** | 26.8 | D |
| 12. Fort Barrette Rd-Enterprise St / Roosevelt Ave | AM | **95.2** | **F** | ***119.9*** | ***F*** | 31.3 | C | ***144.0*** | ***F*** | 38.9 | D | ***171.4*** | ***F*** | 49.2 | D |
| | PM | **91.4** | **F** | ***122.2*** | ***F*** | 27.7 | C | ***146.3*** | ***F*** | 32.6 | C | ***207.5*** | ***F*** | 47.1 | D |

*Source: Fehr & Peers, 2017*

**TABLE 10: NEAR TERM (2020) PLUS PROJECT INTERSECTION LEVELS OF SERVICE**

| Intersection | Peak Hour | Near Term Baseline | | Near Term Plus Parcel 1[1] | | Near Term Plus Parcel 1 w/ Mitigations[1] | | Near Term Plus Parcels 1 & 2[1] | | Near Term Plus Parcels 1 & 2 w/ Mitigations[1] | | Near Term Plus Parcels 1, 2, & 3[1] | | Near Term Plus Parcels 1, 2, and 3 w/ Mitigations[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] | Delay (sec/ veh)[2] | LOS[3,4] |

Notes:

[1] Mixed-Use Development conditions were applied as these are the more conservative results.

[2] Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized and all-way stop-controlled intersections. The vehicular delay for the worst movement is reported for side-street stop-controlled intersections.

[3] LOS calculations performed using the *Highway Capacity Manual (HCM) 2010* method. LOS for side street stop-controlled (SSSC) intersections is worst-case movement. Other uncontrolled movements generally operate well with limited delay.

[4] Undesired LOS and corresponding seconds of delay per vehicle are highlighted in **bold.** ***LOS*** represent project impact.
N/A = Not Applicable. No mitigation necessary.

## 6.3 WAKEA STREET EXTENSION

The Wakea Street extension is a planned roadway improvement that will extend Wakea Street from its existing terminus at Kapolei Parkway in the makai direction to connect to Roosevelt Avenue. This improvement would provide a direct connection for residents in Kalaeloa to the H-1 freeway. The Wakea Street extension will provide a parallel makai-mauka roadway to Kamokila Boulevard and Fort Barrette Road and better distribute traffic through the Kapolei and Kalaeloa communities. An existing discontinuous segment of the extension currently exists between Kapolei Parkway and the ORL right-of-way.

DPP requested that this study analyze if the Wakea Street extension would be needed to accommodate project-generated traffic. The metric for this evaluation is when traffic operations at the Fort Barrette Road-Enterprise Street/Roosevelt Avenue and Roosevelt Avenue/Kamokila Boulevard intersections would degrade below desirable levels (LOS D or better). This analysis revealed that under Near Term (2020) Baseline Conditions, the Fort Barrette Road-Enterprise Street/Roosevelt Avenue would operate at an undesirable level (i.e. LOS F) without and with the project. In addition, operations at the Kamokila Boulevard/Roosevelt Avenue would degrade from LOS D or better to LOS E or F with either development alternative (except for Parcel 1 only under the 1,500 Residential Unit alternative). However, the project would be able to mitigate its impacts at both of these locations by contributing to the installation of traffic signals at each intersection. Accordingly, implementation of this proposed project mitigation would maintain peak hour traffic operations at LOS D or better through project buildout, and the need for the Wakea Street extension would not be warranted with the Parcel 1, 2 and 3 development.

It should be noted that under Near Term (2020) Plus Parcels 1, 2, and 3, the project's proposed mitigation would improve operations at the Fort Barrette Road-Enterprise Street/Roosevelt Avenue intersection to LOS D in the AM peak hour. In the future, as traffic continues to grow in the study area due to upcoming developments, operations of the proposed traffic signal at this location will degrade below LOS D and additional capacity serving the Kalaeloa area will be required. Additional improvements at the Fort Barrette Road-Enterprise Street/Roosevelt Avenue and Roosevelt Avenue/Kamokila Boulevard intersections are not expected to be feasible due to right-of-way constraints. Therefore, as development increases in the Kalaeloa area beyond development of Parcels 1, 2 and 3 (regardless of the project alternative), the Wakea Street extension would need to be implemented to provide an additional route to motorists in Kalaeloa and balance vehicle demand on the surrounding roadway network

# 7.0 ASSESSMENT OF SITE ACCESS AND CIRCULATION

The following chapter provides a summary of the site access, circulation, and parking with the proposed project. Vehicle access to Parcels 1, 2, and 3 are described below and illustrated on **Figure 18**.

Parcel 1:

- Full access driveway on Kamokila Boulevard (all-way stop controlled)
- Full access driveway on Copahee Avenue (side-street stop controlled)

Parcel 2:

- Partial access (right-turn outbound and left-turn and right-turn inbound) driveway on Saratoga Avenue (side-street stop controlled)
- Full access driveway on Tulagi Avenue (side-street stop controlled)

Parcel 3:

- Full access driveway on Hornet Avenue (side-street stop controlled)
- Full access driveway on Saratoga Avenue (all-way stop controlled)
- Full access driveway on Franklin Street (side-street stop controlled)
- Full access driveway on Roosevelt Avenue (side-street stop controlled)

The project driveways identified above are anticipated to serve primarily project trips given that Kamokila Boulevard and Saratoga Avenue are not expected to be major arterials. Therefore, based on the moderately low traffic volumes at these intersections and the sufficient spacing in between intersections, no traffic operations issues (e.g. queue spillbacks, sight distance issues, etc.) are anticipated to occur at any of the project driveways.

# 8.0 MULTI-MODAL ASSESSMENT

Consistent with State of Hawaii and City & County of Honolulu policies on Complete Streets, this chapter addresses any potential project impacts on all non-automobile modes of transportation, including existing and planned pedestrian, bicycle, and transit facilities. Based on the review of the site plan illustrated on **Figure 2 and 3** and the project description, the project would not cause any significant impact to the overall existing and planned external multi-modal transportation system of the Kalaeloa area. The project design will adhere to the policies and principles outlined in the City & County of Honolulu's Ordinance relating to Complete Streets (2012) as it maintains to provide safe mobility and access for all its residents and other users using all modes of transportation. It is further recommended that as the site plan is further refined, the Developer should consult with the State and City & County of Honolulu to design the internal roadway networks, cross sections, and access driveways in a manner that embraces the principles of Complete Streets.

## 8.1.1 PEDESTRIAN NETWORK

The proposed project follows new urbanist design principles that include an emphasis on walkability and connectivity through the pedestrian networks of the project site and of the Kapolei and Kalaeloa communities. Although the proposed project site plan does not illustrate the network of sidewalks within the individual parcels, the site plan does include sidewalks along Kamokila Boulevard, Saratoga Avenue, and Copahee Avenue, as well as an eight (8) foot multi-use path on the makai side of Roosevelt Avenue from Kamokila Boulevard to Franklin Street. These proposed pedestrian facilities would provide convenient and accessible linkages to schools and retail centers adjacent to the project site, which maximizes the relationship of the project to the rest of the Kapolei and Kalaeloa communities, and by nature reduce vehicle trip making and promote the use of non-motorized modes.

It is recommended that appropriate crossing treatments and traffic calming measures be provided where pedestrians will cross Kamokila Boulevard, Roosevelt Avenue, or Saratoga Avenue. Additionally, it is recommended that high-visibility crossing treatments be implemented at designated crossings from the project sites to the Barbers Point Elementary School.

### 8.1.2 BICYCLE NETWORK

The *Oahu Bike Plan* (August 2012) does plan for enhanced bicycle facilities to be implemented within the study area. The following are planned bicycle projects relevant to the project site and that would serve the study area:

- Bicycle lane on Saratoga Avenue from Kamokila Boulevard to Nassau Street
- Bicycle lane on Fort Barrette Road from Farrington Road to Roosevelt Avenue
- Bicycle Route on Enterprise Street from Roosevelt Avenue to Midway Street
- Bicycle lane on Roosevelt Avenue from Kamokila Boulevard to Geiger Road
- Bicycle path on Kapolei Parkway Diamond Head-bound between Kalaeloa Boulevard to Fort Barrette Road

No additional designated bicycle paths or lanes are necessary as part of project implementation. However, bicycle racks or secure storage should be provided within or near each set of major dwelling unit clusters on the site to encourage cycling by both residents and visitors and to provide a dedicated location for bike parking and secure storage.

### 8.1.3 TRANSIT NETWORK

While "The Bus" has no immediate plans to expand service in this area, as the Kalaeloa area develops, it will allow for the introduction of bus services along Kapolei Parkway and Roosevelt Avenue and this should be considered as the Honolulu Public Transit Authority plans for the future expansion of The Bus in the Kapolei region. Additionally, enhancements and amenities (i.e., benches or covered shelter) could be installed at any new bus stops to support future transit riders in the study area.

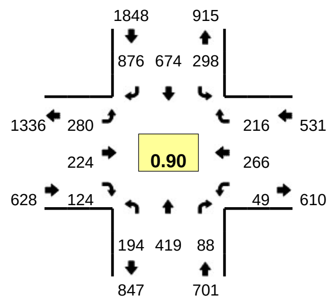
It is anticipated that by 2020, the Honolulu Rail Transit system will start operating the initial section from Kapolei to Aloha Stadium. The East Kapolei Station will be located at Kualaka`i Parkway and Keahumoa Parkway and will serve the Kapolei, Makakilo, Ewa Beach, and other outlying residential areas. The station will be located approximately one mile from the project site and will feature ADA pedestrian access, bicycle parking, a Kiss-and-Ride, and a Park & Ride with 900 spaces. Current plans are for trains to operate between 4:00 AM and midnight daily, with five-minute headways during peak travel times and 10 minute headways during off-peak hours. By the time the rail system is fully open in 2025, it will allow Kapolei residents to travel Diamond Head as far as Ala Moana Center in roughly 42 minutes.

Generally, the proposed project is not expected to substantially increase the walking, biking, or transit demand to a level where it could not be accommodated by existing or planned facilities. In addition, the project is expected to enhance multi-modal facilities and services, especially with the promotion of the use of passive and active spaces and non-motorized modes. The project is also expected to not conflict with any existing facilities and planned improvements. Thus, the project's impacts to pedestrian, bicycle, and transit facilities and services are therefore considered *less-than-significant*.

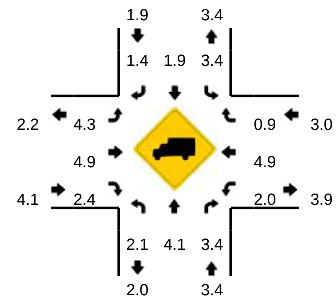
# APPENDIX A: TRAFFIC COUNT DATA

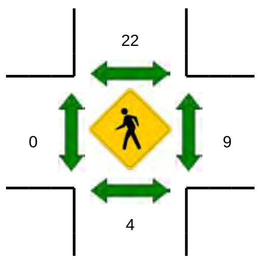
Type of peak hour being reported: Intersection Peak    Method for determining peak hour: Total Entering Volume

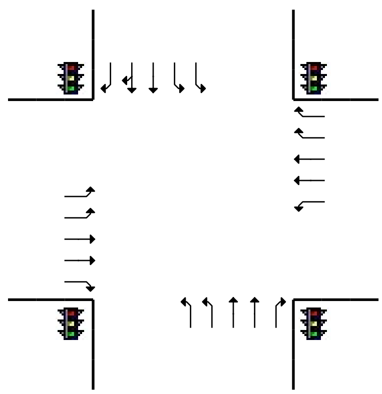
**LOCATION:** Makakilo Dr/Fort Barrette Rd -- Farrington Hwy    **QC JOB #:** 14567201
**CITY/STATE:** Kapolei, HI    **DATE:** Wed, Nov 29 2017

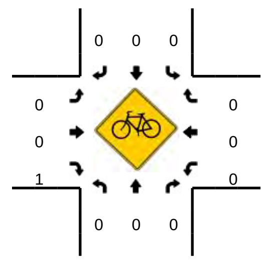


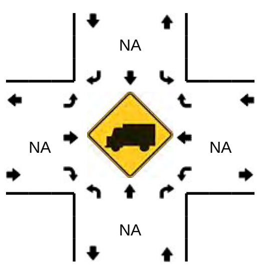

**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:35 AM -- 7:50 AM**

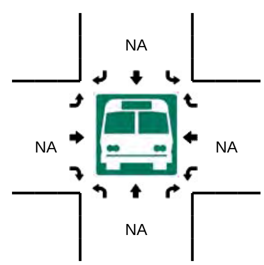





| 5-Min Count Period Beginning At | Makakilo Dr/Fort Barrette Rd (Northbound) Left | Thru | Right | U | Makakilo Dr/Fort Barrette Rd (Southbound) Left | Thru | Right | U | Farrington Hwy (Eastbound) Left | Thru | Right | U | Farrington Hwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 5 | 20 | 4 | 0 | 22 | 38 | 43 | 0 | 12 | 12 | 7 | 0 | 1 | 14 | 19 | 0 | 197 | |
| 6:35 AM | 16 | 16 | 8 | 0 | 14 | 35 | 47 | 0 | 7 | 12 | 8 | 0 | 2 | 11 | 13 | 0 | 189 | |
| 6:40 AM | 8 | 15 | 6 | 0 | 19 | 40 | 34 | 0 | 17 | 20 | 11 | 0 | 1 | 18 | 14 | 0 | 203 | |
| 6:45 AM | 8 | 24 | 4 | 0 | 16 | 51 | 43 | 0 | 13 | 9 | 12 | 0 | 0 | 18 | 12 | 0 | 210 | |
| 6:50 AM | 12 | 18 | 5 | 0 | 14 | 41 | 66 | 0 | 17 | 19 | 9 | 0 | 4 | 12 | 10 | 0 | 227 | |
| 6:55 AM | 12 | 16 | 3 | 0 | 26 | 34 | 47 | 0 | 13 | 9 | 7 | 0 | 1 | 23 | 20 | 0 | 211 | |
| 7:00 AM | 12 | 29 | 7 | 0 | 10 | 51 | 50 | 0 | 18 | 17 | 11 | 0 | 1 | 19 | 22 | 0 | 247 | |
| 7:05 AM | 4 | 36 | 6 | 0 | 12 | 53 | 51 | 0 | 24 | 9 | 9 | 0 | 2 | 22 | 26 | 0 | 254 | |
| 7:10 AM | 9 | 27 | 1 | 0 | 17 | 58 | 72 | 0 | 17 | 16 | 15 | 0 | 3 | 10 | 24 | 0 | 269 | |
| 7:15 AM | 11 | 36 | 7 | 0 | 30 | 75 | 71 | 0 | 10 | 10 | 7 | 0 | 0 | 19 | 32 | 0 | 308 | |
| 7:20 AM | 19 | 10 | 7 | 0 | 29 | 42 | 62 | 0 | 25 | 22 | 14 | 0 | 9 | 24 | 22 | 0 | 285 | |
| 7:25 AM | 12 | 29 | 5 | 0 | 26 | 70 | 78 | 0 | 20 | 15 | 8 | 0 | 10 | 23 | 16 | 0 | 312 | 2912 |
| 7:30 AM | 10 | 38 | 4 | 0 | 10 | 70 | 74 | 0 | 22 | 14 | 16 | 0 | 5 | 18 | 17 | 0 | 298 | 3013 |
| 7:35 AM | 17 | 41 | 12 | 0 | 42 | 76 | 92 | 0 | 21 | 21 | 13 | 0 | 5 | 13 | 19 | 0 | 372 | 3196 |
| 7:40 AM | 19 | 34 | 6 | 0 | 39 | 41 | 64 | 0 | 18 | 15 | 8 | 0 | 3 | 33 | 16 | 0 | 296 | 3289 |
| 7:45 AM | 11 | 47 | 13 | 0 | 25 | 74 | 94 | 0 | 28 | 22 | 12 | 0 | 5 | 15 | 16 | 0 | 362 | 3441 |
| 7:50 AM | 27 | 27 | 5 | 0 | 41 | 47 | 78 | 0 | 19 | 17 | 7 | 0 | 0 | 24 | 13 | 0 | 305 | 3519 |
| 7:55 AM | 13 | 49 | 8 | 0 | 7 | 70 | 87 | 0 | 35 | 24 | 11 | 0 | 3 | 22 | 15 | 0 | 344 | 3652 |
| 8:00 AM | 27 | 43 | 8 | 0 | 24 | 42 | 75 | 0 | 18 | 19 | 8 | 0 | 3 | 19 | 16 | 0 | 302 | 3707 |
| 8:05 AM | 19 | 18 | 6 | 0 | 19 | 22 | 34 | 0 | 29 | 22 | 8 | 0 | 0 | 34 | 16 | 0 | 227 | 3680 |
| 8:10 AM | 9 | 47 | 7 | 0 | 6 | 45 | 67 | 0 | 35 | 23 | 12 | 0 | 6 | 22 | 18 | 0 | 297 | 3708 |
| 8:15 AM | 25 | 42 | 8 | 0 | 13 | 44 | 51 | 0 | 24 | 19 | 13 | 0 | 1 | 15 | 21 | 0 | 276 | 3676 |
| 8:20 AM | 15 | 18 | 3 | 0 | 8 | 23 | 51 | 0 | 39 | 27 | 10 | 0 | 2 | 21 | 14 | 0 | 231 | 3622 |
| 8:25 AM | 17 | 39 | 6 | 0 | 16 | 51 | 52 | 0 | 34 | 15 | 13 | 0 | 6 | 9 | 18 | 0 | 276 | 3586 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 188 | 488 | 124 | 0 | 424 | 764 | 1000 | 0 | 268 | 232 | 132 | 0 | 52 | 244 | 204 | 0 | 4120 |
| Heavy Trucks | 4 | 24 | 4 | | 28 | 20 | 8 | | 12 | 20 | 4 | | 4 | 12 | 4 | | 144 |
| Pedestrians | | 0 | | | | 36 | | | | 0 | | | | 16 | | | 52 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

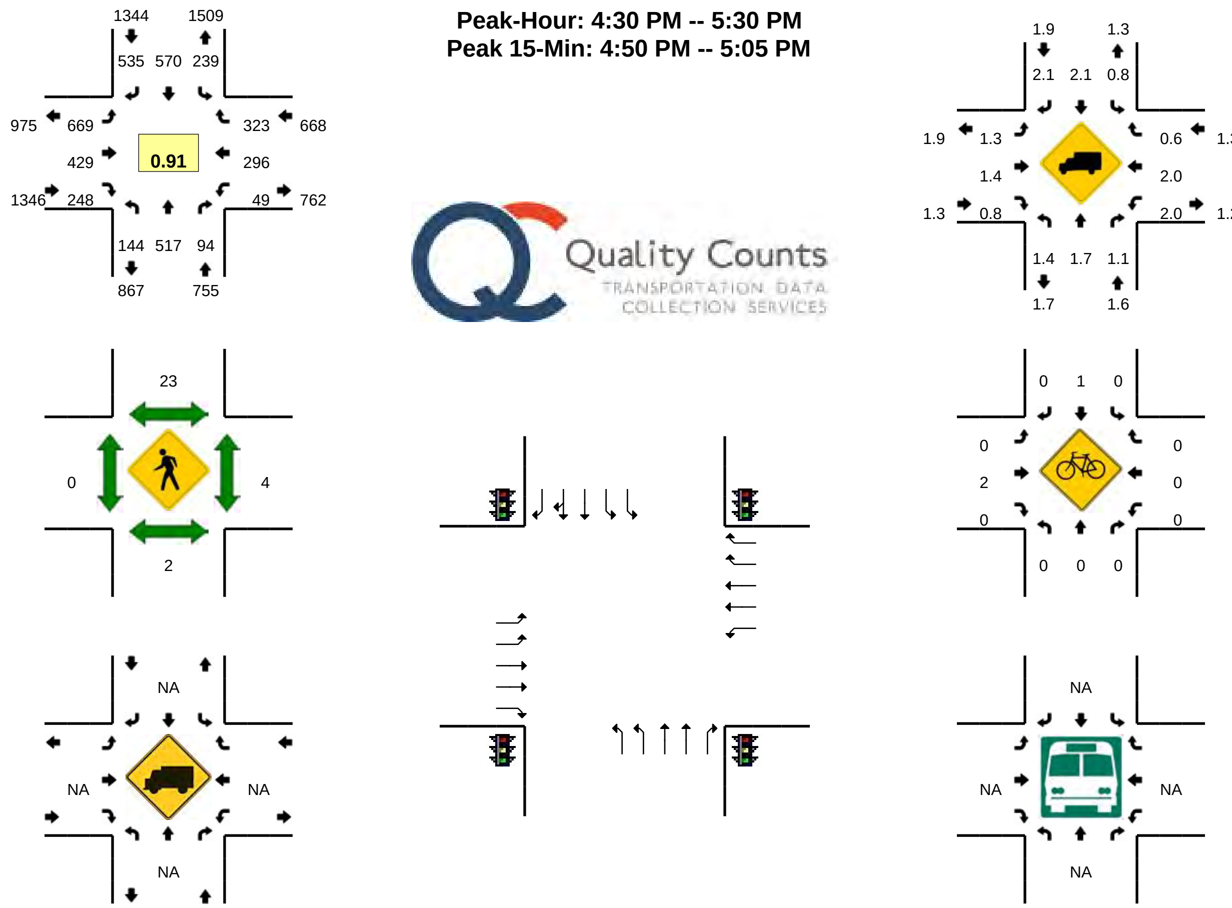
*Comments:*

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

**LOCATION:** Makakilo Dr/Fort Barrette Rd -- Farrington Hwy | **QC JOB #:** 14567202

**CITY/STATE:** Kapolei, HI | **DATE:** Wed, Nov 29 2017

**Peak-Hour: 4:30 PM -- 5:30 PM**
**Peak 15-Min: 4:50 PM -- 5:05 PM**




| 5-Min Count Period Beginning At | Makakilo Dr/Fort Barrette Rd (Northbound) Left | Thru | Right | U | Makakilo Dr/Fort Barrette Rd (Southbound) Left | Thru | Right | U | Farrington Hwy (Eastbound) Left | Thru | Right | U | Farrington Hwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 6 | 33 | 6 | 0 | 10 | 23 | 52 | 0 | 49 | 32 | 18 | 0 | 7 | 29 | 28 | 0 | 293 | |
| 3:35 PM | 22 | 28 | 5 | 0 | 23 | 37 | 47 | 0 | 45 | 26 | 15 | 0 | 6 | 52 | 32 | 0 | 338 | |
| 3:40 PM | 14 | 73 | 6 | 0 | 18 | 67 | 60 | 0 | 42 | 26 | 15 | 0 | 4 | 21 | 34 | 0 | 380 | |
| 3:45 PM | 14 | 30 | 6 | 0 | 14 | 47 | 45 | 0 | 78 | 39 | 27 | 0 | 6 | 22 | 19 | 0 | 347 | |
| 3:50 PM | 11 | 45 | 13 | 0 | 7 | 34 | 40 | 0 | 74 | 22 | 26 | 0 | 4 | 18 | 33 | 0 | 327 | |
| 3:55 PM | 25 | 42 | 2 | 0 | 27 | 28 | 53 | 0 | 40 | 23 | 24 | 0 | 6 | 44 | 24 | 0 | 338 | |
| 4:00 PM | 13 | 74 | 10 | 0 | 25 | 69 | 62 | 0 | 42 | 27 | 24 | 0 | 4 | 17 | 15 | 0 | 382 | |
| 4:05 PM | 12 | 35 | 5 | 0 | 8 | 44 | 50 | 0 | 66 | 47 | 22 | 0 | 12 | 28 | 34 | 0 | 363 | |
| 4:10 PM | 9 | 33 | 6 | 0 | 15 | 40 | 37 | 0 | 68 | 43 | 16 | 0 | 1 | 18 | 19 | 0 | 305 | |
| 4:15 PM | 12 | 40 | 7 | 0 | 27 | 46 | 42 | 0 | 46 | 28 | 11 | 0 | 5 | 28 | 27 | 0 | 319 | |
| 4:20 PM | 18 | 74 | 4 | 0 | 14 | 59 | 57 | 0 | 36 | 22 | 18 | 0 | 5 | 21 | 22 | 0 | 350 | |
| 4:25 PM | 11 | 32 | 8 | 0 | 12 | 39 | 54 | 0 | 62 | 32 | 18 | 0 | 11 | 17 | 23 | 0 | 319 | 4061 |
| 4:30 PM | 10 | 27 | 2 | 0 | 12 | 42 | 44 | 0 | 45 | 39 | 13 | 0 | 1 | 16 | 19 | 0 | 270 | 4038 |
| 4:35 PM | 17 | 17 | 6 | 0 | 30 | 40 | 45 | 0 | 32 | 40 | 22 | 0 | 3 | 37 | 30 | 0 | 319 | 4019 |
| 4:40 PM | 5 | 36 | 12 | 0 | 15 | 71 | 62 | 0 | 46 | 26 | 20 | 0 | 1 | 18 | 22 | 0 | 334 | 3973 |
| 4:45 PM | 9 | 47 | 18 | 0 | 20 | 38 | 45 | 0 | 52 | 47 | 23 | 0 | 9 | 22 | 31 | 0 | 361 | 3987 |
| 4:50 PM | 6 | 46 | 6 | 0 | 16 | 45 | 42 | 0 | 93 | 42 | 23 | 0 | 1 | 18 | 23 | 0 | 361 | 4021 |
| 4:55 PM | 26 | 41 | 7 | 0 | 33 | 36 | 34 | 0 | 50 | 39 | 15 | 0 | 3 | 46 | 29 | 0 | 359 | 4042 |
| 5:00 PM | 16 | 87 | 11 | 0 | 14 | 77 | 55 | 0 | 51 | 26 | 23 | 0 | 5 | 14 | 28 | 0 | 407 | 4067 |
| 5:05 PM | 11 | 28 | 7 | 0 | 18 | 38 | 26 | 0 | 90 | 45 | 21 | 0 | 4 | 22 | 22 | 0 | 332 | 4036 |
| 5:10 PM | 4 | 41 | 5 | 0 | 16 | 39 | 39 | 0 | 63 | 32 | 22 | 0 | 8 | 23 | 40 | 0 | 332 | 4063 |
| 5:15 PM | 18 | 34 | 8 | 0 | 23 | 35 | 35 | 0 | 32 | 24 | 18 | 0 | 6 | 42 | 34 | 0 | 309 | 4053 |
| 5:20 PM | 8 | 67 | 2 | 0 | 27 | 71 | 62 | 0 | 41 | 31 | 29 | 0 | 6 | 24 | 31 | 0 | 399 | 4102 |
| 5:25 PM | 14 | 46 | 10 | 0 | 15 | 38 | 46 | 0 | 74 | 38 | 19 | 0 | 2 | 14 | 14 | 0 | 330 | 4113 |

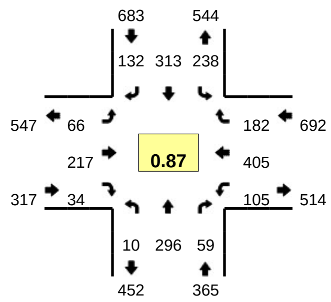
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 192 | 696 | 96 | 0 | 252 | 632 | 524 | 0 | 776 | 428 | 244 | 0 | 36 | 312 | 320 | 0 | 4508 |
| Heavy Trucks | 0 | 16 | 0 | | 4 | 12 | 8 | | 8 | 8 | 4 | | 0 | 4 | 0 | | 64 |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 4 | | | 4 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 | | 0 | 0 | 0 | | 1 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

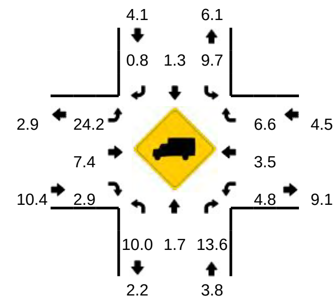
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

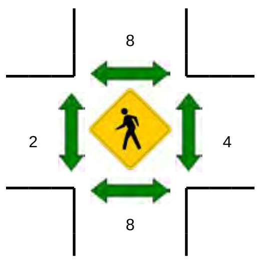
**LOCATION:** Wakea St -- Kamokila Dr | **QC JOB #:** 14567203

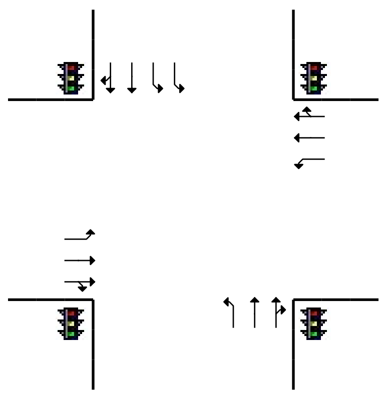
**CITY/STATE:** Kapolei, HI | **DATE:** Wed, Nov 29 2017

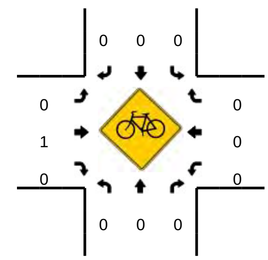


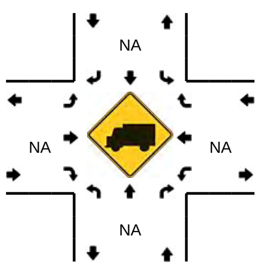

**Peak-Hour: 7:25 AM -- 8:25 AM**
**Peak 15-Min: 7:45 AM -- 8:00 AM**

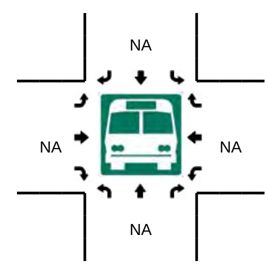





| 5-Min Count Period Beginning At | Wakea St (Northbound) Left | Thru | Right | U | Wakea St (Southbound) Left | Thru | Right | U | Kamokila Dr (Eastbound) Left | Thru | Right | U | Kamokila Dr (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 1 | 21 | 5 | 0 | 7 | 22 | 6 | 0 | 0 | 4 | 3 | 0 | 1 | 18 | 7 | 0 | 95 | |
| 6:35 AM | 0 | 19 | 2 | 0 | 26 | 14 | 6 | 0 | 1 | 5 | 1 | 0 | 5 | 29 | 5 | 0 | 113 | |
| 6:40 AM | 2 | 13 | 1 | 0 | 15 | 13 | 4 | 0 | 1 | 6 | 0 | 0 | 5 | 33 | 20 | 0 | 113 | |
| 6:45 AM | 1 | 17 | 2 | 0 | 19 | 8 | 2 | 0 | 3 | 7 | 1 | 0 | 3 | 28 | 8 | 0 | 99 | |
| 6:50 AM | 2 | 22 | 1 | 0 | 22 | 25 | 7 | 0 | 2 | 8 | 0 | 0 | 10 | 30 | 9 | 0 | 138 | |
| 6:55 AM | 3 | 19 | 3 | 0 | 11 | 29 | 8 | 0 | 1 | 10 | 3 | 0 | 3 | 19 | 16 | 0 | 125 | |
| 7:00 AM | 1 | 14 | 3 | 0 | 18 | 19 | 7 | 0 | 4 | 6 | 1 | 0 | 12 | 27 | 11 | 0 | 123 | |
| 7:05 AM | 2 | 30 | 3 | 0 | 26 | 24 | 3 | 0 | 5 | 6 | 0 | 0 | 4 | 23 | 11 | 0 | 137 | |
| 7:10 AM | 1 | 20 | 1 | 0 | 11 | 19 | 9 | 0 | 4 | 19 | 7 | 0 | 12 | 33 | 13 | 0 | 149 | |
| 7:15 AM | 2 | 23 | 3 | 0 | 24 | 17 | 11 | 0 | 4 | 18 | 2 | 0 | 5 | 28 | 13 | 0 | 150 | |
| 7:20 AM | 2 | 13 | 3 | 0 | 23 | 34 | 9 | 0 | 0 | 10 | 4 | 0 | 11 | 29 | 5 | 0 | 143 | |
| 7:25 AM | 2 | 28 | 4 | 0 | 11 | 24 | 6 | 0 | 6 | 11 | 2 | 0 | 15 | 32 | 15 | 0 | 156 | 1541 |
| 7:30 AM | 0 | 25 | 8 | 0 | 15 | 39 | 18 | 0 | 2 | 12 | 2 | 0 | 9 | 33 | 15 | 0 | 178 | 1624 |
| 7:35 AM | 1 | 24 | 5 | 0 | 17 | 40 | 10 | 0 | 6 | 13 | 2 | 0 | 13 | 40 | 16 | 0 | 187 | 1698 |
| 7:40 AM | 1 | 23 | 7 | 0 | 20 | 36 | 18 | 0 | 1 | 21 | 3 | 0 | 6 | 39 | 18 | 0 | 193 | 1778 |
| 7:45 AM | 0 | 30 | 3 | 0 | 13 | 37 | 15 | 0 | 6 | 11 | 1 | 0 | 14 | 30 | 13 | 0 | 173 | 1852 |
| 7:50 AM | 0 | 34 | 5 | 0 | 22 | 31 | 8 | 0 | 14 | 21 | 1 | 0 | 9 | 42 | 20 | 0 | 207 | 1921 |
| 7:55 AM | 3 | 34 | 9 | 0 | 22 | 32 | 11 | 0 | 1 | 18 | 3 | 0 | 14 | 52 | 14 | 0 | 213 | 2009 |
| 8:00 AM | 0 | 28 | 6 | 0 | 27 | 13 | 16 | 0 | 3 | 17 | 3 | 0 | 4 | 27 | 23 | 0 | 167 | 2053 |
| 8:05 AM | 1 | 27 | 2 | 0 | 11 | 13 | 7 | 0 | 1 | 20 | 5 | 0 | 4 | 27 | 12 | 0 | 130 | 2046 |
| 8:10 AM | 0 | 14 | 3 | 0 | 19 | 5 | 2 | 0 | 7 | 21 | 6 | 0 | 5 | 26 | 11 | 0 | 119 | 2016 |
| 8:15 AM | 1 | 17 | 5 | 0 | 39 | 32 | 16 | 0 | 8 | 28 | 2 | 0 | 5 | 27 | 10 | 0 | 190 | 2056 |
| 8:20 AM | 1 | 12 | 2 | 0 | 22 | 11 | 5 | 0 | 11 | 24 | 4 | 0 | 7 | 30 | 15 | 0 | 144 | 2057 |
| 8:25 AM | 0 | 28 | 3 | 0 | 18 | 12 | 8 | 0 | 11 | 17 | 5 | 0 | 6 | 21 | 14 | 0 | 143 | 2044 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 12 | 392 | 68 | 0 | 228 | 400 | 136 | 0 | 84 | 200 | 20 | 0 | 148 | 496 | 188 | 0 | 2372 |
| Heavy Trucks | 4 | 4 | 4 | | 36 | 12 | 0 | | 40 | 16 | 0 | | 4 | 24 | 0 | | 144 |
| Pedestrians | | 4 | | | | 12 | | | | 4 | | | | 4 | | | 24 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

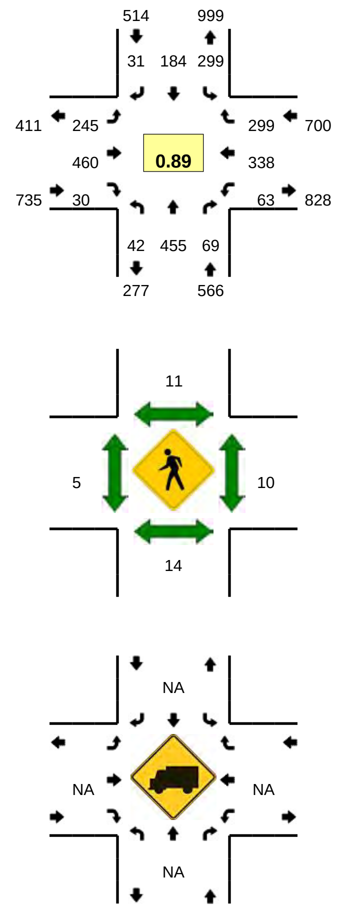
*Comments:*

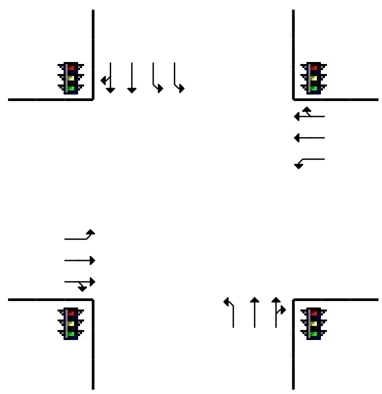
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

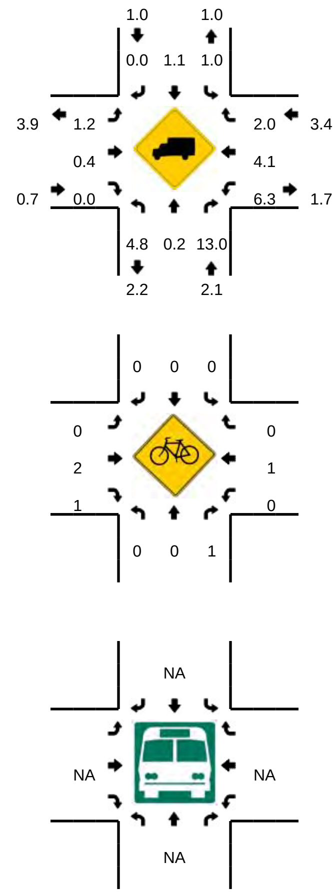
**LOCATION:** Wakea St -- Kamokila Dr — **QC JOB #:** 14567204

**CITY/STATE:** Kapolei, HI — **DATE:** Wed, Nov 29 2017

**Peak-Hour: 4:00 PM -- 5:00 PM**
**Peak 15-Min: 4:35 PM -- 4:50 PM**






| 5-Min Count Period Beginning At | Wakea St (Northbound) Left | Thru | Right | U | Wakea St (Southbound) Left | Thru | Right | U | Kamokila Dr (Eastbound) Left | Thru | Right | U | Kamokila Dr (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 5 | 23 | 8 | 0 | 19 | 20 | 10 | 0 | 10 | 41 | 8 | 0 | 3 | 38 | 25 | 0 | 210 | |
| 3:35 PM | 2 | 42 | 11 | 0 | 21 | 11 | 2 | 0 | 10 | 25 | 2 | 0 | 11 | 25 | 20 | 0 | 182 | |
| 3:40 PM | 1 | 29 | 6 | 0 | 15 | 13 | 7 | 0 | 18 | 55 | 3 | 0 | 5 | 35 | 24 | 0 | 211 | |
| 3:45 PM | 2 | 40 | 5 | 0 | 26 | 19 | 7 | 0 | 20 | 33 | 3 | 0 | 3 | 34 | 19 | 0 | 211 | |
| 3:50 PM | 5 | 38 | 9 | 0 | 17 | 14 | 5 | 0 | 19 | 37 | 5 | 0 | 7 | 26 | 17 | 0 | 199 | |
| 3:55 PM | 5 | 23 | 8 | 0 | 18 | 15 | 6 | 0 | 23 | 32 | 2 | 0 | 5 | 24 | 26 | 0 | 187 | |
| 4:00 PM | 3 | 23 | 11 | 0 | 12 | 20 | 5 | 0 | 15 | 39 | 0 | 0 | 4 | 29 | 21 | 0 | 182 | |
| 4:05 PM | 8 | 33 | 5 | 0 | 29 | 15 | 4 | 0 | 26 | 44 | 5 | 0 | 5 | 25 | 21 | 0 | 220 | |
| 4:10 PM | 2 | 36 | 4 | 0 | 30 | 17 | 1 | 0 | 11 | 28 | 5 | 0 | 9 | 32 | 19 | 0 | 194 | |
| 4:15 PM | 2 | 27 | 5 | 0 | 20 | 8 | 6 | 0 | 12 | 40 | 2 | 0 | 4 | 29 | 24 | 0 | 179 | |
| 4:20 PM | 3 | 32 | 4 | 0 | 25 | 10 | 7 | 0 | 18 | 24 | 4 | 0 | 13 | 30 | 26 | 0 | 196 | |
| 4:25 PM | 3 | 38 | 4 | 0 | 46 | 20 | 0 | 0 | 19 | 21 | 4 | 0 | 5 | 28 | 21 | 0 | 209 | 2380 |
| 4:30 PM | 2 | 41 | 12 | 0 | 11 | 12 | 1 | 0 | 32 | 42 | 1 | 0 | 3 | 30 | 16 | 0 | 203 | 2373 |
| 4:35 PM | 8 | 57 | 3 | 0 | 23 | 17 | 2 | 0 | 23 | 37 | 3 | 0 | 3 | 31 | 35 | 0 | 242 | 2433 |
| 4:40 PM | 3 | 57 | 3 | 0 | 23 | 18 | 3 | 0 | 23 | 39 | 1 | 0 | 3 | 24 | 34 | 0 | 231 | 2453 |
| 4:45 PM | 2 | 29 | 2 | 0 | 27 | 13 | 0 | 0 | 26 | 65 | 3 | 0 | 4 | 31 | 28 | 0 | 230 | 2472 |
| 4:50 PM | 3 | 38 | 8 | 0 | 29 | 18 | 1 | 0 | 26 | 50 | 1 | 0 | 8 | 25 | 28 | 0 | 235 | 2508 |
| 4:55 PM | 3 | 44 | 8 | 0 | 24 | 16 | 1 | 0 | 14 | 31 | 1 | 0 | 2 | 24 | 26 | 0 | 194 | 2515 |
| 5:00 PM | 1 | 48 | 13 | 0 | 15 | 14 | 1 | 0 | 13 | 24 | 3 | 0 | 6 | 23 | 11 | 0 | 172 | 2505 |
| 5:05 PM | 6 | 37 | 3 | 0 | 14 | 12 | 3 | 0 | 17 | 35 | 4 | 0 | 1 | 27 | 36 | 0 | 195 | 2480 |
| 5:10 PM | 3 | 40 | 4 | 0 | 30 | 14 | 2 | 0 | 18 | 21 | 1 | 0 | 9 | 27 | 22 | 0 | 191 | 2477 |
| 5:15 PM | 1 | 51 | 8 | 0 | 14 | 17 | 4 | 0 | 13 | 30 | 3 | 0 | 3 | 19 | 23 | 0 | 186 | 2484 |
| 5:20 PM | 2 | 29 | 5 | 0 | 15 | 12 | 0 | 0 | 7 | 39 | 7 | 0 | 5 | 19 | 26 | 0 | 166 | 2454 |
| 5:25 PM | 1 | 36 | 7 | 0 | 35 | 12 | 2 | 0 | 10 | 35 | 3 | 0 | 11 | 29 | 23 | 0 | 204 | 2449 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 52 | 572 | 32 | 0 | 292 | 192 | 20 | 0 | 288 | 564 | 28 | 0 | 40 | 344 | 388 | 0 | 2812 |
| Heavy Trucks | 0 | 0 | 4 | | 0 | 0 | 0 | | 8 | 4 | 0 | | 0 | 16 | 8 | | 40 |
| Pedestrians | | 12 | | | | 32 | | | | 16 | | | | 8 | | | 68 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 1 | 1 | | 0 | 0 | 0 | | 2 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

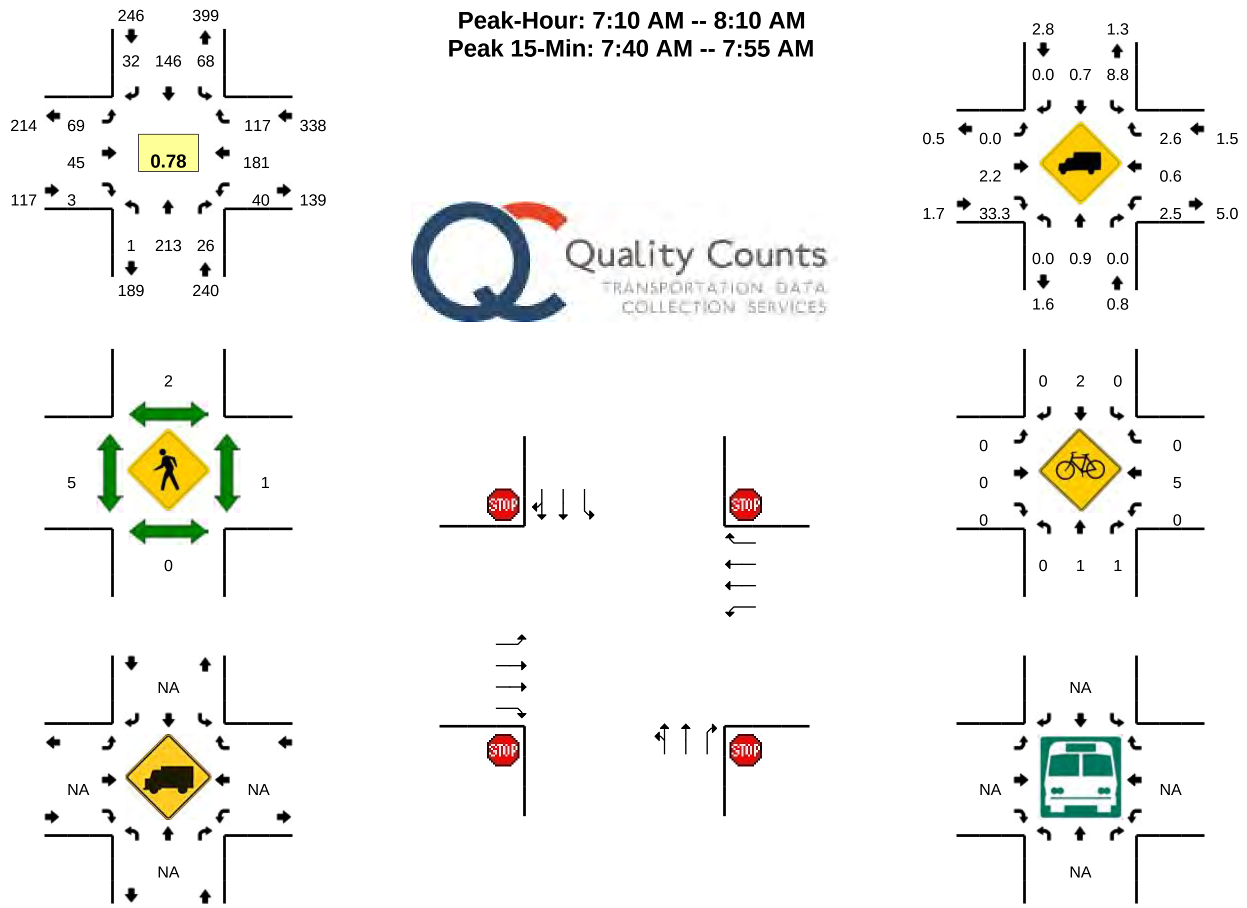
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

**LOCATION:** Wakea St -- Kama`aha Ave | **QC JOB #:** 14567205

**CITY/STATE:** Kapolei, HI | **DATE:** Wed, Nov 29 2017

**Peak-Hour: 7:10 AM -- 8:10 AM**

**Peak 15-Min: 7:40 AM -- 7:55 AM**




| 5-Min Count Period Beginning At | Wakea St (Northbound) Left | Thru | Right | U | Wakea St (Southbound) Left | Thru | Right | U | Kama`aha Ave (Eastbound) Left | Thru | Right | U | Kama`aha Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 0 | 15 | 0 | 0 | 2 | 8 | 1 | 0 | 6 | 1 | 0 | 0 | 3 | 8 | 5 | 0 | 49 | |
| 6:35 AM | 0 | 5 | 1 | 0 | 5 | 17 | 1 | 0 | 12 | 3 | 0 | 0 | 3 | 6 | 6 | 0 | 59 | |
| 6:40 AM | 0 | 17 | 1 | 0 | 1 | 9 | 2 | 0 | 3 | 1 | 1 | 0 | 0 | 10 | 5 | 0 | 50 | |
| 6:45 AM | 0 | 11 | 0 | 0 | 2 | 8 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 11 | 6 | 0 | 42 | |
| 6:50 AM | 0 | 10 | 0 | 0 | 4 | 12 | 0 | 0 | 5 | 4 | 0 | 0 | 1 | 7 | 7 | 0 | 50 | |
| 6:55 AM | 1 | 16 | 0 | 0 | 2 | 22 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 5 | 7 | 0 | 58 | |
| 7:00 AM | 0 | 12 | 3 | 0 | 7 | 16 | 3 | 0 | 2 | 2 | 1 | 0 | 2 | 6 | 6 | 0 | 60 | |
| 7:05 AM | 0 | 17 | 0 | 0 | 1 | 8 | 0 | 0 | 9 | 3 | 0 | 0 | 1 | 10 | 4 | 0 | 53 | |
| 7:10 AM | 0 | 15 | 1 | 0 | 1 | 13 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 10 | 4 | 0 | 56 | |
| 7:15 AM | 0 | 10 | 4 | 0 | 4 | 7 | 1 | 0 | 4 | 3 | 0 | 0 | 2 | 7 | 4 | 0 | 46 | |
| 7:20 AM | 0 | 14 | 2 | 0 | 4 | 12 | 3 | 0 | 2 | 6 | 0 | 0 | 2 | 8 | 16 | 0 | 69 | |
| 7:25 AM | 0 | 15 | 0 | 0 | 6 | 12 | 3 | 0 | 5 | 3 | 0 | 0 | 3 | 17 | 9 | 0 | 73 | 665 |
| 7:30 AM | 0 | 20 | 2 | 0 | 9 | 19 | 2 | 0 | 3 | 2 | 0 | 0 | 1 | 11 | 10 | 0 | 79 | 695 |
| 7:35 AM | 0 | 20 | 2 | 0 | 8 | 16 | 2 | 0 | 8 | 1 | 1 | 0 | 1 | 20 | 14 | 0 | 93 | 729 |
| 7:40 AM | 0 | 25 | 1 | 0 | 8 | 11 | 3 | 0 | 6 | 4 | 0 | 0 | 5 | 21 | 16 | 0 | 100 | 779 |
| 7:45 AM | 1 | 32 | 4 | 0 | 7 | 13 | 6 | 0 | 10 | 4 | 0 | 0 | 5 | 17 | 9 | 0 | 108 | 845 |
| 7:50 AM | 0 | 17 | 5 | 0 | 7 | 13 | 2 | 0 | 9 | 1 | 0 | 0 | 5 | 21 | 14 | 0 | 94 | 889 |
| 7:55 AM | 0 | 22 | 1 | 0 | 5 | 14 | 2 | 0 | 8 | 3 | 0 | 0 | 7 | 23 | 9 | 0 | 94 | 925 |
| 8:00 AM | 0 | 10 | 3 | 0 | 4 | 6 | 2 | 0 | 4 | 6 | 0 | 0 | 4 | 17 | 8 | 0 | 64 | 929 |
| 8:05 AM | 0 | 13 | 1 | 0 | 5 | 10 | 2 | 0 | 6 | 8 | 2 | 0 | 5 | 9 | 4 | 0 | 65 | 941 |
| 8:10 AM | 0 | 12 | 3 | 0 | 5 | 5 | 1 | 0 | 3 | 5 | 1 | 0 | 3 | 4 | 6 | 0 | 48 | 933 |
| 8:15 AM | 1 | 12 | 2 | 0 | 1 | 14 | 3 | 0 | 2 | 2 | 1 | 0 | 2 | 7 | 1 | 0 | 48 | 935 |
| 8:20 AM | 0 | 9 | 5 | 0 | 2 | 4 | 1 | 0 | 6 | 7 | 0 | 0 | 4 | 9 | 2 | 0 | 49 | 915 |
| 8:25 AM | 0 | 23 | 2 | 0 | 5 | 12 | 2 | 0 | 2 | 5 | 0 | 0 | 4 | 12 | 3 | 0 | 68 | 910 |

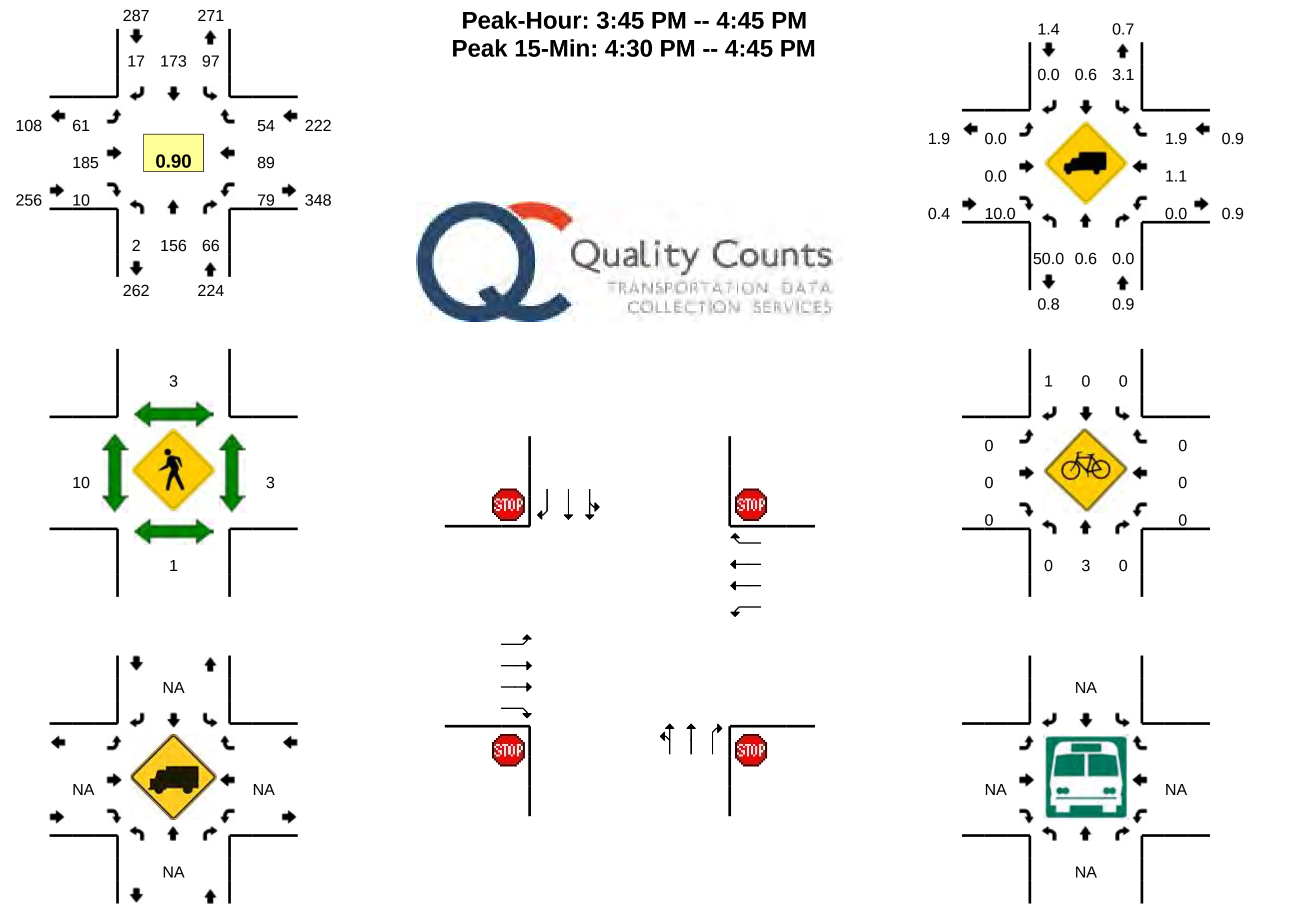
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 4 | 296 | 40 | 0 | 88 | 148 | 44 | 0 | 100 | 36 | 0 | 0 | 60 | 236 | 156 | 0 | 1208 |
| Heavy Trucks | 0 | 0 | 0 | | 4 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 8 | | 12 |
| Pedestrians | | 0 | | | | 0 | | | | 4 | | | | 0 | | | 4 |
| Bicycles | 0 | 0 | 0 | | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 | | 2 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

**LOCATION:** Wakea St -- Kama`aha Ave — **QC JOB #:** 14567206

**CITY/STATE:** Kapolei, HI — **DATE:** Wed, Nov 29 2017




| 5-Min Count Period Beginning At | Wakea St (Northbound) Left | Thru | Right | U | Wakea St (Southbound) Left | Thru | Right | U | Kama`aha Ave (Eastbound) Left | Thru | Right | U | Kama`aha Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 0 | 9 | 5 | 0 | 6 | 15 | 4 | 0 | 5 | 11 | 1 | 0 | 9 | 7 | 5 | 0 | 77 | |
| 3:35 PM | 1 | 19 | 4 | 0 | 12 | 13 | 1 | 0 | 6 | 7 | 0 | 0 | 6 | 9 | 3 | 0 | 81 | |
| 3:40 PM | 2 | 16 | 8 | 0 | 9 | 12 | 0 | 0 | 8 | 9 | 1 | 0 | 8 | 5 | 3 | 0 | 81 | |
| 3:45 PM | 0 | 13 | 4 | 0 | 10 | 14 | 1 | 0 | 7 | 18 | 2 | 0 | 15 | 7 | 2 | 0 | 93 | |
| 3:50 PM | 0 | 12 | 6 | 0 | 8 | 14 | 0 | 0 | 6 | 10 | 3 | 0 | 7 | 10 | 3 | 0 | 79 | |
| 3:55 PM | 1 | 10 | 6 | 0 | 9 | 19 | 2 | 0 | 7 | 17 | 0 | 0 | 5 | 13 | 5 | 0 | 94 | |
| 4:00 PM | 0 | 14 | 5 | 0 | 7 | 14 | 1 | 0 | 3 | 20 | 1 | 0 | 5 | 5 | 5 | 0 | 80 | |
| 4:05 PM | 0 | 7 | 6 | 0 | 7 | 13 | 3 | 0 | 5 | 13 | 0 | 0 | 3 | 6 | 5 | 0 | 68 | |
| 4:10 PM | 0 | 14 | 5 | 0 | 10 | 10 | 2 | 0 | 2 | 10 | 1 | 0 | 6 | 8 | 3 | 0 | 71 | |
| 4:15 PM | 0 | 9 | 7 | 0 | 8 | 15 | 0 | 0 | 5 | 9 | 1 | 0 | 5 | 7 | 3 | 0 | 69 | |
| 4:20 PM | 0 | 15 | 7 | 0 | 5 | 10 | 2 | 0 | 2 | 20 | 0 | 0 | 4 | 7 | 2 | 0 | 74 | |
| 4:25 PM | 0 | 18 | 6 | 0 | 11 | 14 | 2 | 0 | 4 | 9 | 0 | 0 | 7 | 6 | 8 | 0 | 85 | 952 |
| 4:30 PM | 0 | 17 | 7 | 0 | 7 | 18 | 1 | 0 | 5 | 20 | 0 | 0 | 6 | 10 | 1 | 0 | 92 | 967 |
| 4:35 PM | 0 | 13 | 3 | 0 | 6 | 17 | 1 | 0 | 8 | 19 | 2 | 0 | 4 | 5 | 6 | 0 | 84 | 970 |
| 4:40 PM | 1 | 14 | 4 | 0 | 9 | 15 | 2 | 0 | 7 | 20 | 0 | 0 | 12 | 5 | 11 | 0 | 100 | 989 |
| 4:45 PM | 0 | 13 | 5 | 0 | 6 | 12 | 2 | 0 | 6 | 16 | 0 | 0 | 7 | 7 | 6 | 0 | 80 | 976 |
| 4:50 PM | 0 | 14 | 6 | 0 | 11 | 11 | 3 | 0 | 4 | 14 | 0 | 0 | 12 | 5 | 2 | 0 | 82 | 979 |
| 4:55 PM | 0 | 11 | 5 | 0 | 4 | 19 | 1 | 0 | 6 | 16 | 0 | 0 | 7 | 9 | 3 | 0 | 81 | 966 |
| 5:00 PM | 0 | 8 | 8 | 0 | 3 | 14 | 1 | 0 | 4 | 6 | 0 | 0 | 4 | 13 | 4 | 0 | 65 | 951 |
| 5:05 PM | 2 | 19 | 7 | 0 | 7 | 15 | 1 | 0 | 4 | 9 | 0 | 0 | 2 | 11 | 5 | 0 | 82 | 965 |
| 5:10 PM | 0 | 10 | 5 | 0 | 4 | 13 | 2 | 0 | 4 | 18 | 1 | 0 | 3 | 6 | 7 | 0 | 73 | 967 |
| 5:15 PM | 0 | 10 | 5 | 0 | 5 | 12 | 1 | 0 | 7 | 10 | 2 | 0 | 3 | 8 | 3 | 0 | 66 | 964 |
| 5:20 PM | 1 | 15 | 2 | 0 | 8 | 12 | 3 | 0 | 5 | 18 | 0 | 0 | 8 | 10 | 7 | 0 | 89 | 979 |
| 5:25 PM | 0 | 16 | 7 | 0 | 4 | 19 | 0 | 0 | 6 | 15 | 2 | 0 | 3 | 5 | 1 | 0 | 78 | 972 |

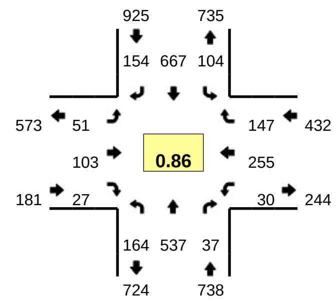
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 4 | 176 | 56 | 0 | 88 | 200 | 16 | 0 | 80 | 236 | 8 | 0 | 88 | 80 | 72 | 0 | 1104 |
| Heavy Trucks | 0 | 0 | 0 | | 8 | 4 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 12 |
| Pedestrians | | 4 | | | | 0 | | | | 8 | | | | 4 | | | 16 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

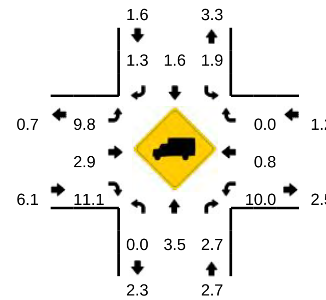
*Comments:*

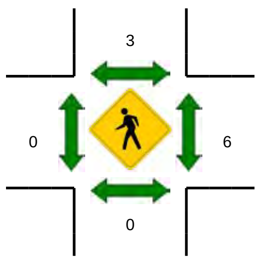
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

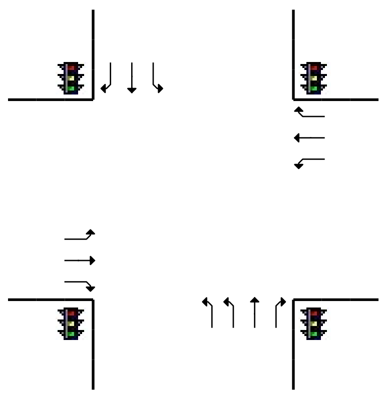
**LOCATION:** Fort Barrette Rd -- Kama`aha Ave | **QC JOB #:** 14567207
**CITY/STATE:** Kapolei, HI | **DATE:** Wed, Nov 29 2017

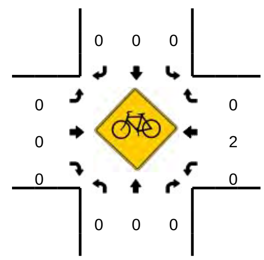
**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:40 AM -- 7:55 AM**

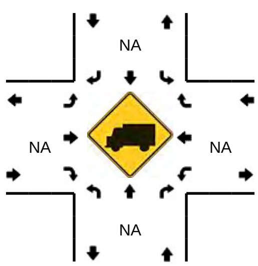


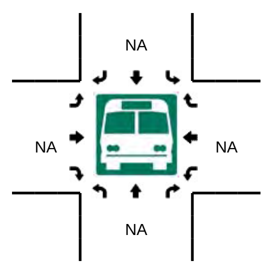






| 5-Min Count Period Beginning At | Fort Barrette Rd (Northbound) Left | Thru | Right | U | Fort Barrette Rd (Southbound) Left | Thru | Right | U | Kama`aha Ave (Eastbound) Left | Thru | Right | U | Kama`aha Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 3 | 18 | 1 | 0 | 4 | 40 | 5 | 0 | 1 | 3 | 1 | 0 | 0 | 10 | 11 | 0 | 97 | |
| 6:35 AM | 2 | 25 | 0 | 0 | 8 | 23 | 6 | 0 | 4 | 4 | 0 | 0 | 0 | 14 | 14 | 0 | 100 | |
| 6:40 AM | 2 | 17 | 0 | 0 | 8 | 50 | 8 | 0 | 3 | 3 | 2 | 0 | 2 | 15 | 7 | 0 | 117 | |
| 6:45 AM | 4 | 27 | 0 | 0 | 6 | 30 | 5 | 0 | 3 | 2 | 1 | 0 | 2 | 12 | 9 | 0 | 101 | |
| 6:50 AM | 2 | 21 | 0 | 0 | 6 | 43 | 9 | 0 | 0 | 4 | 1 | 0 | 2 | 7 | 12 | 0 | 107 | |
| 6:55 AM | 3 | 18 | 1 | 0 | 9 | 35 | 7 | 0 | 4 | 4 | 0 | 0 | 2 | 15 | 14 | 0 | 112 | |
| 7:00 AM | 2 | 36 | 4 | 0 | 8 | 59 | 5 | 0 | 1 | 7 | 0 | 0 | 1 | 11 | 16 | 0 | 150 | |
| 7:05 AM | 3 | 28 | 3 | 0 | 5 | 57 | 6 | 0 | 2 | 4 | 0 | 0 | 0 | 12 | 19 | 0 | 139 | |
| 7:10 AM | 5 | 25 | 2 | 0 | 8 | 59 | 5 | 0 | 1 | 3 | 0 | 0 | 3 | 15 | 20 | 0 | 146 | |
| 7:15 AM | 9 | 42 | 2 | 0 | 6 | 48 | 8 | 0 | 4 | 6 | 1 | 0 | 7 | 15 | 7 | 0 | 155 | |
| 7:20 AM | 12 | 27 | 0 | 0 | 13 | 61 | 15 | 0 | 1 | 9 | 1 | 0 | 4 | 30 | 9 | 0 | 182 | |
| 7:25 AM | 4 | 43 | 0 | 0 | 7 | 67 | 22 | 0 | 2 | 9 | 4 | 0 | 3 | 21 | 3 | 0 | 185 | 1591 |
| 7:30 AM | 8 | 46 | 4 | 0 | 11 | 66 | 11 | 0 | 2 | 14 | 0 | 0 | 0 | 30 | 11 | 0 | 203 | 1697 |
| 7:35 AM | 21 | 34 | 7 | 0 | 13 | 55 | 14 | 0 | 4 | 7 | 1 | 0 | 6 | 27 | 21 | 0 | 210 | 1807 |
| 7:40 AM | 23 | 57 | 6 | 0 | 7 | 69 | 15 | 0 | 6 | 5 | 0 | 0 | 1 | 15 | 15 | 0 | 219 | 1909 |
| 7:45 AM | 25 | 42 | 4 | 0 | 13 | 47 | 16 | 0 | 8 | 11 | 2 | 0 | 4 | 32 | 20 | 0 | 224 | 2032 |
| 7:50 AM | 23 | 50 | 7 | 0 | 3 | 72 | 13 | 0 | 5 | 5 | 4 | 0 | 2 | 16 | 15 | 0 | 215 | 2140 |
| 7:55 AM | 22 | 49 | 4 | 0 | 14 | 51 | 11 | 0 | 4 | 12 | 2 | 0 | 2 | 35 | 12 | 0 | 218 | 2246 |
| 8:00 AM | 6 | 51 | 0 | 0 | 10 | 54 | 16 | 0 | 5 | 7 | 6 | 0 | 0 | 14 | 9 | 0 | 178 | 2274 |
| 8:05 AM | 4 | 39 | 1 | 0 | 3 | 32 | 5 | 0 | 8 | 11 | 6 | 0 | 1 | 12 | 9 | 0 | 131 | 2266 |
| 8:10 AM | 7 | 57 | 2 | 0 | 4 | 45 | 8 | 0 | 2 | 7 | 0 | 0 | 0 | 8 | 16 | 0 | 156 | 2276 |
| 8:15 AM | 11 | 37 | 0 | 0 | 10 | 19 | 4 | 0 | 4 | 5 | 0 | 0 | 1 | 9 | 15 | 0 | 115 | 2236 |
| 8:20 AM | 4 | 28 | 2 | 0 | 6 | 51 | 10 | 0 | 9 | 7 | 1 | 0 | 2 | 10 | 10 | 0 | 140 | 2194 |
| 8:25 AM | 4 | 46 | 0 | 0 | 4 | 49 | 15 | 0 | 4 | 6 | 3 | 0 | 2 | 9 | 12 | 0 | 154 | 2163 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 284 | 596 | 68 | 0 | 92 | 752 | 176 | 0 | 76 | 84 | 24 | 0 | 28 | 252 | 200 | 0 | 2632 |
| Heavy Trucks | 0 | 32 | 4 | | 0 | 16 | 4 | | 0 | 4 | 0 | | 0 | 4 | 0 | | 64 |
| Pedestrians | | 0 | | | | 4 | | | | 0 | | | | 0 | | | 4 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 12/7/2017 5:09 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

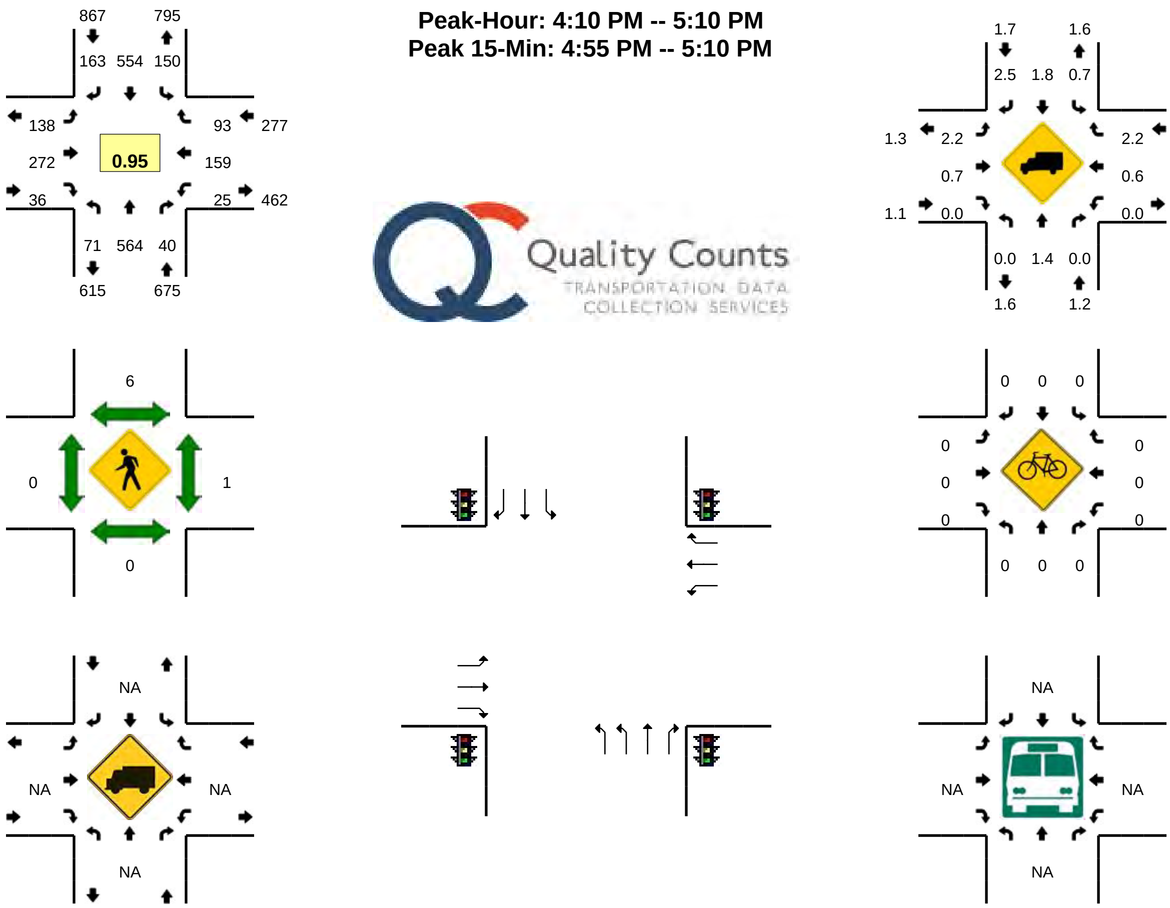
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

**LOCATION:** Fort Barrette Rd -- Kama`aha Ave — **QC JOB #:** 14567208

**CITY/STATE:** Kapolei, HI — **DATE:** Wed, Nov 29 2017

**Peak-Hour: 4:10 PM -- 5:10 PM**

**Peak 15-Min: 4:55 PM -- 5:10 PM**




| 5-Min Count Period Beginning At | Fort Barrette Rd (Northbound) Left | Thru | Right | U | Fort Barrette Rd (Southbound) Left | Thru | Right | U | Kama`aha Ave (Eastbound) Left | Thru | Right | U | Kama`aha Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 7 | 36 | 2 | 0 | 10 | 47 | 7 | 0 | 12 | 12 | 2 | 0 | 2 | 14 | 13 | 0 | 164 | |
| 3:35 PM | 11 | 44 | 2 | 0 | 7 | 33 | 13 | 0 | 10 | 23 | 3 | 0 | 1 | 12 | 6 | 0 | 165 | |
| 3:40 PM | 6 | 51 | 4 | 0 | 15 | 33 | 11 | 0 | 7 | 11 | 3 | 0 | 1 | 22 | 12 | 0 | 176 | |
| 3:45 PM | 5 | 53 | 7 | 0 | 11 | 41 | 21 | 0 | 13 | 24 | 4 | 0 | 2 | 16 | 3 | 0 | 200 | |
| 3:50 PM | 2 | 72 | 3 | 0 | 13 | 62 | 9 | 0 | 7 | 10 | 0 | 0 | 4 | 8 | 10 | 0 | 200 | |
| 3:55 PM | 5 | 44 | 4 | 0 | 27 | 38 | 8 | 0 | 11 | 21 | 9 | 0 | 2 | 14 | 4 | 0 | 187 | |
| 4:00 PM | 3 | 32 | 3 | 0 | 15 | 40 | 14 | 0 | 15 | 27 | 6 | 0 | 1 | 11 | 15 | 0 | 182 | |
| 4:05 PM | 6 | 54 | 3 | 0 | 16 | 50 | 13 | 0 | 5 | 14 | 4 | 0 | 1 | 6 | 6 | 0 | 178 | |
| 4:10 PM | 4 | 40 | 5 | 0 | 17 | 53 | 17 | 0 | 17 | 25 | 2 | 0 | 1 | 12 | 8 | 0 | 201 | |
| 4:15 PM | 4 | 57 | 4 | 0 | 7 | 42 | 13 | 0 | 8 | 27 | 5 | 0 | 3 | 11 | 5 | 0 | 186 | |
| 4:20 PM | 4 | 58 | 6 | 0 | 9 | 31 | 12 | 0 | 12 | 24 | 4 | 0 | 0 | 11 | 15 | 0 | 186 | |
| 4:25 PM | 2 | 45 | 4 | 0 | 10 | 50 | 17 | 0 | 7 | 27 | 4 | 0 | 0 | 15 | 9 | 0 | 190 | 2215 |
| 4:30 PM | 5 | 16 | 1 | 0 | 15 | 42 | 15 | 0 | 11 | 29 | 7 | 0 | 1 | 9 | 11 | 0 | 162 | 2213 |
| 4:35 PM | 4 | 47 | 2 | 0 | 13 | 43 | 12 | 0 | 10 | 20 | 2 | 0 | 0 | 16 | 9 | 0 | 178 | 2226 |
| 4:40 PM | 9 | 44 | 5 | 0 | 4 | 41 | 11 | 0 | 19 | 23 | 5 | 0 | 2 | 14 | 6 | 0 | 183 | 2233 |
| 4:45 PM | 8 | 38 | 5 | 0 | 18 | 56 | 15 | 0 | 10 | 13 | 3 | 0 | 7 | 13 | 10 | 0 | 196 | 2229 |
| 4:50 PM | 3 | 55 | 5 | 0 | 11 | 54 | 17 | 0 | 7 | 19 | 4 | 0 | 3 | 6 | 6 | 0 | 190 | 2219 |
| 4:55 PM | 15 | 34 | 0 | 0 | 20 | 34 | 10 | 0 | 16 | 33 | 0 | 0 | 4 | 22 | 6 | 0 | 194 | 2226 |
| 5:00 PM | 3 | 71 | 1 | 0 | 10 | 53 | 12 | 0 | 12 | 7 | 0 | 0 | 4 | 9 | 4 | 0 | 186 | 2230 |
| 5:05 PM | 10 | 59 | 2 | 0 | 16 | 55 | 12 | 0 | 9 | 25 | 0 | 0 | 0 | 21 | 4 | 0 | 213 | 2265 |
| 5:10 PM | 8 | 35 | 4 | 0 | 21 | 36 | 13 | 0 | 14 | 17 | 1 | 0 | 2 | 19 | 7 | 0 | 177 | 2241 |
| 5:15 PM | 3 | 51 | 2 | 0 | 14 | 51 | 16 | 0 | 7 | 19 | 0 | 0 | 3 | 13 | 4 | 0 | 183 | 2238 |
| 5:20 PM | 2 | 43 | 6 | 0 | 12 | 44 | 10 | 0 | 11 | 20 | 5 | 0 | 0 | 13 | 5 | 0 | 171 | 2223 |
| 5:25 PM | 6 | 48 | 5 | 0 | 15 | 45 | 15 | 0 | 3 | 22 | 8 | 0 | 4 | 13 | 4 | 0 | 188 | 2221 |

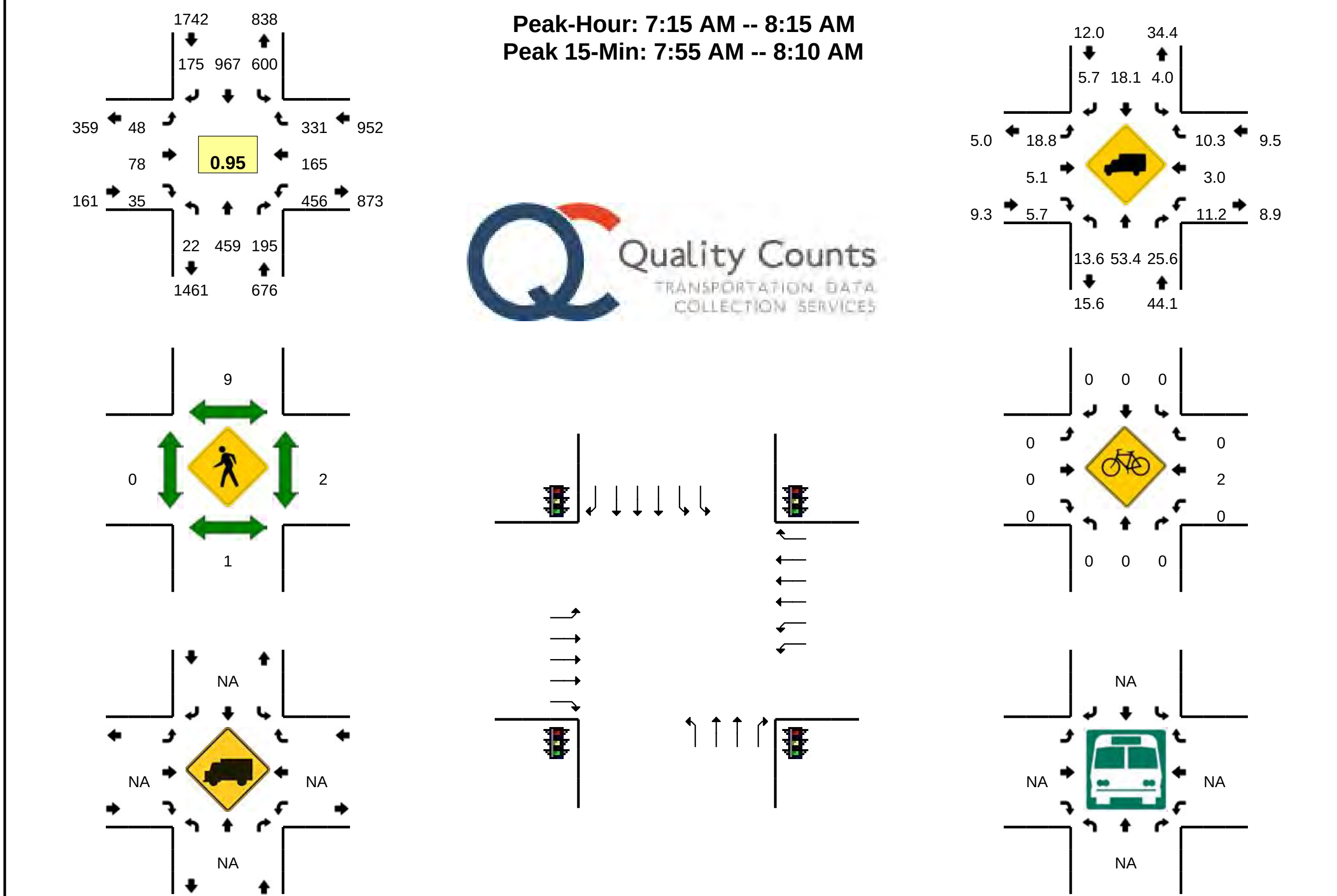
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 112 | 656 | 12 | 0 | 184 | 568 | 136 | 0 | 148 | 260 | 0 | 0 | 32 | 208 | 56 | 0 | 2372 |
| Heavy Trucks | 0 | 16 | 0 | | 0 | 12 | 4 | | 4 | 0 | 0 | | 0 | 0 | 0 | | 36 |
| Pedestrians | | 0 | | | | 12 | | | | 0 | | | | 0 | | | 12 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

Type of peak hour being reported: Intersection Peak Method for determining peak hour: Total Entering Volume

**LOCATION:** Kalaeloa Boulevard -- Kapolei Pkwy **QC JOB #:** 14567209
**CITY/STATE:** Kapolei, HI **DATE:** Wed, Nov 29 2017

**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:55 AM -- 8:10 AM**




| 5-Min Count Period Beginning At | Kalaeloa Boulevard (Northbound) Left | Thru | Right | U | Kalaeloa Boulevard (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 1 | 19 | 7 | 0 | 38 | 108 | 10 | 0 | 0 | 4 | 4 | 0 | 43 | 12 | 17 | 0 | 263 | |
| 6:35 AM | 2 | 21 | 7 | 0 | 47 | 104 | 6 | 0 | 3 | 2 | 2 | 0 | 67 | 8 | 19 | 0 | 288 | |
| 6:40 AM | 3 | 28 | 8 | 1 | 23 | 89 | 8 | 0 | 4 | 3 | 5 | 0 | 70 | 5 | 19 | 0 | 266 | |
| 6:45 AM | 1 | 25 | 6 | 0 | 22 | 107 | 10 | 0 | 3 | 1 | 3 | 0 | 68 | 13 | 21 | 0 | 280 | |
| 6:50 AM | 4 | 33 | 14 | 0 | 46 | 128 | 7 | 0 | 3 | 7 | 6 | 0 | 37 | 3 | 13 | 0 | 301 | |
| 6:55 AM | 1 | 23 | 13 | 0 | 41 | 111 | 13 | 0 | 2 | 5 | 3 | 0 | 56 | 9 | 19 | 0 | 296 | |
| 7:00 AM | 3 | 23 | 21 | 0 | 32 | 87 | 10 | 0 | 8 | 7 | 3 | 0 | 48 | 7 | 22 | 0 | 271 | |
| 7:05 AM | 0 | 29 | 12 | 0 | 52 | 77 | 12 | 0 | 5 | 7 | 6 | 0 | 39 | 8 | 15 | 0 | 262 | |
| 7:10 AM | 3 | 39 | 11 | 0 | 48 | 86 | 12 | 0 | 2 | 13 | 1 | 0 | 22 | 3 | 24 | 0 | 264 | |
| 7:15 AM | 0 | 41 | 14 | 1 | 26 | 82 | 13 | 0 | 5 | 6 | 3 | 0 | 56 | 8 | 40 | 0 | 295 | |
| 7:20 AM | 3 | 37 | 11 | 0 | 74 | 104 | 4 | 0 | 1 | 8 | 4 | 0 | 32 | 7 | 11 | 0 | 296 | |
| 7:25 AM | 0 | 42 | 17 | 0 | 34 | 76 | 15 | 0 | 5 | 5 | 2 | 0 | 53 | 12 | 22 | 0 | 283 | 3365 |
| 7:30 AM | 1 | 36 | 10 | 0 | 67 | 105 | 9 | 0 | 2 | 6 | 2 | 0 | 25 | 5 | 24 | 0 | 292 | 3394 |
| 7:35 AM | 2 | 22 | 23 | 0 | 65 | 67 | 6 | 0 | 7 | 12 | 5 | 0 | 46 | 7 | 27 | 0 | 289 | 3395 |
| 7:40 AM | 0 | 37 | 20 | 0 | 40 | 86 | 22 | 0 | 3 | 1 | 1 | 0 | 42 | 8 | 29 | 0 | 289 | 3418 |
| 7:45 AM | 0 | 38 | 9 | 0 | 69 | 80 | 18 | 0 | 0 | 5 | 1 | 0 | 32 | 14 | 28 | 0 | 294 | 3432 |
| 7:50 AM | 3 | 38 | 20 | 0 | 34 | 65 | 13 | 0 | 4 | 3 | 4 | 0 | 46 | 21 | 25 | 0 | 276 | 3407 |
| 7:55 AM | 4 | 39 | 15 | 1 | 73 | 93 | 24 | 0 | 4 | 10 | 1 | 0 | 27 | 18 | 35 | 0 | 344 | 3455 |
| 8:00 AM | 4 | 29 | 20 | 0 | 38 | 71 | 18 | 0 | 3 | 8 | 6 | 0 | 36 | 26 | 28 | 0 | 287 | 3471 |
| 8:05 AM | 1 | 34 | 18 | 0 | 39 | 72 | 18 | 0 | 6 | 10 | 2 | 0 | 38 | 26 | 33 | 0 | 297 | 3506 |
| 8:10 AM | 1 | 66 | 18 | 1 | 41 | 66 | 15 | 0 | 8 | 4 | 4 | 0 | 23 | 13 | 29 | 0 | 289 | 3531 |
| 8:15 AM | 2 | 42 | 9 | 0 | 37 | 65 | 20 | 0 | 6 | 11 | 5 | 0 | 45 | 25 | 26 | 0 | 293 | 3529 |
| 8:20 AM | 2 | 60 | 19 | 0 | 50 | 51 | 19 | 0 | 7 | 8 | 4 | 0 | 22 | 7 | 16 | 0 | 265 | 3498 |
| 8:25 AM | 5 | 54 | 19 | 0 | 28 | 46 | 22 | 0 | 15 | 7 | 1 | 0 | 24 | 21 | 33 | 0 | 275 | 3490 |

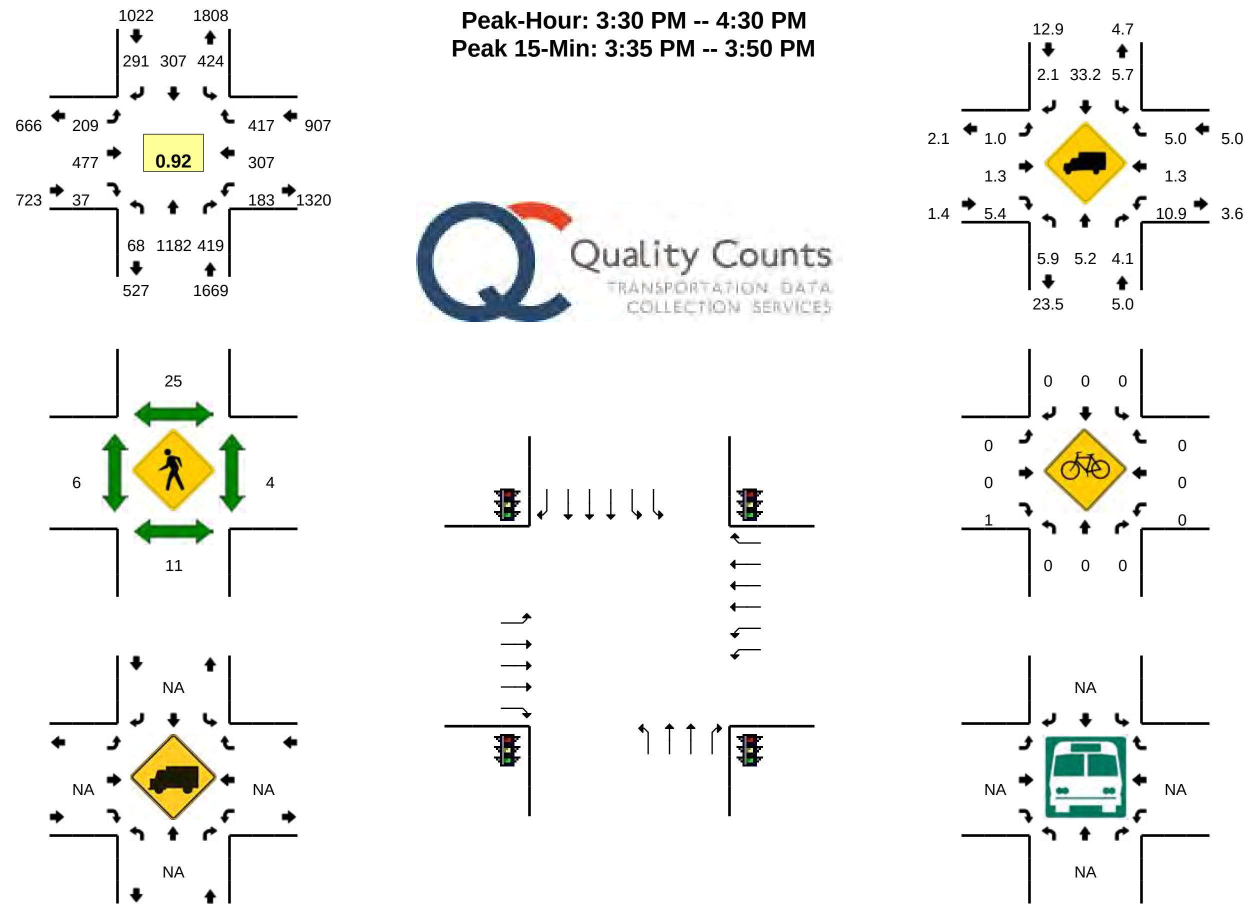
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 36 | 408 | 212 | 4 | 600 | 944 | 240 | 0 | 52 | 112 | 36 | 0 | 404 | 280 | 384 | 0 | 3712 |
| Heavy Trucks | 8 | 220 | 52 | | 32 | 228 | 20 | | 8 | 4 | 4 | | 52 | 12 | 52 | | 692 |
| Pedestrians | | 0 | | | | 8 | | | | 0 | | | | 4 | | | 12 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

**LOCATION:** Kalaeloa Boulevard -- Kapolei Pkwy | **QC JOB #:** 14567210
**CITY/STATE:** Kapolei, HI | **DATE:** Wed, Nov 29 2017

**Peak-Hour: 3:30 PM -- 4:30 PM**
**Peak 15-Min: 3:35 PM -- 3:50 PM**



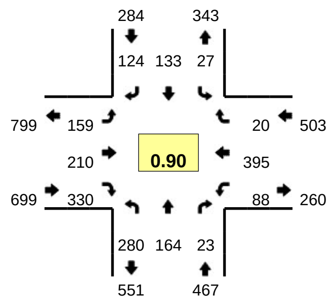

| 5-Min Count Period Beginning At | Kalaeloa Boulevard (Northbound) Left | Thru | Right | U | Kalaeloa Boulevard (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 3 | 115 | 41 | 0 | 33 | 36 | 26 | 0 | 17 | 36 | 3 | 0 | 21 | 13 | 33 | 0 | 377 | |
| 3:35 PM | 5 | 107 | 41 | 0 | 36 | 24 | 26 | 0 | 27 | 35 | 3 | 0 | 32 | 32 | 34 | 0 | 402 | |
| 3:40 PM | 6 | 111 | 39 | 0 | 30 | 28 | 21 | 0 | 14 | 54 | 2 | 0 | 7 | 41 | 33 | 0 | 386 | |
| 3:45 PM | 7 | 108 | 42 | 0 | 55 | 35 | 31 | 0 | 16 | 33 | 1 | 0 | 13 | 19 | 31 | 0 | 391 | |
| 3:50 PM | 4 | 101 | 21 | 0 | 42 | 28 | 34 | 0 | 15 | 31 | 1 | 0 | 15 | 24 | 34 | 0 | 350 | |
| 3:55 PM | 8 | 90 | 42 | 0 | 29 | 17 | 27 | 0 | 13 | 31 | 3 | 0 | 15 | 17 | 27 | 0 | 319 | |
| 4:00 PM | 8 | 60 | 20 | 0 | 43 | 25 | 27 | 0 | 26 | 56 | 4 | 0 | 6 | 31 | 42 | 0 | 348 | |
| 4:05 PM | 11 | 108 | 36 | 0 | 35 | 31 | 13 | 0 | 16 | 39 | 3 | 0 | 0 | 17 | 35 | 0 | 344 | |
| 4:10 PM | 4 | 117 | 44 | 0 | 26 | 19 | 23 | 0 | 13 | 40 | 2 | 0 | 9 | 13 | 35 | 0 | 345 | |
| 4:15 PM | 3 | 119 | 32 | 0 | 27 | 23 | 15 | 0 | 14 | 24 | 3 | 0 | 9 | 34 | 31 | 0 | 334 | |
| 4:20 PM | 3 | 72 | 34 | 0 | 34 | 18 | 25 | 0 | 25 | 50 | 4 | 0 | 35 | 37 | 49 | 0 | 386 | |
| 4:25 PM | 6 | 74 | 27 | 0 | 34 | 23 | 23 | 0 | 13 | 48 | 8 | 0 | 21 | 29 | 33 | 0 | 339 | 4321 |
| 4:30 PM | 2 | 89 | 31 | 0 | 50 | 38 | 18 | 0 | 14 | 24 | 3 | 0 | 11 | 18 | 25 | 0 | 323 | 4267 |
| 4:35 PM | 8 | 36 | 29 | 0 | 53 | 32 | 24 | 0 | 31 | 37 | 2 | 0 | 16 | 28 | 52 | 0 | 348 | 4213 |
| 4:40 PM | 9 | 105 | 54 | 0 | 24 | 33 | 17 | 0 | 15 | 32 | 3 | 0 | 28 | 26 | 48 | 0 | 394 | 4221 |
| 4:45 PM | 2 | 116 | 51 | 0 | 37 | 16 | 14 | 0 | 14 | 41 | 2 | 0 | 9 | 16 | 38 | 0 | 356 | 4186 |
| 4:50 PM | 1 | 83 | 44 | 0 | 22 | 24 | 18 | 0 | 28 | 30 | 1 | 0 | 35 | 19 | 30 | 0 | 335 | 4171 |
| 4:55 PM | 11 | 41 | 26 | 0 | 64 | 22 | 23 | 0 | 11 | 33 | 2 | 0 | 9 | 55 | 40 | 0 | 337 | 4189 |
| 5:00 PM | 5 | 103 | 25 | 0 | 31 | 25 | 18 | 0 | 15 | 28 | 1 | 0 | 17 | 15 | 29 | 0 | 312 | 4153 |
| 5:05 PM | 0 | 87 | 31 | 0 | 36 | 17 | 25 | 0 | 13 | 39 | 4 | 0 | 15 | 22 | 30 | 0 | 319 | 4128 |
| 5:10 PM | 5 | 63 | 32 | 0 | 28 | 21 | 21 | 0 | 29 | 35 | 3 | 0 | 41 | 20 | 34 | 0 | 332 | 4115 |
| 5:15 PM | 12 | 65 | 32 | 0 | 46 | 26 | 24 | 0 | 14 | 50 | 2 | 0 | 7 | 24 | 25 | 0 | 327 | 4108 |
| 5:20 PM | 7 | 53 | 14 | 1 | 40 | 13 | 16 | 0 | 26 | 30 | 3 | 0 | 22 | 33 | 32 | 0 | 290 | 4012 |
| 5:25 PM | 1 | 82 | 42 | 0 | 22 | 22 | 19 | 0 | 26 | 24 | 2 | 0 | 19 | 21 | 25 | 0 | 305 | 3978 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 72 | 1304 | 488 | 0 | 484 | 348 | 312 | 0 | 228 | 488 | 24 | 0 | 208 | 368 | 392 | 0 | 4716 |
| Heavy Trucks | 0 | 52 | 20 | | 48 | 136 | 20 | | 4 | 12 | 0 | | 40 | 4 | 32 | | 368 |
| Pedestrians | | 16 | | | | 8 | | | | 4 | | | | 0 | | | 28 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

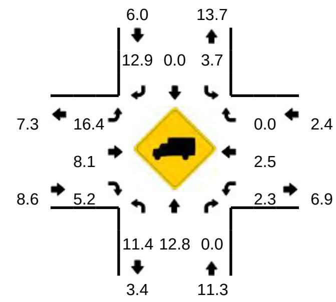
*Comments:*

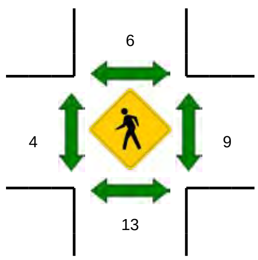
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

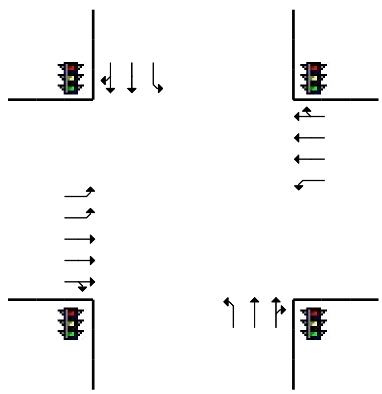
**LOCATION:** Kamokila Blvd -- Kapolei Pkwy | **QC JOB #:** 14567211
**CITY/STATE:** Kapolei, HI | **DATE:** Wed, Nov 29 2017

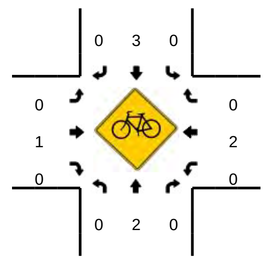


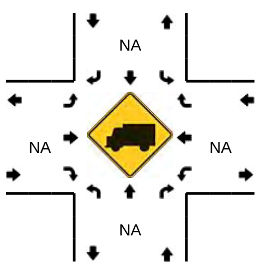

**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:50 AM -- 8:05 AM**

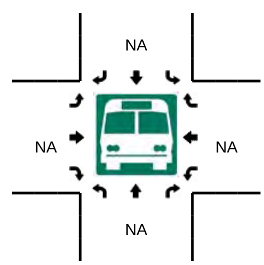





| 5-Min Count Period Beginning At | Kamokila Blvd (Northbound) Left | Thru | Right | U | Kamokila Blvd (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 15 | 1 | 0 | 0 | 1 | 8 | 16 | 0 | 11 | 9 | 19 | 0 | 2 | 27 | 0 | 0 | 109 | |
| 6:35 AM | 36 | 7 | 0 | 0 | 2 | 9 | 12 | 0 | 7 | 5 | 14 | 0 | 2 | 30 | 1 | 0 | 125 | |
| 6:40 AM | 33 | 4 | 0 | 0 | 1 | 3 | 19 | 0 | 4 | 9 | 11 | 0 | 4 | 25 | 3 | 0 | 116 | |
| 6:45 AM | 25 | 6 | 0 | 0 | 0 | 6 | 9 | 0 | 5 | 11 | 4 | 0 | 1 | 36 | 0 | 0 | 103 | |
| 6:50 AM | 14 | 5 | 0 | 0 | 4 | 12 | 8 | 0 | 5 | 21 | 12 | 0 | 1 | 30 | 1 | 0 | 113 | |
| 6:55 AM | 32 | 8 | 1 | 0 | 1 | 11 | 11 | 0 | 11 | 7 | 14 | 0 | 6 | 17 | 4 | 0 | 123 | |
| 7:00 AM | 32 | 12 | 2 | 0 | 1 | 8 | 6 | 0 | 8 | 16 | 19 | 0 | 1 | 20 | 4 | 0 | 129 | |
| 7:05 AM | 18 | 0 | 2 | 0 | 1 | 7 | 18 | 0 | 9 | 15 | 22 | 0 | 3 | 18 | 2 | 0 | 115 | |
| 7:10 AM | 22 | 12 | 1 | 0 | 4 | 6 | 4 | 0 | 21 | 12 | 26 | 0 | 3 | 34 | 1 | 0 | 146 | |
| 7:15 AM | 27 | 11 | 0 | 0 | 2 | 8 | 9 | 0 | 10 | 7 | 17 | 0 | 2 | 27 | 3 | 0 | 123 | |
| 7:20 AM | 23 | 8 | 3 | 0 | 2 | 3 | 11 | 0 | 13 | 18 | 28 | 0 | 4 | 39 | 0 | 0 | 152 | |
| 7:25 AM | 13 | 8 | 1 | 0 | 0 | 17 | 10 | 0 | 18 | 14 | 22 | 0 | 9 | 22 | 3 | 0 | 137 | 1491 |
| 7:30 AM | 32 | 14 | 2 | 0 | 3 | 15 | 7 | 0 | 11 | 16 | 30 | 0 | 6 | 13 | 0 | 0 | 149 | 1531 |
| 7:35 AM | 26 | 9 | 3 | 0 | 1 | 17 | 6 | 0 | 9 | 17 | 34 | 0 | 5 | 31 | 1 | 0 | 159 | 1565 |
| 7:40 AM | 16 | 18 | 3 | 0 | 2 | 9 | 8 | 0 | 18 | 20 | 42 | 0 | 9 | 41 | 2 | 0 | 188 | 1637 |
| 7:45 AM | 25 | 27 | 2 | 0 | 3 | 17 | 8 | 0 | 14 | 12 | 14 | 0 | 14 | 28 | 3 | 0 | 167 | 1701 |
| 7:50 AM | 30 | 29 | 2 | 0 | 5 | 9 | 10 | 0 | 9 | 12 | 29 | 0 | 4 | 45 | 0 | 0 | 184 | 1772 |
| 7:55 AM | 21 | 12 | 2 | 0 | 3 | 8 | 9 | 0 | 14 | 23 | 25 | 0 | 10 | 35 | 4 | 0 | 166 | 1815 |
| 8:00 AM | 14 | 7 | 0 | 0 | 3 | 5 | 24 | 0 | 21 | 25 | 33 | 0 | 8 | 49 | 2 | 0 | 191 | 1877 |
| 8:05 AM | 26 | 11 | 4 | 0 | 2 | 11 | 6 | 0 | 14 | 19 | 22 | 0 | 9 | 34 | 0 | 0 | 158 | 1920 |
| 8:10 AM | 27 | 10 | 1 | 0 | 1 | 14 | 16 | 0 | 8 | 27 | 34 | 0 | 8 | 31 | 2 | 0 | 179 | 1953 |
| 8:15 AM | 24 | 5 | 1 | 0 | 4 | 7 | 13 | 0 | 9 | 12 | 19 | 0 | 7 | 16 | 1 | 0 | 118 | 1948 |
| 8:20 AM | 22 | 10 | 1 | 0 | 6 | 7 | 11 | 0 | 23 | 12 | 28 | 0 | 5 | 22 | 4 | 0 | 151 | 1947 |
| 8:25 AM | 24 | 4 | 1 | 0 | 0 | 14 | 14 | 0 | 12 | 11 | 17 | 0 | 4 | 19 | 0 | 0 | 120 | 1930 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 260 | 192 | 16 | 0 | 44 | 88 | 172 | 0 | 176 | 240 | 348 | 0 | 88 | 516 | 24 | 0 | 2164 |
| Heavy Trucks | 16 | 28 | 0 | | 0 | 0 | 24 | | 28 | 8 | 20 | | 0 | 16 | 0 | | 140 |
| Pedestrians | | 16 | | | | 8 | | | | 0 | | | | 8 | | | 32 |
| Bicycles | 0 | 1 | 0 | | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 2 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

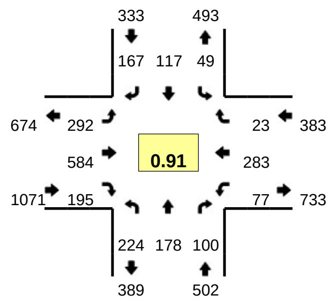
*Comments:*

Report generated on 12/7/2017 5:09 PM

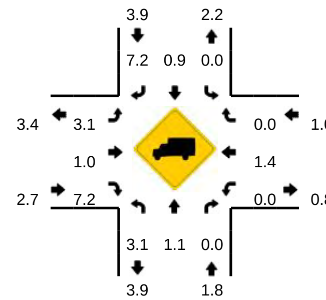
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

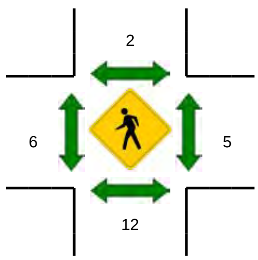
**LOCATION:** Kamokila Blvd -- Kapolei Pkwy
**CITY/STATE:** Kapolei, HI

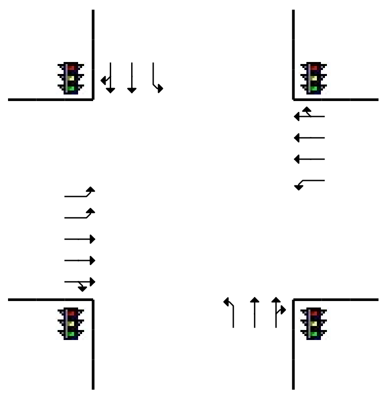
**QC JOB #:** 14567212
**DATE:** Wed, Nov 29 2017

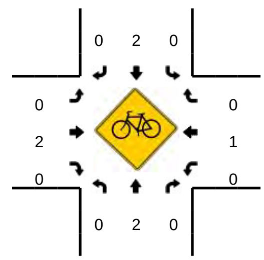


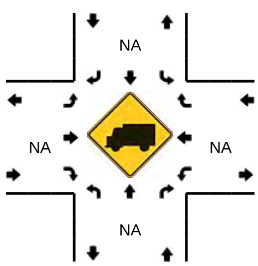

**Peak-Hour: 3:50 PM -- 4:50 PM**
**Peak 15-Min: 4:35 PM -- 4:50 PM**

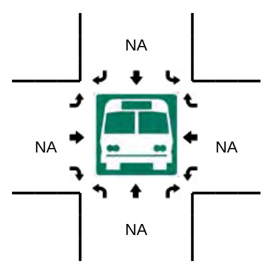




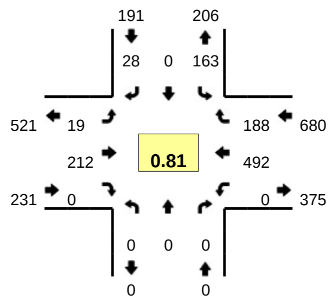

| 5-Min Count Period Beginning At | Kamokila Blvd (Northbound) Left | Thru | Right | U | Kamokila Blvd (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 13 | 13 | 6 | 0 | 5 | 5 | 29 | 0 | 33 | 42 | 14 | 0 | 5 | 25 | 1 | 0 | 191 | |
| 3:35 PM | 23 | 17 | 4 | 0 | 5 | 18 | 8 | 0 | 19 | 45 | 16 | 0 | 2 | 29 | 2 | 0 | 188 | |
| 3:40 PM | 14 | 15 | 8 | 0 | 3 | 7 | 12 | 0 | 25 | 48 | 22 | 0 | 10 | 19 | 3 | 0 | 186 | |
| 3:45 PM | 29 | 16 | 5 | 0 | 6 | 16 | 10 | 0 | 16 | 39 | 17 | 0 | 7 | 22 | 1 | 0 | 184 | |
| 3:50 PM | 19 | 11 | 7 | 0 | 8 | 6 | 6 | 0 | 33 | 57 | 22 | 0 | 6 | 27 | 4 | 0 | 206 | |
| 3:55 PM | 11 | 13 | 3 | 0 | 3 | 14 | 16 | 0 | 19 | 53 | 19 | 0 | 8 | 19 | 2 | 0 | 180 | |
| 4:00 PM | 13 | 10 | 8 | 0 | 4 | 11 | 18 | 0 | 20 | 40 | 5 | 0 | 8 | 25 | 2 | 0 | 164 | |
| 4:05 PM | 17 | 27 | 8 | 0 | 3 | 10 | 12 | 0 | 34 | 38 | 18 | 0 | 3 | 11 | 0 | 0 | 181 | |
| 4:10 PM | 7 | 6 | 4 | 0 | 5 | 11 | 11 | 0 | 37 | 53 | 22 | 0 | 8 | 30 | 2 | 0 | 196 | |
| 4:15 PM | 31 | 20 | 10 | 0 | 6 | 7 | 17 | 0 | 21 | 33 | 14 | 0 | 4 | 19 | 0 | 0 | 182 | |
| 4:20 PM | 19 | 9 | 8 | 0 | 4 | 11 | 9 | 0 | 12 | 52 | 10 | 0 | 5 | 34 | 1 | 0 | 174 | |
| 4:25 PM | 16 | 11 | 10 | 0 | 3 | 15 | 16 | 0 | 24 | 41 | 11 | 0 | 9 | 27 | 1 | 0 | 184 | 2216 |
| 4:30 PM | 26 | 16 | 10 | 0 | 3 | 11 | 11 | 0 | 17 | 54 | 21 | 0 | 5 | 16 | 1 | 0 | 191 | 2216 |
| 4:35 PM | 14 | 16 | 12 | 0 | 0 | 7 | 27 | 0 | 32 | 46 | 21 | 0 | 6 | 13 | 4 | 0 | 198 | 2226 |
| 4:40 PM | 30 | 23 | 14 | 0 | 4 | 2 | 11 | 0 | 21 | 31 | 16 | 0 | 7 | 40 | 5 | 0 | 204 | 2244 |
| 4:45 PM | 21 | 16 | 6 | 0 | 6 | 12 | 13 | 0 | 22 | 86 | 16 | 0 | 8 | 22 | 1 | 0 | 229 | 2289 |
| 4:50 PM | 21 | 12 | 7 | 0 | 1 | 10 | 16 | 0 | 31 | 47 | 7 | 0 | 9 | 37 | 1 | 0 | 199 | 2282 |
| 4:55 PM | 18 | 6 | 4 | 0 | 3 | 2 | 12 | 0 | 17 | 49 | 8 | 0 | 10 | 26 | 2 | 0 | 157 | 2259 |
| 5:00 PM | 18 | 14 | 12 | 0 | 6 | 14 | 20 | 0 | 19 | 41 | 13 | 0 | 2 | 20 | 0 | 0 | 179 | 2274 |
| 5:05 PM | 20 | 13 | 5 | 0 | 4 | 2 | 5 | 0 | 23 | 42 | 15 | 0 | 11 | 30 | 3 | 0 | 173 | 2266 |
| 5:10 PM | 10 | 6 | 4 | 0 | 6 | 10 | 8 | 0 | 18 | 58 | 20 | 0 | 4 | 28 | 5 | 0 | 177 | 2247 |
| 5:15 PM | 25 | 13 | 6 | 0 | 2 | 14 | 7 | 0 | 24 | 43 | 11 | 0 | 4 | 25 | 2 | 0 | 176 | 2241 |
| 5:20 PM | 15 | 8 | 7 | 0 | 7 | 9 | 18 | 0 | 29 | 39 | 10 | 0 | 7 | 31 | 3 | 0 | 183 | 2250 |
| 5:25 PM | 22 | 11 | 8 | 0 | 8 | 6 | 9 | 0 | 20 | 48 | 10 | 0 | 3 | 22 | 4 | 0 | 171 | 2237 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 260 | 220 | 128 | 0 | 40 | 84 | 204 | 0 | 300 | 652 | 212 | 0 | 84 | 300 | 40 | 0 | 2524 |
| Heavy Trucks | 0 | 4 | 0 | | 0 | 0 | 24 | | 16 | 4 | 8 | | 0 | 4 | 0 | | 60 |
| Pedestrians | | 20 | | | | 4 | | | | 8 | | | | 0 | | | 32 |
| Bicycles | 0 | 1 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 | | 0 | 0 | 0 | | 2 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

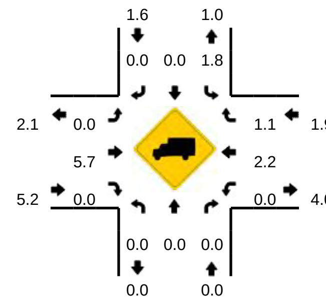
*Comments:*

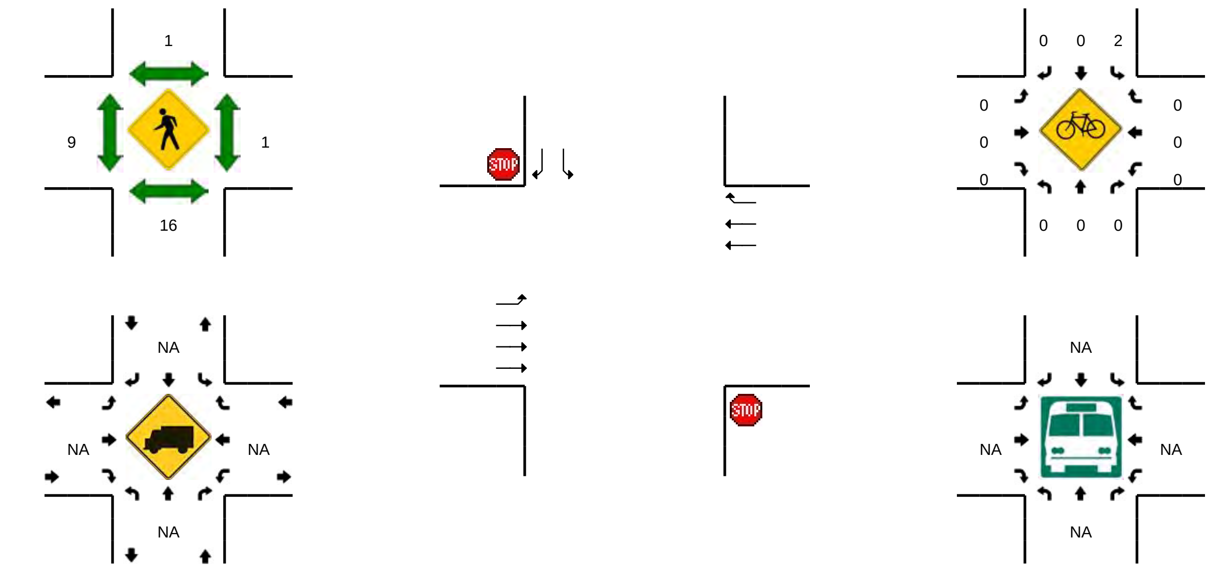
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

**LOCATION:** Wakea St -- Kapolei Pkwy — **QC JOB #:** 14567213
**CITY/STATE:** Honolulu, HI — **DATE:** Wed, Nov 29 2017




**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:35 AM -- 7:50 AM**



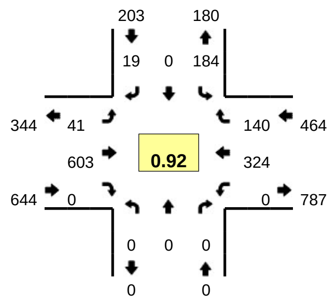




| 5-Min Count Period Beginning At | Wakea St (Northbound) Left | Thru | Right | U | Wakea St (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 17 | 6 | 0 | 39 | |
| 6:35 AM | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 1 | 8 | 0 | 0 | 0 | 38 | 9 | 0 | 70 | |
| 6:40 AM | 0 | 0 | 0 | 0 | 10 | 0 | 1 | 0 | 0 | 6 | 0 | 0 | 0 | 15 | 8 | 0 | 40 | |
| 6:45 AM | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 31 | 6 | 0 | 57 | |
| 6:50 AM | 0 | 0 | 0 | 0 | 11 | 0 | 1 | 0 | 1 | 14 | 0 | 0 | 0 | 25 | 13 | 0 | 65 | |
| 6:55 AM | 0 | 0 | 0 | 0 | 21 | 0 | 1 | 0 | 1 | 10 | 0 | 0 | 0 | 18 | 9 | 0 | 60 | |
| 7:00 AM | 0 | 0 | 0 | 0 | 21 | 0 | 0 | 0 | 3 | 13 | 0 | 0 | 0 | 25 | 10 | 0 | 72 | |
| 7:05 AM | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 3 | 13 | 0 | 0 | 0 | 19 | 16 | 0 | 63 | |
| 7:10 AM | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 4 | 8 | 0 | 0 | 0 | 34 | 12 | 0 | 71 | |
| 7:15 AM | 0 | 0 | 0 | 0 | 9 | 0 | 2 | 0 | 1 | 10 | 0 | 0 | 0 | 28 | 13 | 0 | 63 | |
| 7:20 AM | 0 | 0 | 0 | 0 | 11 | 0 | 4 | 0 | 1 | 14 | 0 | 0 | 0 | 41 | 11 | 0 | 82 | |
| 7:25 AM | 0 | 0 | 0 | 0 | 18 | 0 | 1 | 0 | 2 | 12 | 0 | 0 | 0 | 36 | 18 | 0 | 87 | 769 |
| 7:30 AM | 0 | 0 | 0 | 0 | 26 | 0 | 1 | 0 | 3 | 22 | 0 | 0 | 0 | 21 | 10 | 0 | 83 | 813 |
| 7:35 AM | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 46 | 25 | 0 | 108 | 851 |
| 7:40 AM | 0 | 0 | 0 | 0 | 13 | 0 | 4 | 0 | 0 | 25 | 0 | 0 | 0 | 44 | 20 | 0 | 106 | 917 |
| 7:45 AM | 0 | 0 | 0 | 0 | 16 | 0 | 1 | 0 | 2 | 17 | 0 | 0 | 0 | 60 | 29 | 0 | 125 | 985 |
| 7:50 AM | 0 | 0 | 0 | 0 | 16 | 0 | 6 | 0 | 3 | 19 | 0 | 0 | 0 | 30 | 20 | 0 | 94 | 1014 |
| 7:55 AM | 0 | 0 | 0 | 0 | 13 | 0 | 1 | 0 | 1 | 19 | 0 | 0 | 0 | 57 | 20 | 0 | 111 | 1065 |
| 8:00 AM | 0 | 0 | 0 | 0 | 11 | 0 | 1 | 0 | 1 | 23 | 0 | 1 | 0 | 56 | 6 | 0 | 99 | 1092 |
| 8:05 AM | 0 | 0 | 0 | 0 | 12 | 0 | 4 | 0 | 2 | 15 | 0 | 0 | 0 | 26 | 6 | 0 | 65 | 1094 |
| 8:10 AM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 2 | 14 | 0 | 0 | 0 | 47 | 10 | 0 | 79 | 1102 |
| 8:15 AM | 0 | 0 | 0 | 0 | 13 | 0 | 1 | 0 | 2 | 14 | 0 | 0 | 0 | 24 | 9 | 0 | 63 | 1102 |
| 8:20 AM | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 13 | 0 | 0 | 0 | 28 | 6 | 0 | 54 | 1074 |
| 8:25 AM | 0 | 0 | 0 | 0 | 9 | 0 | 1 | 0 | 1 | 15 | 0 | 0 | 0 | 18 | 13 | 0 | 57 | 1044 |

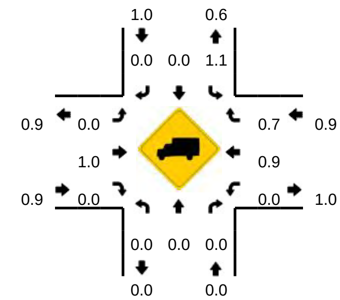
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 0 | 0 | 0 | 0 | 176 | 0 | 20 | 0 | 8 | 256 | 0 | 0 | 0 | 600 | 296 | 0 | 1356 |
| Heavy Trucks | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 16 | 0 | | 0 | 16 | 4 | | 36 |
| Pedestrians | | 20 | | | | 0 | | | | 16 | | | | 4 | | | 40 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

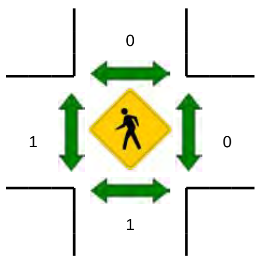
*Comments:*

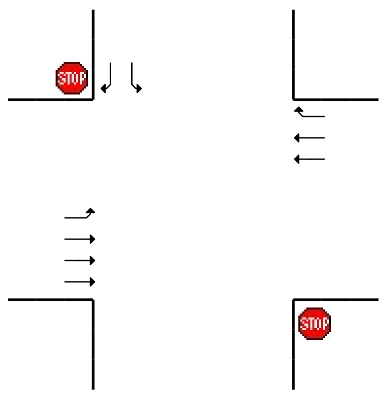
**LOCATION:** Wakea St -- Kapolei Pkwy **QC JOB #:** 14567214
**CITY/STATE:** Honolulu, HI **DATE:** Wed, Nov 29 2017

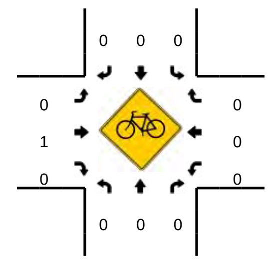


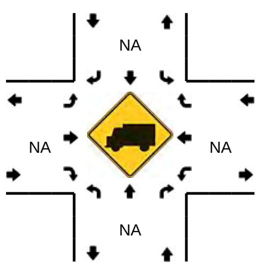

**Peak-Hour: 4:05 PM -- 5:05 PM**
**Peak 15-Min: 4:35 PM -- 4:50 PM**

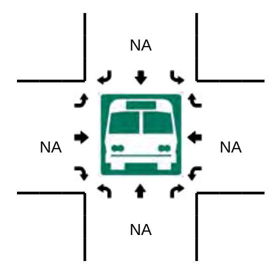



| 5-Min Count Period Beginning At | Wakea St (Northbound) Left | Thru | Right | U | Wakea St (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 0 | 0 | 0 | 0 | 17 | 0 | 4 | 0 | 3 | 34 | 0 | 0 | 0 | 21 | 15 | 0 | 94 | |
| 3:35 PM | 0 | 0 | 0 | 0 | 15 | 0 | 3 | 0 | 2 | 42 | 0 | 0 | 0 | 15 | 15 | 0 | 92 | |
| 3:40 PM | 0 | 0 | 0 | 0 | 13 | 0 | 1 | 0 | 4 | 52 | 0 | 0 | 0 | 38 | 12 | 0 | 120 | |
| 3:45 PM | 0 | 0 | 0 | 0 | 17 | 0 | 2 | 0 | 1 | 44 | 0 | 0 | 0 | 34 | 16 | 0 | 114 | |
| 3:50 PM | 0 | 0 | 0 | 0 | 8 | 0 | 3 | 0 | 3 | 58 | 0 | 0 | 0 | 21 | 10 | 0 | 103 | |
| 3:55 PM | 0 | 0 | 0 | 0 | 23 | 0 | 3 | 0 | 6 | 30 | 0 | 0 | 0 | 24 | 10 | 0 | 96 | |
| 4:00 PM | 0 | 0 | 0 | 0 | 15 | 0 | 3 | 0 | 5 | 47 | 0 | 0 | 0 | 27 | 7 | 0 | 104 | |
| 4:05 PM | 0 | 0 | 0 | 0 | 18 | 0 | 1 | 0 | 1 | 48 | 0 | 0 | 0 | 25 | 10 | 0 | 103 | |
| 4:10 PM | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 6 | 43 | 0 | 0 | 0 | 28 | 12 | 0 | 107 | |
| 4:15 PM | 0 | 0 | 0 | 0 | 15 | 0 | 1 | 0 | 3 | 32 | 0 | 0 | 0 | 33 | 18 | 0 | 102 | |
| 4:20 PM | 0 | 0 | 0 | 0 | 13 | 0 | 2 | 0 | 2 | 46 | 0 | 0 | 0 | 25 | 8 | 0 | 96 | |
| 4:25 PM | 0 | 0 | 0 | 0 | 14 | 0 | 2 | 0 | 3 | 42 | 0 | 1 | 0 | 25 | 12 | 0 | 99 | 1230 |
| 4:30 PM | 0 | 0 | 0 | 0 | 12 | 0 | 5 | 0 | 1 | 58 | 0 | 0 | 0 | 15 | 17 | 0 | 108 | 1244 |
| 4:35 PM | 0 | 0 | 0 | 0 | 12 | 0 | 2 | 0 | 3 | 55 | 0 | 0 | 0 | 42 | 11 | 0 | 125 | 1277 |
| 4:40 PM | 0 | 0 | 0 | 0 | 14 | 0 | 3 | 0 | 4 | 53 | 0 | 0 | 0 | 17 | 5 | 0 | 96 | 1253 |
| 4:45 PM | 0 | 0 | 0 | 0 | 22 | 0 | 1 | 0 | 6 | 60 | 0 | 0 | 0 | 35 | 13 | 0 | 137 | 1276 |
| 4:50 PM | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 5 | 56 | 0 | 0 | 0 | 30 | 8 | 0 | 110 | 1283 |
| 4:55 PM | 0 | 0 | 0 | 0 | 23 | 0 | 1 | 0 | 3 | 43 | 0 | 0 | 0 | 21 | 10 | 0 | 101 | 1288 |
| 5:00 PM | 0 | 0 | 0 | 0 | 12 | 0 | 1 | 0 | 3 | 67 | 0 | 0 | 0 | 28 | 16 | 0 | 127 | 1311 |
| 5:05 PM | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 2 | 32 | 0 | 0 | 0 | 18 | 10 | 0 | 73 | 1281 |
| 5:10 PM | 0 | 0 | 0 | 0 | 14 | 0 | 2 | 0 | 3 | 58 | 0 | 0 | 0 | 30 | 6 | 0 | 113 | 1287 |
| 5:15 PM | 0 | 0 | 0 | 0 | 15 | 0 | 3 | 0 | 2 | 40 | 0 | 0 | 0 | 34 | 8 | 0 | 102 | 1287 |
| 5:20 PM | 0 | 0 | 0 | 0 | 11 | 0 | 2 | 0 | 2 | 41 | 0 | 0 | 0 | 19 | 11 | 0 | 86 | 1277 |
| 5:25 PM | 0 | 0 | 0 | 0 | 23 | 0 | 1 | 0 | 4 | 40 | 0 | 1 | 0 | 27 | 16 | 0 | 112 | 1290 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 0 | 0 | 0 | 0 | 192 | 0 | 24 | 0 | 52 | 672 | 0 | 0 | 0 | 376 | 116 | 0 | 1432 |
| Heavy Trucks | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 8 | 0 | | 0 | 0 | 0 | | 8 |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 | | 0 | 0 | 0 | | 1 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

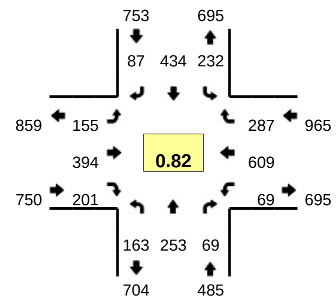
*Comments:*


SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

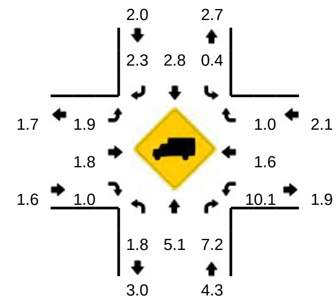
**LOCATION:** Fort Barrette Rd -- Kapolei Pkwy | **QC JOB #:** 14567215

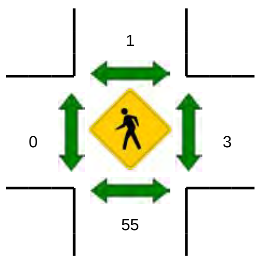
**CITY/STATE:** Honolulu, HI | **DATE:** Thu, Nov 30 2017

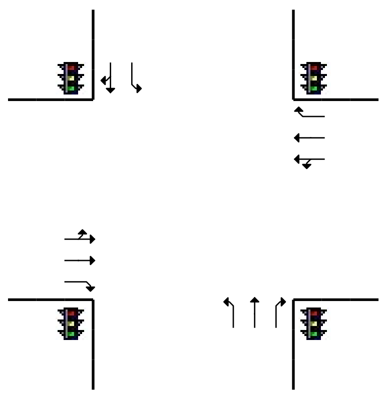


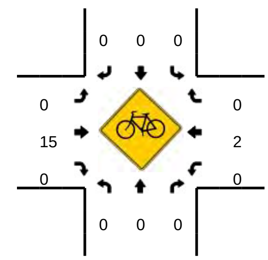

**Peak-Hour: 7:10 AM -- 8:10 AM**

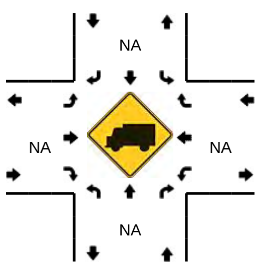
**Peak 15-Min: 7:40 AM -- 7:55 AM**

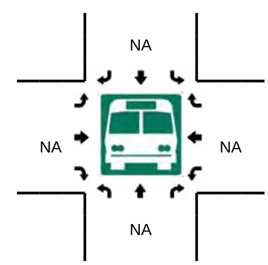





| 5-Min Count Period Beginning At | Fort Barrette Rd (Northbound) Left | Thru | Right | U | Fort Barrette Rd (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 5 | 12 | 0 | 0 | 6 | 29 | 6 | 0 | 13 | 19 | 10 | 0 | 3 | 34 | 14 | 0 | 151 | |
| 6:35 AM | 3 | 12 | 2 | 0 | 5 | 28 | 4 | 0 | 14 | 13 | 7 | 0 | 2 | 14 | 3 | 0 | 107 | |
| 6:40 AM | 3 | 7 | 1 | 0 | 7 | 21 | 4 | 0 | 5 | 7 | 10 | 0 | 2 | 32 | 10 | 0 | 109 | |
| 6:45 AM | 11 | 12 | 2 | 0 | 15 | 22 | 0 | 0 | 12 | 12 | 7 | 0 | 1 | 32 | 9 | 0 | 135 | |
| 6:50 AM | 5 | 11 | 2 | 0 | 6 | 37 | 7 | 0 | 7 | 23 | 11 | 0 | 5 | 38 | 13 | 0 | 165 | |
| 6:55 AM | 7 | 5 | 2 | 0 | 15 | 29 | 8 | 0 | 11 | 15 | 9 | 0 | 2 | 21 | 6 | 0 | 130 | |
| 7:00 AM | 6 | 18 | 0 | 0 | 11 | 36 | 10 | 0 | 8 | 18 | 13 | 0 | 1 | 40 | 8 | 0 | 169 | |
| 7:05 AM | 15 | 11 | 2 | 0 | 13 | 25 | 14 | 0 | 11 | 18 | 17 | 0 | 1 | 28 | 10 | 0 | 165 | |
| 7:10 AM | 12 | 15 | 1 | 0 | 7 | 25 | 5 | 0 | 12 | 21 | 11 | 0 | 2 | 39 | 14 | 0 | 164 | |
| 7:15 AM | 11 | 12 | 1 | 0 | 17 | 35 | 9 | 0 | 9 | 25 | 14 | 0 | 5 | 45 | 9 | 0 | 192 | |
| 7:20 AM | 11 | 27 | 3 | 0 | 11 | 45 | 7 | 0 | 13 | 31 | 10 | 0 | 5 | 30 | 9 | 0 | 202 | |
| 7:25 AM | 24 | 17 | 4 | 0 | 31 | 29 | 8 | 0 | 4 | 27 | 19 | 0 | 3 | 76 | 15 | 0 | 257 | 1946 |
| 7:30 AM | 5 | 22 | 8 | 0 | 19 | 35 | 7 | 0 | 26 | 32 | 13 | 0 | 5 | 46 | 28 | 0 | 246 | 2041 |
| 7:35 AM | 24 | 29 | 8 | 0 | 28 | 41 | 6 | 0 | 8 | 19 | 12 | 0 | 6 | 59 | 16 | 0 | 256 | 2190 |
| 7:40 AM | 10 | 16 | 7 | 0 | 14 | 36 | 4 | 0 | 20 | 50 | 20 | 0 | 8 | 55 | 37 | 0 | 277 | 2358 |
| 7:45 AM | 22 | 33 | 10 | 0 | 26 | 49 | 10 | 0 | 8 | 31 | 28 | 0 | 8 | 51 | 36 | 0 | 312 | 2535 |
| 7:50 AM | 14 | 15 | 6 | 0 | 18 | 30 | 3 | 0 | 19 | 56 | 24 | 0 | 12 | 65 | 47 | 0 | 309 | 2679 |
| 7:55 AM | 14 | 34 | 9 | 0 | 25 | 45 | 10 | 0 | 16 | 32 | 19 | 0 | 4 | 41 | 26 | 0 | 275 | 2824 |
| 8:00 AM | 10 | 18 | 8 | 0 | 30 | 29 | 5 | 0 | 11 | 43 | 18 | 0 | 6 | 69 | 25 | 0 | 272 | 2927 |
| 8:05 AM | 6 | 15 | 4 | 0 | 6 | 35 | 13 | 0 | 9 | 27 | 13 | 0 | 5 | 33 | 25 | 0 | 191 | 2953 |
| 8:10 AM | 11 | 15 | 1 | 0 | 13 | 24 | 6 | 0 | 4 | 26 | 6 | 0 | 1 | 35 | 18 | 0 | 160 | 2949 |
| 8:15 AM | 5 | 12 | 5 | 0 | 10 | 20 | 4 | 0 | 13 | 22 | 12 | 0 | 1 | 48 | 23 | 0 | 175 | 2932 |
| 8:20 AM | 11 | 26 | 1 | 0 | 9 | 27 | 6 | 0 | 17 | 19 | 9 | 0 | 3 | 27 | 12 | 0 | 167 | 2897 |
| 8:25 AM | 9 | 13 | 4 | 0 | 14 | 24 | 3 | 0 | 14 | 9 | 11 | 0 | 4 | 25 | 11 | 0 | 141 | 2781 |

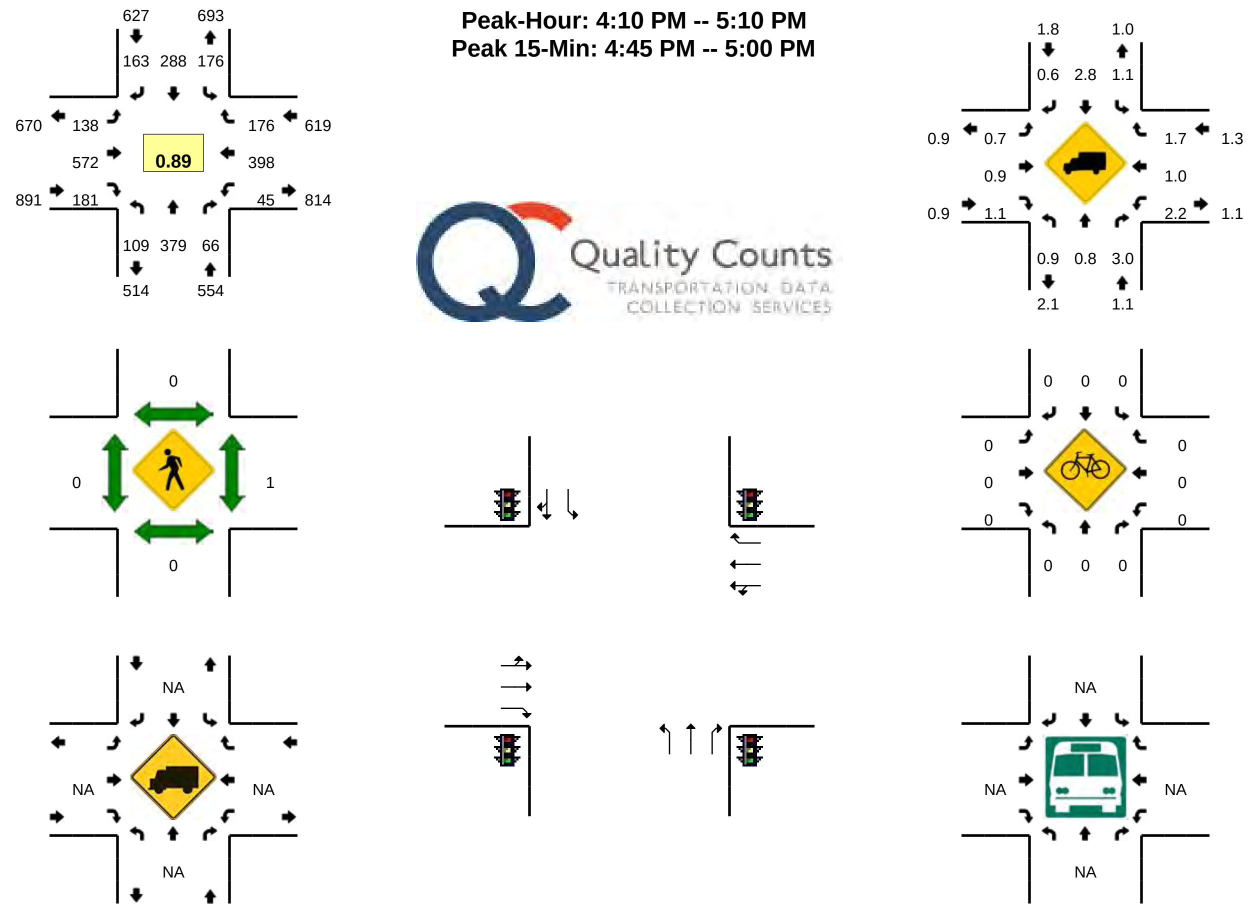
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 184 | 256 | 92 | 0 | 232 | 460 | 68 | 0 | 188 | 548 | 288 | 0 | 112 | 684 | 480 | 0 | 3592 |
| Heavy Trucks | 4 | 8 | 12 | | 4 | 24 | 4 | | 4 | 0 | 4 | | 8 | 8 | 4 | | 84 |
| Pedestrians | | 48 | | | | 4 | | | | 0 | | | | 0 | | | 52 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 4 | 0 | | 0 | 1 | 0 | | 5 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

**LOCATION:** Fort Barrette Rd -- Kapolei Pkwy | **QC JOB #:** 14567216
**CITY/STATE:** Honolulu, HI | **DATE:** Wed, Nov 29 2017

**Peak-Hour: 4:10 PM -- 5:10 PM**
**Peak 15-Min: 4:45 PM -- 5:00 PM**



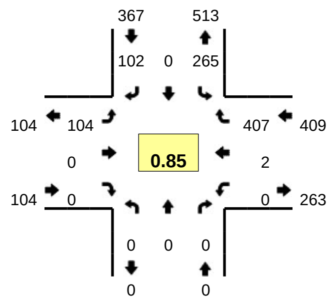

| 5-Min Count Period Beginning At | Fort Barrette Rd (Northbound) Left | Thru | Right | U | Fort Barrette Rd (Southbound) Left | Thru | Right | U | Kapolei Pkwy (Eastbound) Left | Thru | Right | U | Kapolei Pkwy (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 9 | 26 | 2 | 0 | 13 | 28 | 15 | 0 | 7 | 35 | 14 | 0 | 2 | 34 | 15 | 0 | 200 | |
| 3:35 PM | 8 | 32 | 8 | 0 | 8 | 21 | 14 | 0 | 13 | 44 | 17 | 0 | 6 | 38 | 20 | 0 | 229 | |
| 3:40 PM | 9 | 33 | 5 | 0 | 9 | 21 | 9 | 0 | 17 | 45 | 15 | 0 | 4 | 38 | 24 | 0 | 229 | |
| 3:45 PM | 13 | 37 | 4 | 0 | 15 | 21 | 16 | 0 | 11 | 37 | 16 | 0 | 3 | 22 | 10 | 0 | 205 | |
| 3:50 PM | 16 | 26 | 6 | 0 | 19 | 16 | 6 | 0 | 14 | 46 | 15 | 0 | 11 | 39 | 19 | 0 | 233 | |
| 3:55 PM | 8 | 36 | 5 | 0 | 16 | 31 | 14 | 0 | 16 | 34 | 17 | 0 | 0 | 18 | 13 | 0 | 208 | |
| 4:00 PM | 4 | 27 | 9 | 0 | 20 | 20 | 15 | 0 | 5 | 38 | 11 | 0 | 3 | 26 | 16 | 0 | 194 | |
| 4:05 PM | 9 | 11 | 7 | 0 | 24 | 21 | 8 | 0 | 19 | 50 | 13 | 0 | 8 | 44 | 8 | 0 | 222 | |
| 4:10 PM | 5 | 34 | 9 | 0 | 13 | 26 | 12 | 0 | 12 | 49 | 13 | 0 | 4 | 29 | 11 | 0 | 217 | |
| 4:15 PM | 13 | 50 | 5 | 0 | 10 | 30 | 16 | 0 | 8 | 25 | 12 | 0 | 3 | 40 | 15 | 0 | 227 | |
| 4:20 PM | 4 | 23 | 8 | 0 | 7 | 21 | 10 | 0 | 19 | 48 | 13 | 0 | 5 | 50 | 12 | 0 | 220 | |
| 4:25 PM | 12 | 36 | 2 | 0 | 8 | 19 | 15 | 0 | 4 | 46 | 12 | 0 | 3 | 29 | 15 | 0 | 201 | 2585 |
| 4:30 PM | 8 | 23 | 1 | 0 | 13 | 28 | 13 | 0 | 9 | 49 | 18 | 0 | 1 | 11 | 7 | 0 | 181 | 2566 |
| 4:35 PM | 15 | 30 | 3 | 0 | 17 | 23 | 13 | 0 | 10 | 36 | 18 | 0 | 8 | 36 | 11 | 0 | 220 | 2557 |
| 4:40 PM | 6 | 25 | 7 | 0 | 11 | 10 | 15 | 0 | 9 | 60 | 15 | 0 | 5 | 44 | 10 | 0 | 217 | 2545 |
| 4:45 PM | 12 | 33 | 11 | 0 | 29 | 38 | 13 | 0 | 5 | 37 | 15 | 0 | 3 | 23 | 20 | 0 | 239 | 2579 |
| 4:50 PM | 10 | 18 | 8 | 0 | 19 | 14 | 11 | 0 | 16 | 70 | 13 | 0 | 5 | 56 | 24 | 0 | 264 | 2610 |
| 4:55 PM | 8 | 38 | 2 | 0 | 27 | 35 | 14 | 0 | 18 | 62 | 20 | 0 | 1 | 5 | 19 | 0 | 249 | 2651 |
| 5:00 PM | 11 | 39 | 5 | 0 | 9 | 24 | 14 | 0 | 7 | 30 | 15 | 0 | 2 | 45 | 14 | 0 | 215 | 2672 |
| 5:05 PM | 5 | 30 | 5 | 0 | 13 | 20 | 17 | 0 | 21 | 60 | 17 | 0 | 5 | 30 | 18 | 0 | 241 | 2691 |
| 5:10 PM | 15 | 31 | 3 | 0 | 24 | 22 | 10 | 0 | 13 | 37 | 14 | 0 | 2 | 23 | 9 | 0 | 203 | 2677 |
| 5:15 PM | 15 | 21 | 3 | 0 | 16 | 24 | 10 | 0 | 10 | 41 | 10 | 0 | 3 | 43 | 14 | 0 | 210 | 2660 |
| 5:20 PM | 9 | 28 | 6 | 0 | 8 | 20 | 12 | 0 | 9 | 58 | 25 | 0 | 2 | 36 | 12 | 0 | 225 | 2665 |
| 5:25 PM | 7 | 42 | 4 | 0 | 15 | 24 | 19 | 0 | 7 | 42 | 15 | 0 | 0 | 13 | 12 | 0 | 200 | 2664 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 120 | 356 | 84 | 0 | 300 | 348 | 152 | 0 | 156 | 676 | 192 | 0 | 36 | 336 | 252 | 0 | 3008 |
| Heavy Trucks | 0 | 4 | 4 | | 8 | 12 | 0 | | 0 | 4 | 0 | | 0 | 4 | 4 | | 40 |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

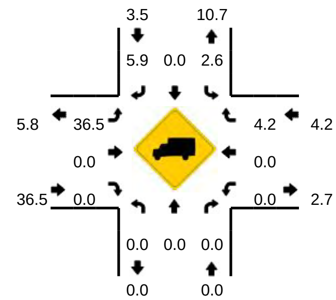
*Comments:*

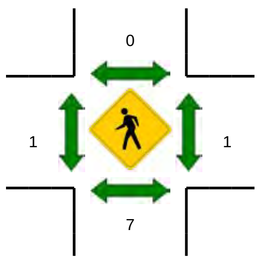
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

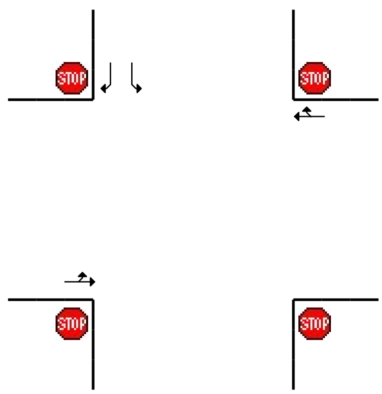
**LOCATION:** Kamokila Blvd -- Roosevelt Ave | **QC JOB #:** 14567217
**CITY/STATE:** Honolulu, HI | **DATE:** Wed, Nov 29 2017

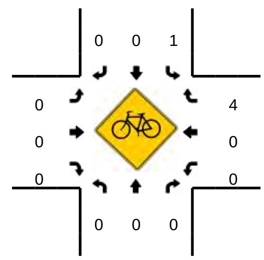


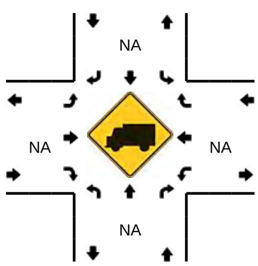

**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:30 AM -- 7:45 AM**

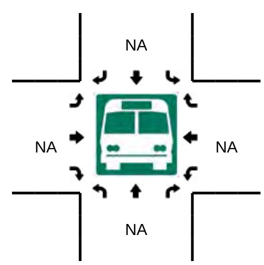




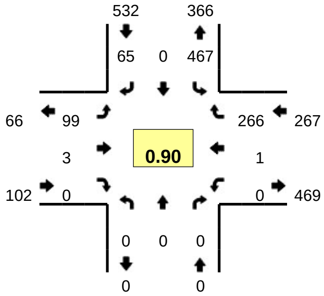

| 5-Min Count Period Beginning At | Kamokila Blvd (Northbound) | | | | Kamokila Blvd (Southbound) | | | | Roosevelt Ave (Eastbound) | | | | Roosevelt Ave (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 6:30 AM | 0 | 0 | 0 | 0 | 15 | 0 | 13 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 27 | 0 | 59 | |
| 6:35 AM | 0 | 0 | 0 | 0 | 10 | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 47 | |
| 6:40 AM | 0 | 0 | 0 | 0 | 10 | 0 | 5 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 52 | |
| 6:45 AM | 0 | 0 | 0 | 0 | 9 | 0 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 1 | 24 | 0 | 49 | |
| 6:50 AM | 0 | 0 | 0 | 0 | 12 | 0 | 4 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 55 | |
| 6:55 AM | 0 | 0 | 0 | 0 | 17 | 0 | 12 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 66 | |
| 7:00 AM | 0 | 0 | 0 | 0 | 17 | 0 | 9 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 62 | |
| 7:05 AM | 0 | 0 | 0 | 0 | 27 | 0 | 10 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 60 | |
| 7:10 AM | 0 | 0 | 0 | 0 | 16 | 0 | 5 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | 55 | |
| 7:15 AM | 0 | 0 | 0 | 0 | 18 | 0 | 11 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 37 | 0 | 80 | |
| 7:20 AM | 0 | 0 | 0 | 0 | 10 | 0 | 6 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 28 | 0 | 50 | |
| 7:25 AM | 0 | 0 | 0 | 0 | 30 | 0 | 12 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 85 | 720 |
| 7:30 AM | 0 | 0 | 0 | 0 | 19 | 0 | 9 | 1 | 10 | 0 | 0 | 0 | 0 | 1 | 40 | 0 | 80 | 741 |
| 7:35 AM | 0 | 0 | 0 | 0 | 39 | 0 | 8 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 81 | 775 |
| 7:40 AM | 0 | 0 | 0 | 0 | 35 | 0 | 12 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 41 | 0 | 97 | 820 |
| 7:45 AM | 0 | 0 | 0 | 0 | 20 | 0 | 4 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 34 | 0 | 73 | 844 |
| 7:50 AM | 0 | 0 | 0 | 0 | 15 | 0 | 10 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 81 | 870 |
| 7:55 AM | 0 | 0 | 0 | 0 | 20 | 0 | 6 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 65 | 869 |
| 8:00 AM | 0 | 0 | 0 | 0 | 20 | 0 | 3 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 36 | 0 | 65 | 872 |
| 8:05 AM | 0 | 0 | 0 | 0 | 19 | 0 | 11 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 61 | 873 |
| 8:10 AM | 0 | 0 | 0 | 0 | 18 | 0 | 10 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 62 | 880 |
| 8:15 AM | 0 | 0 | 0 | 0 | 16 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 45 | 845 |
| 8:20 AM | 0 | 0 | 0 | 0 | 18 | 0 | 4 | 0 | 10 | 1 | 0 | 0 | 0 | 0 | 28 | 0 | 61 | 856 |
| 8:25 AM | 0 | 0 | 0 | 0 | 13 | 0 | 5 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 42 | 813 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 0 | 0 | 0 | 0 | 372 | 0 | 116 | 4 | 100 | 0 | 0 | 0 | 0 | 4 | 436 | 0 | 1032 |
| Heavy Trucks | 0 | 0 | 0 | | 8 | 0 | 0 | | 40 | 0 | 0 | | 0 | 0 | 8 | | 56 |
| Pedestrians | | 4 | | | | 0 | | | | 0 | | | | 4 | | | 8 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

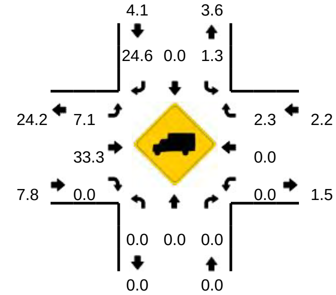
*Comments:*

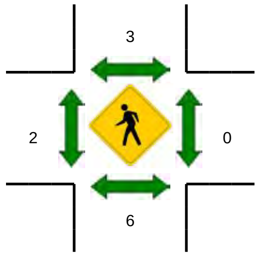
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

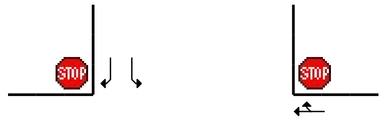
**LOCATION:** Kamokila Blvd -- Roosevelt Ave | **QC JOB #:** 14567218
**CITY/STATE:** Honolulu, HI | **DATE:** Wed, Nov 29 2017

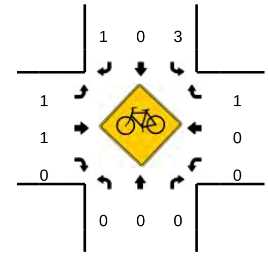


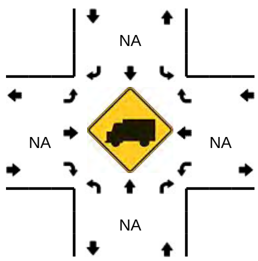

**Peak-Hour: 3:40 PM -- 4:40 PM**
**Peak 15-Min: 3:40 PM -- 3:55 PM**

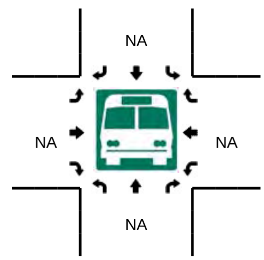





| 5-Min Count Period Beginning At | Kamokila Blvd (Northbound) | | | | Kamokila Blvd (Southbound) | | | | Roosevelt Ave (Eastbound) | | | | Roosevelt Ave (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 3:30 PM | 0 | 0 | 0 | 0 | 30 | 0 | 8 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 23 | 0 | 67 | |
| 3:35 PM | 0 | 0 | 0 | 0 | 33 | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 63 | |
| 3:40 PM | 0 | 0 | 0 | 0 | 37 | 0 | 11 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 90 | |
| 3:45 PM | 0 | 0 | 0 | 0 | 36 | 0 | 6 | 0 | 9 | 1 | 0 | 0 | 0 | 0 | 29 | 0 | 81 | |
| 3:50 PM | 0 | 0 | 0 | 0 | 42 | 0 | 4 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 80 | |
| 3:55 PM | 0 | 0 | 0 | 0 | 43 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 74 | |
| 4:00 PM | 0 | 0 | 0 | 0 | 35 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 62 | |
| 4:05 PM | 0 | 0 | 0 | 0 | 36 | 0 | 5 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 69 | |
| 4:10 PM | 0 | 0 | 0 | 0 | 42 | 0 | 4 | 0 | 10 | 1 | 0 | 0 | 0 | 0 | 21 | 0 | 78 | |
| 4:15 PM | 0 | 0 | 0 | 0 | 42 | 0 | 7 | 0 | 8 | 1 | 0 | 0 | 0 | 0 | 23 | 0 | 81 | |
| 4:20 PM | 0 | 0 | 0 | 0 | 31 | 0 | 3 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 61 | |
| 4:25 PM | 0 | 0 | 0 | 0 | 35 | 0 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 63 | 869 |
| 4:30 PM | 0 | 0 | 0 | 0 | 48 | 0 | 4 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 89 | 891 |
| 4:35 PM | 0 | 0 | 0 | 0 | 39 | 0 | 4 | 0 | 7 | 0 | 0 | 0 | 0 | 1 | 22 | 0 | 73 | 901 |
| 4:40 PM | 0 | 0 | 0 | 0 | 31 | 0 | 9 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 74 | 885 |
| 4:45 PM | 0 | 0 | 0 | 0 | 30 | 0 | 4 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 66 | 870 |
| 4:50 PM | 0 | 0 | 0 | 0 | 36 | 0 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 67 | 857 |
| 4:55 PM | 0 | 0 | 0 | 0 | 22 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 55 | 838 |
| 5:00 PM | 0 | 0 | 0 | 0 | 28 | 0 | 5 | 0 | 7 | 1 | 0 | 0 | 0 | 1 | 27 | 0 | 69 | 845 |
| 5:05 PM | 0 | 0 | 0 | 0 | 43 | 0 | 7 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 71 | 847 |
| 5:10 PM | 0 | 0 | 0 | 0 | 42 | 0 | 2 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 17 | 0 | 66 | 835 |
| 5:15 PM | 0 | 0 | 0 | 0 | 42 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 76 | 830 |
| 5:20 PM | 0 | 0 | 0 | 0 | 28 | 0 | 1 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 59 | 828 |
| 5:25 PM | 0 | 0 | 0 | 0 | 26 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 57 | 822 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 0 | 0 | 0 | 0 | 460 | 0 | 84 | 0 | 156 | 4 | 0 | 0 | 0 | 0 | 300 | 0 | 1004 |
| Heavy Trucks | 0 | 0 | 0 | | 8 | 0 | 28 | | 12 | 0 | 0 | | 0 | 0 | 4 | | 52 |
| Pedestrians | | 8 | | | | 0 | | | | 0 | | | | 0 | | | 8 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

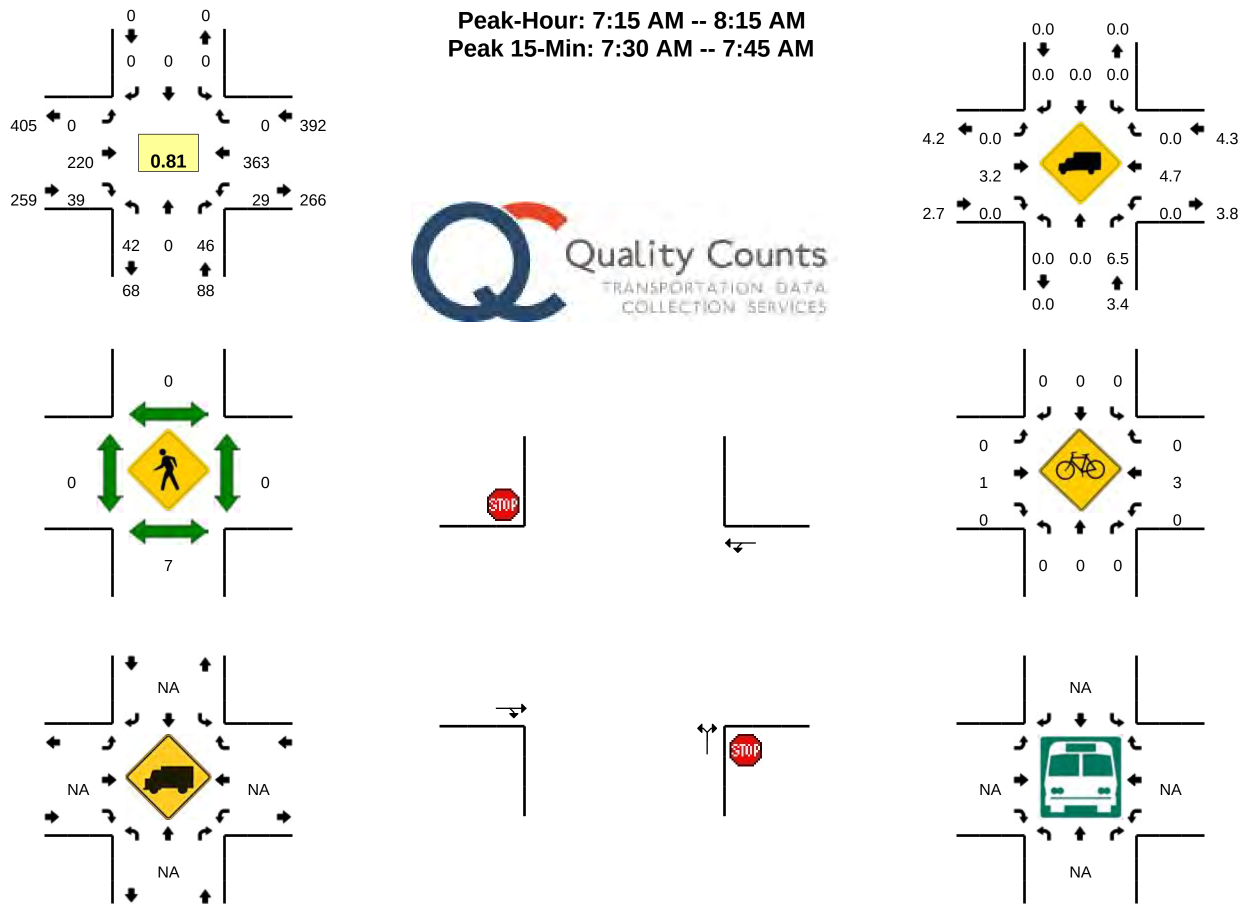
*Comments:*

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

**LOCATION:** Copahee Ave -- Roosevelt Ave | **QC JOB #:** 14567219

**CITY/STATE:** Honolulu, HI | **DATE:** Wed, Nov 29 2017

**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:30 AM -- 7:45 AM**




| 5-Min Count Period Beginning At | Copahee Ave (Northbound) Left | Thru | Right | U | Copahee Ave (Southbound) Left | Thru | Right | U | Roosevelt Ave (Eastbound) Left | Thru | Right | U | Roosevelt Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 1 | 32 | 0 | 0 | 45 | |
| 6:35 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 1 | 29 | 0 | 0 | 43 | |
| 6:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 1 | 34 | 0 | 0 | 47 | |
| 6:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 1 | 0 | 0 | 24 | 0 | 0 | 32 | |
| 6:50 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 1 | 0 | 0 | 28 | 0 | 0 | 41 | |
| 6:55 AM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 1 | 0 | 3 | 30 | 0 | 0 | 50 | |
| 7:00 AM | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 2 | 0 | 1 | 26 | 0 | 0 | 47 | |
| 7:05 AM | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 2 | 0 | 1 | 20 | 0 | 0 | 53 | |
| 7:10 AM | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 2 | 25 | 0 | 0 | 48 | |
| 7:15 AM | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 2 | 0 | 3 | 34 | 0 | 0 | 58 | |
| 7:20 AM | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1 | 0 | 5 | 27 | 0 | 0 | 48 | |
| 7:25 AM | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 3 | 0 | 2 | 26 | 0 | 0 | 63 | 575 |
| 7:30 AM | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 8 | 0 | 5 | 32 | 0 | 0 | 66 | 596 |
| 7:35 AM | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 4 | 0 | 5 | 27 | 0 | 0 | 78 | 631 |
| 7:40 AM | 5 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 7 | 0 | 2 | 36 | 0 | 0 | 84 | 668 |
| 7:45 AM | 11 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 2 | 0 | 3 | 25 | 0 | 0 | 63 | 699 |
| 7:50 AM | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 3 | 0 | 1 | 33 | 0 | 0 | 64 | 722 |
| 7:55 AM | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 4 | 0 | 1 | 34 | 0 | 0 | 60 | 732 |
| 8:00 AM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 3 | 0 | 0 | 30 | 0 | 0 | 51 | 736 |
| 8:05 AM | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 2 | 31 | 0 | 0 | 55 | 738 |
| 8:10 AM | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 2 | 0 | 0 | 28 | 0 | 0 | 49 | 739 |
| 8:15 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 22 | 0 | 0 | 41 | 722 |
| 8:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 1 | 26 | 0 | 0 | 41 | 715 |
| 8:25 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 1 | 0 | 0 | 22 | 0 | 0 | 40 | 692 |

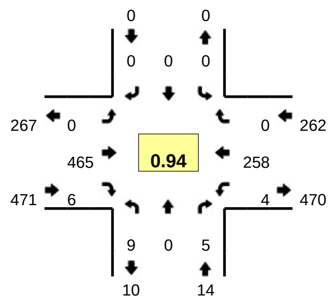
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 40 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 304 | 76 | 0 | 48 | 380 | 0 | 0 | 912 |
| Heavy Trucks | 0 | 0 | 4 | | 0 | 0 | 0 | | 0 | 8 | 0 | | 0 | 8 | 0 | | 20 |
| Pedestrians | | 4 | | | | 0 | | | | 0 | | | | 0 | | | 4 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

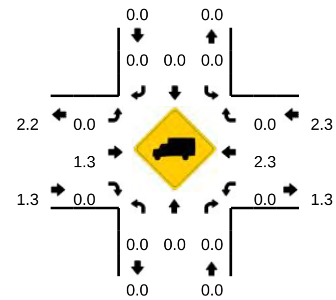
*Comments:*

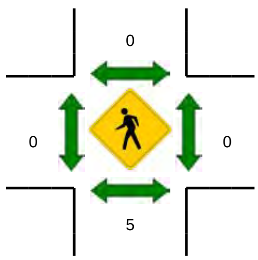
Type of peak hour being reported: Intersection Peak Method for determining peak hour: Total Entering Volume

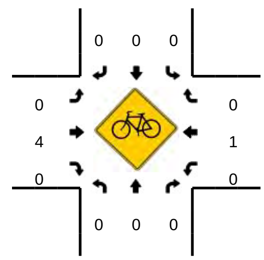
**LOCATION:** Copahee Ave -- Roosevelt Ave **QC JOB #:** 14567220
**CITY/STATE:** Honolulu, HI **DATE:** Wed, Nov 29 2017

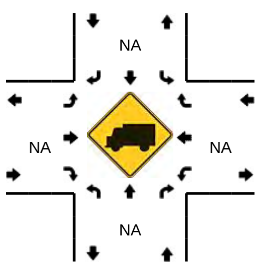
**Peak-Hour: 3:40 PM -- 4:40 PM**
**Peak 15-Min: 3:40 PM -- 3:55 PM**

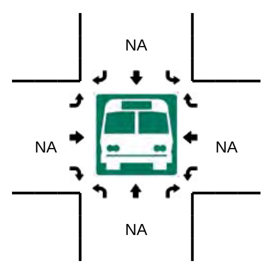



| 5-Min Count Period Beginning At | Copahee Ave (Northbound) Left | Thru | Right | U | Copahee Ave (Southbound) Left | Thru | Right | U | Roosevelt Ave (Eastbound) Left | Thru | Right | U | Roosevelt Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 21 | 0 | 0 | 46 | |
| 3:35 PM | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 1 | 0 | 0 | 19 | 0 | 0 | 57 | |
| 3:40 PM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 22 | 0 | 0 | 62 | |
| 3:45 PM | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 1 | 0 | 0 | 27 | 0 | 0 | 68 | |
| 3:50 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 1 | 0 | 0 | 22 | 0 | 0 | 69 | |
| 3:55 PM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 1 | 0 | 1 | 17 | 0 | 0 | 59 | |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 19 | 0 | 0 | 50 | |
| 4:05 PM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 15 | 0 | 0 | 53 | |
| 4:10 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 0 | 0 | 2 | 22 | 0 | 0 | 68 | |
| 4:15 PM | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 1 | 0 | 0 | 23 | 0 | 0 | 67 | |
| 4:20 PM | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 1 | 0 | 0 | 21 | 0 | 0 | 57 | |
| 4:25 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 0 | 0 | 1 | 17 | 0 | 0 | 52 | 708 |
| 4:30 PM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 1 | 0 | 0 | 30 | 0 | 0 | 79 | 741 |
| 4:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 23 | 0 | 0 | 63 | 747 |
| 4:40 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | 19 | 0 | 0 | 48 | 733 |
| 4:45 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 1 | 0 | 0 | 24 | 0 | 0 | 57 | 722 |
| 4:50 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 1 | 0 | 0 | 24 | 0 | 0 | 57 | 710 |
| 4:55 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | 0 | 0 | 24 | 0 | 0 | 51 | 702 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 1 | 0 | 0 | 27 | 0 | 0 | 53 | 705 |
| 5:05 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 17 | 0 | 0 | 54 | 706 |
| 5:10 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 1 | 0 | 0 | 21 | 0 | 0 | 75 | 713 |
| 5:15 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 1 | 0 | 0 | 24 | 0 | 0 | 64 | 710 |
| 5:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 22 | 0 | 0 | 46 | 699 |
| 5:25 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 25 | 0 | 0 | 55 | 702 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 484 | 8 | 0 | 0 | 284 | 0 | 0 | 796 |
| Heavy Trucks | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 8 | 0 | | 0 | 0 | 0 | | 8 |
| Pedestrians | | 8 | | | | 0 | | | | 0 | | | | 0 | | | 8 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

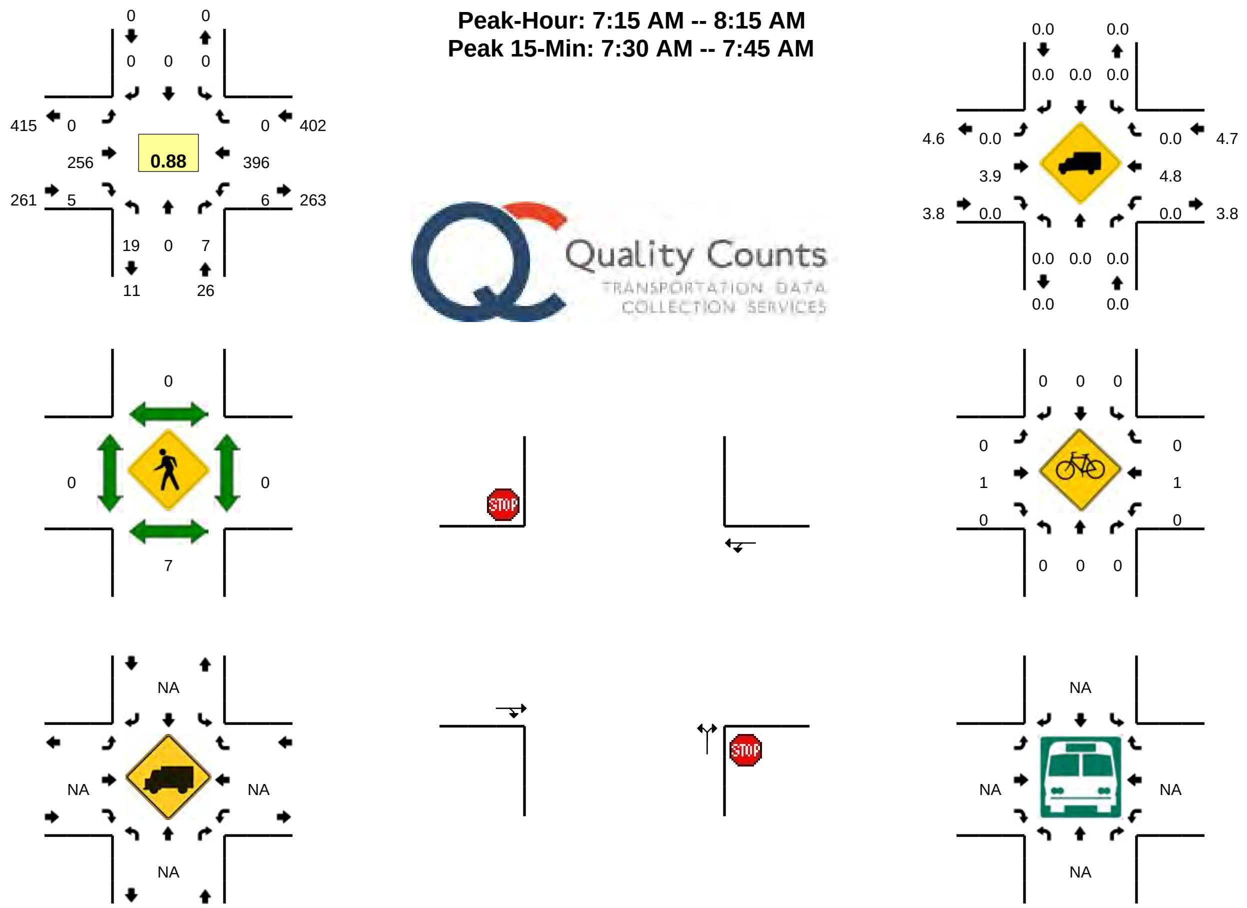
*Comments:*

Report generated on 12/7/2017 5:10 PM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

**LOCATION:** Hornet St -- Roosevelt Ave | **QC JOB #:** 14567221
**CITY/STATE:** Honolulu, HI | **DATE:** Wed, Nov 29 2017

**Peak-Hour: 7:15 AM -- 8:15 AM**
**Peak 15-Min: 7:30 AM -- 7:45 AM**




| 5-Min Count Period Beginning At | Hornet St (Northbound) Left | Thru | Right | U | Hornet St (Southbound) Left | Thru | Right | U | Roosevelt Ave (Eastbound) Left | Thru | Right | U | Roosevelt Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 34 | 0 | 0 | 46 | |
| 6:35 AM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 1 | 0 | 0 | 28 | 0 | 0 | 43 | |
| 6:40 AM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 2 | 38 | 0 | 0 | 54 | |
| 6:45 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 0 | 3 | 21 | 0 | 0 | 32 | |
| 6:50 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 1 | 27 | 0 | 0 | 37 | |
| 6:55 AM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 2 | 35 | 0 | 0 | 52 | |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 30 | 0 | 0 | 45 | |
| 7:05 AM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 1 | 0 | 1 | 26 | 0 | 0 | 52 | |
| 7:10 AM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 1 | 24 | 0 | 0 | 47 | |
| 7:15 AM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 2 | 37 | 0 | 0 | 57 | |
| 7:20 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 41 | 0 | 0 | 52 | |
| 7:25 AM | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 1 | 0 | 0 | 29 | 0 | 0 | 56 | 573 |
| 7:30 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 41 | 0 | 0 | 62 | 589 |
| 7:35 AM | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 1 | 31 | 0 | 0 | 60 | 606 |
| 7:40 AM | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 37 | 0 | 0 | 74 | 626 |
| 7:45 AM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 29 | 0 | 0 | 59 | 653 |
| 7:50 AM | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 1 | 0 | 1 | 24 | 0 | 0 | 59 | 675 |
| 7:55 AM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 31 | 0 | 0 | 56 | 679 |
| 8:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 35 | 0 | 0 | 51 | 685 |
| 8:05 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 2 | 0 | 0 | 33 | 0 | 0 | 54 | 687 |
| 8:10 AM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 1 | 0 | 2 | 28 | 0 | 0 | 49 | 689 |
| 8:15 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 0 | 1 | 23 | 0 | 0 | 46 | 678 |
| 8:20 AM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 1 | 0 | 3 | 28 | 0 | 0 | 45 | 671 |
| 8:25 AM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1 | 0 | 0 | 21 | 0 | 0 | 36 | 651 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 20 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 304 | 0 | 0 | 4 | 436 | 0 | 0 | 784 |
| Heavy Trucks | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 12 | 0 | | 0 | 12 | 0 | | 24 |
| Pedestrians | | 8 | | | | 0 | | | | 0 | | | | 0 | | | 8 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

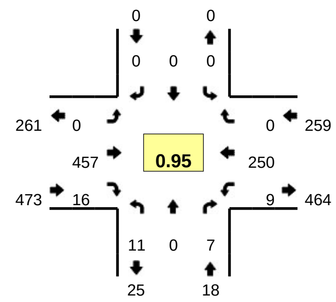
*Comments:*

Report generated on 12/7/2017 5:10 PM

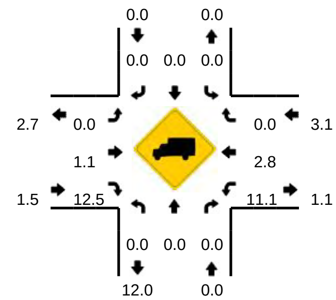
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

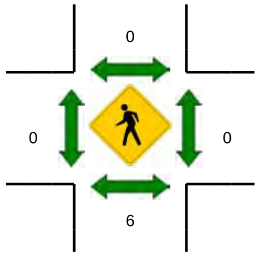
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

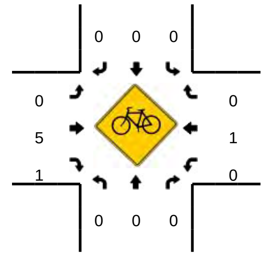
**LOCATION:** Hornet St -- Roosevelt Ave | **QC JOB #:** 14567222
**CITY/STATE:** Honolulu, HI | **DATE:** Wed, Nov 29 2017

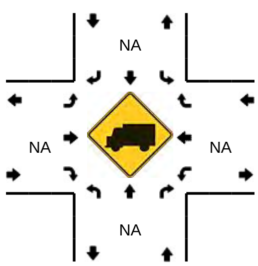


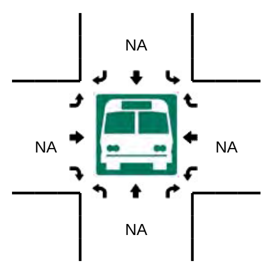

**Peak-Hour: 3:40 PM -- 4:40 PM**
**Peak 15-Min: 4:25 PM -- 4:40 PM**




| 5-Min Count Period Beginning At | Hornet St (Northbound) Left | Thru | Right | U | Hornet St (Southbound) Left | Thru | Right | U | Roosevelt Ave (Eastbound) Left | Thru | Right | U | Roosevelt Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 1 | 19 | 0 | 0 | 48 | |
| 3:35 PM | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 0 | 0 | 1 | 17 | 0 | 0 | 57 | |
| 3:40 PM | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 1 | 0 | 0 | 21 | 0 | 0 | 65 | |
| 3:45 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 2 | 0 | 0 | 23 | 0 | 0 | 57 | |
| 3:50 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 2 | 0 | 1 | 24 | 0 | 0 | 70 | |
| 3:55 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 1 | 0 | 1 | 17 | 0 | 0 | 63 | |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 2 | 0 | 1 | 18 | 0 | 0 | 48 | |
| 4:05 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 1 | 0 | 0 | 13 | 0 | 0 | 58 | |
| 4:10 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 37 | 1 | 0 | 0 | 22 | 0 | 0 | 62 | |
| 4:15 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 1 | 0 | 3 | 22 | 0 | 0 | 74 | |
| 4:20 PM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 2 | 0 | 1 | 20 | 0 | 0 | 56 | |
| 4:25 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 20 | 0 | 0 | 57 | 715 |
| 4:30 PM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 2 | 0 | 1 | 25 | 0 | 0 | 73 | 740 |
| 4:35 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 1 | 0 | 1 | 25 | 0 | 0 | 67 | 750 |
| 4:40 PM | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 1 | 0 | 1 | 20 | 0 | 0 | 56 | 741 |
| 4:45 PM | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 23 | 0 | 0 | 59 | 743 |
| 4:50 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 1 | 26 | 0 | 0 | 61 | 734 |
| 4:55 PM | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 1 | 27 | 0 | 0 | 58 | 729 |
| 5:00 PM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 2 | 0 | 2 | 20 | 0 | 0 | 48 | 729 |
| 5:05 PM | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 2 | 0 | 1 | 15 | 0 | 0 | 53 | 724 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 1 | 0 | 1 | 24 | 0 | 0 | 77 | 739 |
| 5:15 PM | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 2 | 23 | 0 | 0 | 67 | 732 |
| 5:20 PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 1 | 18 | 0 | 0 | 45 | 721 |
| 5:25 PM | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 1 | 0 | 0 | 25 | 0 | 0 | 59 | 723 |

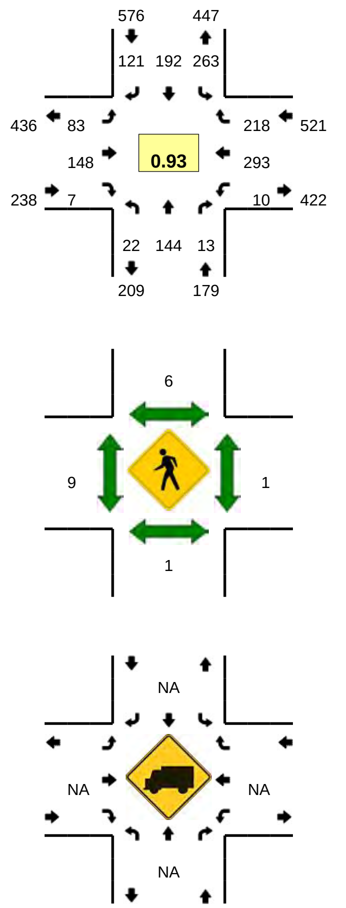
| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 8 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 468 | 12 | 0 | 8 | 280 | 0 | 0 | 788 |
| Heavy Trucks | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 4 | 0 | | 0 | 16 | 0 | | 20 |
| Pedestrians | | 4 | | | | 0 | | | | 0 | | | | 0 | | | 4 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 1 | 0 | | 0 | 1 | 0 | | 2 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

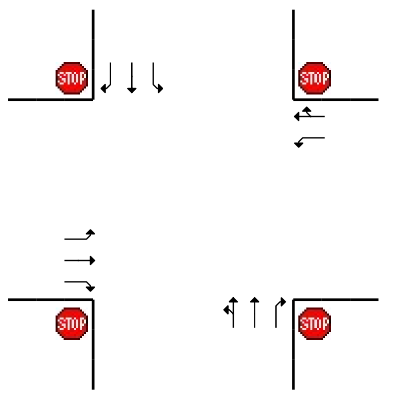
*Comments:*

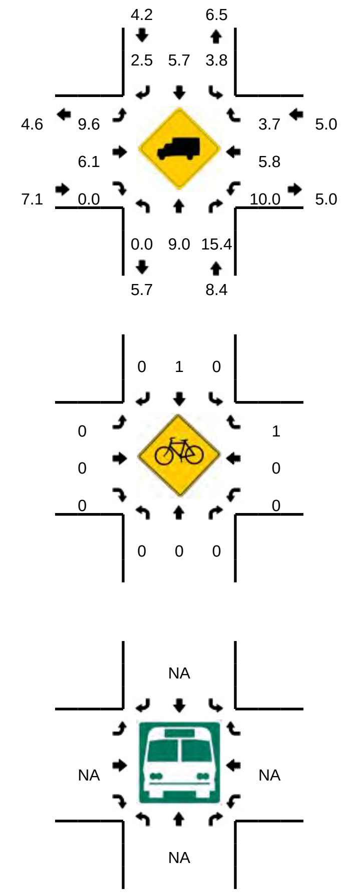
Type of peak hour being reported: Intersection Peak　　Method for determining peak hour: Total Entering Volume

**LOCATION:** Fort Barrette Rd/Enterprise St -- Roosevelt Ave　　**QC JOB #:** 14567223
**CITY/STATE:** Honolulu, HI　　**DATE:** Wed, Nov 29 2017

**Peak-Hour: 7:10 AM -- 8:10 AM**
**Peak 15-Min: 7:45 AM -- 8:00 AM**



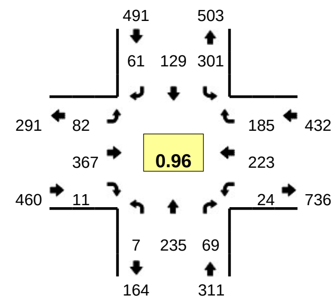

| 5-Min Count Period Beginning At | Fort Barrette Rd/Enterprise St (Northbound) Left | Thru | Right | U | Fort Barrette Rd/Enterprise St (Southbound) Left | Thru | Right | U | Roosevelt Ave (Eastbound) Left | Thru | Right | U | Roosevelt Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:30 AM | 0 | 2 | 3 | 0 | 17 | 15 | 5 | 0 | 2 | 6 | 1 | 0 | 0 | 32 | 6 | 0 | 89 | |
| 6:35 AM | 1 | 3 | 0 | 0 | 15 | 10 | 3 | 0 | 4 | 8 | 0 | 0 | 3 | 22 | 13 | 0 | 82 | |
| 6:40 AM | 0 | 2 | 0 | 0 | 15 | 10 | 5 | 0 | 4 | 11 | 0 | 0 | 0 | 29 | 16 | 0 | 92 | |
| 6:45 AM | 0 | 1 | 0 | 0 | 15 | 20 | 4 | 0 | 2 | 2 | 0 | 0 | 2 | 26 | 20 | 0 | 92 | |
| 6:50 AM | 0 | 3 | 0 | 0 | 17 | 19 | 7 | 0 | 3 | 8 | 2 | 0 | 2 | 24 | 14 | 0 | 99 | |
| 6:55 AM | 1 | 5 | 8 | 0 | 17 | 9 | 8 | 0 | 2 | 7 | 1 | 0 | 4 | 32 | 15 | 0 | 109 | |
| 7:00 AM | 1 | 3 | 2 | 0 | 17 | 14 | 2 | 0 | 4 | 12 | 2 | 0 | 4 | 24 | 16 | 0 | 101 | |
| 7:05 AM | 0 | 5 | 2 | 0 | 24 | 16 | 5 | 0 | 4 | 13 | 0 | 0 | 3 | 19 | 15 | 0 | 106 | |
| 7:10 AM | 0 | 6 | 1 | 0 | 17 | 13 | 7 | 0 | 6 | 19 | 1 | 0 | 3 | 27 | 19 | 0 | 119 | |
| 7:15 AM | 1 | 5 | 1 | 0 | 27 | 16 | 10 | 0 | 2 | 5 | 0 | 0 | 0 | 30 | 15 | 0 | 112 | |
| 7:20 AM | 0 | 7 | 1 | 0 | 30 | 14 | 10 | 0 | 3 | 10 | 0 | 0 | 0 | 30 | 14 | 0 | 119 | |
| 7:25 AM | 4 | 12 | 3 | 0 | 24 | 8 | 8 | 0 | 7 | 10 | 2 | 0 | 0 | 24 | 26 | 0 | 128 | 1248 |
| 7:30 AM | 2 | 15 | 0 | 0 | 23 | 19 | 11 | 0 | 6 | 10 | 0 | 0 | 0 | 26 | 18 | 0 | 130 | 1289 |
| 7:35 AM | 4 | 17 | 1 | 0 | 15 | 12 | 11 | 0 | 11 | 13 | 0 | 0 | 0 | 20 | 21 | 0 | 125 | 1332 |
| 7:40 AM | 2 | 23 | 0 | 0 | 17 | 13 | 10 | 1 | 7 | 14 | 0 | 0 | 2 | 20 | 22 | 0 | 131 | 1371 |
| 7:45 AM | 3 | 16 | 2 | 0 | 17 | 15 | 9 | 0 | 11 | 19 | 0 | 0 | 1 | 19 | 19 | 0 | 131 | 1410 |
| 7:50 AM | 2 | 18 | 0 | 0 | 28 | 20 | 5 | 0 | 13 | 20 | 0 | 0 | 0 | 16 | 21 | 0 | 143 | 1454 |
| 7:55 AM | 3 | 7 | 2 | 0 | 27 | 22 | 11 | 0 | 8 | 9 | 1 | 0 | 1 | 29 | 15 | 0 | 135 | 1480 |
| 8:00 AM | 0 | 6 | 1 | 0 | 19 | 22 | 15 | 1 | 6 | 10 | 1 | 0 | 1 | 28 | 11 | 0 | 121 | 1500 |
| 8:05 AM | 1 | 12 | 1 | 0 | 17 | 18 | 14 | 0 | 3 | 9 | 2 | 0 | 2 | 24 | 17 | 0 | 120 | 1514 |
| 8:10 AM | 0 | 9 | 1 | 0 | 13 | 18 | 10 | 0 | 7 | 7 | 0 | 0 | 1 | 19 | 15 | 0 | 100 | 1495 |
| 8:15 AM | 1 | 10 | 0 | 0 | 12 | 21 | 11 | 0 | 6 | 14 | 2 | 0 | 1 | 24 | 18 | 0 | 120 | 1503 |
| 8:20 AM | 1 | 15 | 2 | 0 | 9 | 18 | 5 | 0 | 2 | 9 | 0 | 0 | 2 | 29 | 17 | 0 | 109 | 1493 |
| 8:25 AM | 0 | 8 | 2 | 1 | 16 | 21 | 9 | 0 | 6 | 6 | 1 | 0 | 3 | 13 | 10 | 0 | 96 | 1461 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 32 | 164 | 16 | 0 | 288 | 228 | 100 | 0 | 128 | 192 | 4 | 0 | 8 | 256 | 220 | 0 | 1636 |
| Heavy Trucks | 0 | 8 | 4 | | 12 | 8 | 0 | | 12 | 12 | 0 | | 0 | 20 | 16 | | 92 |
| Pedestrians | | 0 | | | | 8 | | | | 16 | | | | 0 | | | 24 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

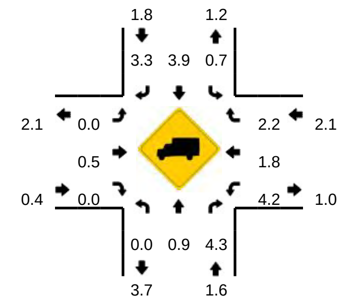
*Comments:*

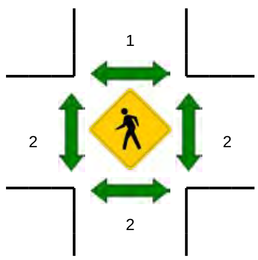
Type of peak hour being reported: Intersection Peak
Method for determining peak hour: Total Entering Volume

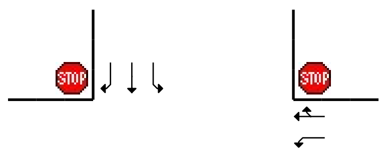
**LOCATION:** Fort Barrette Rd/Enterprise St -- Roosevelt Ave
**QC JOB #:** 14567224
**CITY/STATE:** Honolulu, HI
**DATE:** Wed, Nov 29 2017

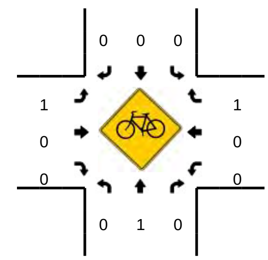


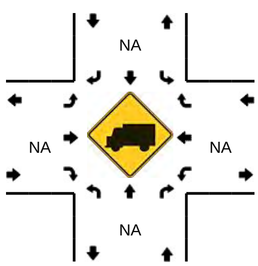

**Peak-Hour: 4:10 PM -- 5:10 PM**
**Peak 15-Min: 4:10 PM -- 4:25 PM**

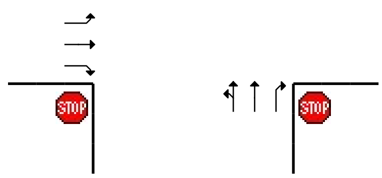


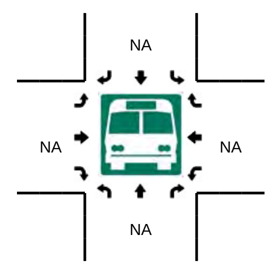








| 5-Min Count Period Beginning At | Fort Barrette Rd/Enterprise St (Northbound) Left | Thru | Right | U | Fort Barrette Rd/Enterprise St (Southbound) Left | Thru | Right | U | Roosevelt Ave (Eastbound) Left | Thru | Right | U | Roosevelt Ave (Westbound) Left | Thru | Right | U | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3:30 PM | 1 | 13 | 2 | 0 | 26 | 11 | 7 | 0 | 4 | 20 | 2 | 0 | 2 | 13 | 14 | 0 | 115 | |
| 3:35 PM | 1 | 19 | 11 | 0 | 28 | 7 | 3 | 0 | 7 | 26 | 2 | 0 | 1 | 13 | 14 | 0 | 132 | |
| 3:40 PM | 2 | 20 | 1 | 0 | 31 | 9 | 4 | 0 | 2 | 30 | 3 | 0 | 2 | 19 | 19 | 0 | 142 | |
| 3:45 PM | 0 | 21 | 3 | 0 | 20 | 13 | 1 | 0 | 2 | 28 | 1 | 0 | 3 | 18 | 23 | 0 | 133 | |
| 3:50 PM | 3 | 23 | 5 | 0 | 25 | 8 | 4 | 0 | 3 | 31 | 1 | 0 | 3 | 18 | 18 | 0 | 142 | |
| 3:55 PM | 1 | 17 | 0 | 0 | 21 | 10 | 5 | 0 | 2 | 38 | 4 | 0 | 6 | 10 | 15 | 0 | 129 | |
| 4:00 PM | 1 | 17 | 4 | 0 | 28 | 8 | 1 | 0 | 3 | 35 | 0 | 0 | 3 | 15 | 14 | 0 | 129 | |
| 4:05 PM | 2 | 20 | 3 | 0 | 22 | 6 | 2 | 0 | 8 | 25 | 1 | 0 | 3 | 9 | 13 | 0 | 114 | |
| 4:10 PM | 2 | 27 | 5 | 0 | 29 | 14 | 7 | 0 | 7 | 29 | 3 | 0 | 1 | 16 | 11 | 0 | 151 | |
| 4:15 PM | 0 | 17 | 5 | 0 | 22 | 9 | 4 | 0 | 6 | 38 | 0 | 0 | 4 | 17 | 19 | 0 | 141 | |
| 4:20 PM | 1 | 24 | 5 | 0 | 22 | 16 | 5 | 0 | 3 | 32 | 1 | 0 | 5 | 22 | 11 | 0 | 147 | |
| 4:25 PM | 0 | 20 | 5 | 0 | 19 | 15 | 2 | 0 | 8 | 32 | 2 | 0 | 1 | 22 | 18 | 0 | 144 | 1619 |
| 4:30 PM | 0 | 14 | 8 | 0 | 26 | 8 | 5 | 0 | 5 | 33 | 1 | 0 | 2 | 26 | 10 | 0 | 138 | 1642 |
| 4:35 PM | 0 | 20 | 6 | 0 | 29 | 9 | 5 | 0 | 3 | 32 | 0 | 0 | 3 | 17 | 17 | 0 | 141 | 1651 |
| 4:40 PM | 1 | 19 | 6 | 0 | 21 | 9 | 6 | 0 | 14 | 32 | 1 | 0 | 2 | 19 | 16 | 0 | 146 | 1655 |
| 4:45 PM | 0 | 19 | 7 | 0 | 23 | 9 | 3 | 1 | 8 | 33 | 1 | 0 | 1 | 19 | 16 | 0 | 140 | 1662 |
| 4:50 PM | 2 | 25 | 7 | 0 | 30 | 10 | 10 | 0 | 7 | 28 | 0 | 0 | 0 | 20 | 13 | 0 | 152 | 1672 |
| 4:55 PM | 0 | 11 | 8 | 0 | 26 | 9 | 10 | 0 | 6 | 30 | 1 | 0 | 3 | 19 | 16 | 0 | 139 | 1682 |
| 5:00 PM | 1 | 22 | 2 | 0 | 31 | 7 | 1 | 0 | 8 | 17 | 1 | 0 | 2 | 15 | 21 | 0 | 128 | 1681 |
| 5:05 PM | 0 | 17 | 5 | 0 | 22 | 14 | 3 | 0 | 7 | 31 | 0 | 0 | 0 | 11 | 17 | 0 | 127 | 1694 |
| 5:10 PM | 0 | 11 | 6 | 0 | 27 | 6 | 12 | 0 | 9 | 39 | 0 | 0 | 1 | 19 | 17 | 0 | 147 | 1690 |
| 5:15 PM | 4 | 25 | 13 | 0 | 15 | 3 | 7 | 0 | 5 | 35 | 1 | 0 | 1 | 15 | 13 | 0 | 137 | 1686 |
| 5:20 PM | 1 | 15 | 4 | 0 | 30 | 8 | 6 | 0 | 9 | 28 | 0 | 0 | 5 | 20 | 18 | 0 | 144 | 1683 |
| 5:25 PM | 1 | 18 | 7 | 0 | 32 | 5 | 3 | 0 | 3 | 29 | 0 | 0 | 1 | 17 | 23 | 0 | 139 | 1678 |

| Peak 15-Min Flowrates | Northbound Left | Thru | Right | U | Southbound Left | Thru | Right | U | Eastbound Left | Thru | Right | U | Westbound Left | Thru | Right | U | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All Vehicles | 12 | 272 | 60 | 0 | 292 | 156 | 64 | 0 | 64 | 396 | 16 | 0 | 40 | 220 | 164 | 0 | 1756 |
| Heavy Trucks | 0 | 4 | 4 | | 0 | 4 | 4 | | 0 | 4 | 0 | | 0 | 0 | 4 | | 24 |
| Pedestrians | | 4 | | | | 4 | | | | 4 | | | | 4 | | | 16 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 1 | 0 | 0 | | 0 | 0 | 0 | | 1 |
| Railroad | | | | | | | | | | | | | | | | | |
| Stopped Buses | | | | | | | | | | | | | | | | | |

*Comments:*

# APPENDIX B: EXISTING LOS WORKSHEETS

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 280 | 224 | 124 | 49 | 266 | 216 | 194 | 419 | 88 | 298 | 674 | 876 |
| Future Volume (veh/h) | 280 | 224 | 124 | 49 | 266 | 216 | 194 | 419 | 88 | 298 | 674 | 876 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.98 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 304 | 243 | 0 | 53 | 289 | 0 | 211 | 455 | 0 | 324 | 1011 | 459 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 413 | 1018 | 455 | 78 | 748 | 934 | 312 | 1204 | 539 | 439 | 1391 | 576 |
| Arrive On Green | 0.12 | 0.29 | 0.00 | 0.04 | 0.21 | 0.00 | 0.09 | 0.34 | 0.00 | 0.12 | 0.37 | 0.37 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1544 |
| Grp Volume(v), veh/h | 304 | 243 | 0 | 53 | 289 | 0 | 211 | 455 | 0 | 324 | 1011 | 459 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1544 |
| Q Serve(g_s), s | 6.7 | 4.1 | 0.0 | 2.3 | 5.5 | 0.0 | 4.6 | 7.6 | 0.0 | 6.9 | 18.2 | 20.7 |
| Cycle Q Clear(g_c), s | 6.7 | 4.1 | 0.0 | 2.3 | 5.5 | 0.0 | 4.6 | 7.6 | 0.0 | 6.9 | 18.2 | 20.7 |
| 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 | 413 | 1018 | 455 | 78 | 748 | 934 | 312 | 1204 | 539 | 439 | 1391 | 576 |
| V/C Ratio(X) | 0.74 | 0.24 | 0.00 | 0.68 | 0.39 | 0.00 | 0.68 | 0.38 | 0.00 | 0.74 | 0.73 | 0.80 |
| Avail Cap(c_a), veh/h | 793 | 1630 | 729 | 409 | 1630 | 1628 | 837 | 1404 | 628 | 862 | 1478 | 612 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 33.2 | 21.3 | 0.0 | 36.8 | 26.5 | 0.0 | 34.4 | 19.5 | 0.0 | 33.0 | 21.1 | 21.8 |
| Incr Delay (d2), s/veh | 2.6 | 0.1 | 0.0 | 10.1 | 0.3 | 0.0 | 2.6 | 0.2 | 0.0 | 2.4 | 1.7 | 6.9 |
| 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 | 3.3 | 2.0 | 0.0 | 1.4 | 2.7 | 0.0 | 2.3 | 3.8 | 0.0 | 3.5 | 9.6 | 9.9 |
| LnGrp Delay(d),s/veh | 35.8 | 21.4 | 0.0 | 46.9 | 26.8 | 0.0 | 37.0 | 19.7 | 0.0 | 35.5 | 22.8 | 28.7 |
| LnGrp LOS | D | C | | D | C | | D | B | | D | C | C |
| Approach Vol, veh/h | | 547 | | | 342 | | | 666 | | | 1794 | |
| Approach Delay, s/veh | | 29.4 | | | 29.9 | | | 25.2 | | | 26.6 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 13.7 | 30.6 | 7.4 | 26.5 | 11.1 | 33.2 | 13.4 | 20.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 8.9 | 9.6 | 4.3 | 6.1 | 6.6 | 22.7 | 8.7 | 7.5 |
| Green Ext Time (p_c), s | 0.8 | 12.2 | 0.1 | 3.6 | 0.5 | 6.1 | 0.7 | 3.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 27.1 |
| HCM 2010 LOS | C |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 71 | 223 | 37 | 96 | 394 | 181 | 8 | 296 | 58 | 245 | 301 | 134 |
| Future Volume (veh/h) | 71 | 223 | 37 | 96 | 394 | 181 | 8 | 296 | 58 | 245 | 301 | 134 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 83 | 259 | 28 | 112 | 458 | 155 | 9 | 344 | 53 | 285 | 350 | 121 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 108 | 937 | 100 | 147 | 812 | 272 | 20 | 800 | 122 | 399 | 943 | 321 |
| Arrive On Green | 0.06 | 0.29 | 0.29 | 0.08 | 0.31 | 0.31 | 0.01 | 0.26 | 0.26 | 0.12 | 0.36 | 0.36 |
| Sat Flow, veh/h | 1774 | 3217 | 344 | 1774 | 2594 | 871 | 1774 | 3073 | 469 | 3442 | 2586 | 879 |
| Grp Volume(v), veh/h | 83 | 141 | 146 | 112 | 311 | 302 | 9 | 197 | 200 | 285 | 238 | 233 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1792 | 1774 | 1770 | 1695 | 1774 | 1770 | 1772 | 1721 | 1770 | 1696 |
| Q Serve(g_s), s | 3.0 | 3.9 | 4.0 | 4.0 | 9.4 | 9.5 | 0.3 | 5.9 | 6.0 | 5.1 | 6.3 | 6.5 |
| Cycle Q Clear(g_c), s | 3.0 | 3.9 | 4.0 | 4.0 | 9.4 | 9.5 | 0.3 | 5.9 | 6.0 | 5.1 | 6.3 | 6.5 |
| Prop In Lane | 1.00 | | 0.19 | 1.00 | | 0.51 | 1.00 | | 0.26 | 1.00 | | 0.52 |
| Lane Grp Cap(c), veh/h | 108 | 515 | 522 | 147 | 554 | 530 | 20 | 461 | 461 | 399 | 646 | 619 |
| V/C Ratio(X) | 0.77 | 0.27 | 0.28 | 0.76 | 0.56 | 0.57 | 0.44 | 0.43 | 0.43 | 0.71 | 0.37 | 0.38 |
| Avail Cap(c_a), veh/h | 443 | 1684 | 1705 | 443 | 1684 | 1613 | 304 | 994 | 995 | 591 | 994 | 952 |
| 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 | 29.6 | 17.5 | 17.5 | 28.8 | 18.4 | 18.4 | 31.5 | 19.7 | 19.8 | 27.3 | 14.9 | 15.0 |
| Incr Delay (d2), s/veh | 10.6 | 0.3 | 0.3 | 8.0 | 0.9 | 1.0 | 14.1 | 0.6 | 0.6 | 2.4 | 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 | 1.8 | 2.0 | 2.0 | 2.3 | 4.7 | 4.6 | 0.2 | 3.0 | 3.0 | 2.5 | 3.1 | 3.1 |
| LnGrp Delay(d),s/veh | 40.3 | 17.8 | 17.8 | 36.7 | 19.3 | 19.4 | 45.6 | 20.4 | 20.4 | 29.7 | 15.3 | 15.4 |
| LnGrp LOS | D | B | B | D | B | B | D | C | C | C | B | B |
| Approach Vol, veh/h | | 370 | | | 725 | | | 406 | | | 756 | |
| Approach Delay, s/veh | | 22.8 | | | 22.0 | | | 20.9 | | | 20.7 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.4 | 20.7 | 9.3 | 22.7 | 4.7 | 27.4 | 7.9 | 24.1 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 7.1 | 8.0 | 6.0 | 6.0 | 2.3 | 8.5 | 5.0 | 11.5 |
| Green Ext Time (p_c), s | 0.4 | 6.2 | 0.2 | 7.2 | 0.0 | 6.2 | 0.1 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 21.5 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 13.5 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 68 | 46 | 4 | 43 | 175 | 119 | 1 | 210 | 28 | 72 | 138 | 29 |
| Future Vol, veh/h | 68 | 46 | 4 | 43 | 175 | 119 | 1 | 210 | 28 | 72 | 138 | 29 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 86 | 58 | 5 | 54 | 222 | 151 | 1 | 266 | 35 | 91 | 175 | 37 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 12.5 | 13.6 | 13.3 | 13.9 |
| HCM LOS | B | B | B | B |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 1% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 51% | 0% |
| Vol Thru, % | 99% | 79% | 0% | 100% | 79% | 0% | 100% | 33% | 49% | 70% |
| Vol Right, % | 0% | 21% | 0% | 0% | 21% | 0% | 0% | 67% | 0% | 30% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 106 | 133 | 68 | 31 | 19 | 43 | 117 | 177 | 141 | 98 |
| LT Vol | 1 | 0 | 68 | 0 | 0 | 43 | 0 | 0 | 72 | 0 |
| Through Vol | 105 | 105 | 0 | 31 | 15 | 0 | 117 | 58 | 69 | 69 |
| RT Vol | 0 | 28 | 0 | 0 | 4 | 0 | 0 | 119 | 0 | 29 |
| Lane Flow Rate | 134 | 168 | 86 | 39 | 24 | 54 | 148 | 224 | 178 | 124 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.275 | 0.338 | 0.202 | 0.086 | 0.053 | 0.118 | 0.298 | 0.423 | 0.378 | 0.247 |
| Departure Headway (Hd) | 7.391 | 7.237 | 8.465 | 7.951 | 7.803 | 7.781 | 7.269 | 6.789 | 7.625 | 7.16 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 486 | 497 | 423 | 450 | 458 | 461 | 495 | 530 | 471 | 501 |
| Service Time | 5.136 | 4.983 | 6.222 | 5.708 | 5.559 | 5.526 | 5.015 | 4.534 | 5.37 | 4.904 |
| HCM Lane V/C Ratio | 0.276 | 0.338 | 0.203 | 0.087 | 0.052 | 0.117 | 0.299 | 0.423 | 0.378 | 0.248 |
| HCM Control Delay | 12.9 | 13.7 | 13.4 | 11.5 | 11 | 11.6 | 13.1 | 14.5 | 15 | 12.3 |
| HCM Lane LOS | B | B | B | B | B | B | B | B | B | B |
| HCM 95th-tile Q | 1.1 | 1.5 | 0.7 | 0.3 | 0.2 | 0.4 | 1.2 | 2.1 | 1.7 | 1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | ↰ | ↑ | ↱ | ↰ | ↑ | ↱ | ↰↰ | ↑ | ↱ | ↰ | ↑ | ↱ |
| Traffic Volume (veh/h) | 51 | 103 | 27 | 30 | 255 | 147 | 164 | 537 | 37 | 104 | 667 | 154 |
| Future Volume (veh/h) | 51 | 103 | 27 | 30 | 255 | 147 | 164 | 537 | 37 | 104 | 667 | 154 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 59 | 118 | 3 | 34 | 293 | 0 | 189 | 617 | 0 | 120 | 767 | 72 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 82 | 430 | 363 | 59 | 406 | 345 | 276 | 827 | 703 | 152 | 838 | 708 |
| Arrive On Green | 0.05 | 0.23 | 0.23 | 0.03 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 59 | 118 | 3 | 34 | 293 | 0 | 189 | 617 | 0 | 120 | 767 | 72 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 2.6 | 4.0 | 0.1 | 1.5 | 11.4 | 0.0 | 4.2 | 21.4 | 0.0 | 5.2 | 30.0 | 2.1 |
| Cycle Q Clear(g_c), s | 2.6 | 4.0 | 0.1 | 1.5 | 11.4 | 0.0 | 4.2 | 21.4 | 0.0 | 5.2 | 30.0 | 2.1 |
| 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 | 82 | 430 | 363 | 59 | 406 | 345 | 276 | 827 | 703 | 152 | 838 | 708 |
| V/C Ratio(X) | 0.72 | 0.27 | 0.01 | 0.57 | 0.72 | 0.00 | 0.68 | 0.75 | 0.00 | 0.79 | 0.92 | 0.10 |
| Avail Cap(c_a), veh/h | 183 | 958 | 809 | 183 | 958 | 814 | 443 | 862 | 733 | 228 | 862 | 729 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 36.6 | 24.6 | 23.0 | 37.0 | 28.2 | 0.0 | 34.8 | 18.0 | 0.0 | 34.8 | 20.0 | 12.3 |
| Incr Delay (d2), s/veh | 11.1 | 0.3 | 0.0 | 8.4 | 2.4 | 0.0 | 3.0 | 3.4 | 0.0 | 10.1 | 14.1 | 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 | 1.5 | 2.1 | 0.1 | 0.9 | 6.1 | 0.0 | 2.1 | 11.8 | 0.0 | 3.0 | 18.6 | 0.9 |
| LnGrp Delay(d),s/veh | 47.7 | 24.9 | 23.1 | 45.5 | 30.7 | 0.0 | 37.8 | 21.4 | 0.0 | 45.0 | 34.1 | 12.4 |
| LnGrp LOS | D | C | C | D | C | | D | C | | D | C | B |
| Approach Vol, veh/h | | 180 | | | 327 | | | 806 | | | 959 | |
| Approach Delay, s/veh | | 32.3 | | | 32.2 | | | 25.2 | | | 33.8 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 10.7 | 38.5 | 6.6 | 21.9 | 10.2 | 39.0 | 7.6 | 20.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.2 | 23.4 | 3.5 | 6.0 | 6.2 | 32.0 | 4.6 | 13.4 |
| Green Ext Time (p_c), s | 0.1 | 7.2 | 0.0 | 2.8 | 0.2 | 2.9 | 0.0 | 2.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 30.4 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 48 | 78 | 35 | 456 | 165 | 331 | 19 | 459 | 195 | 600 | 967 | 175 |
| Future Volume (veh/h) | 48 | 78 | 35 | 456 | 165 | 331 | 19 | 459 | 195 | 600 | 967 | 175 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 49 | 80 | 0 | 470 | 170 | 0 | 20 | 473 | 0 | 619 | 997 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 68 | 402 | 125 | 596 | 1088 | 339 | 36 | 1026 | 0 | 749 | 2402 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.19 | 0.23 | 0.00 | 0.02 | 0.30 | 0.00 | 0.23 | 0.51 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 49 | 80 | 0 | 470 | 170 | 0 | 20 | 473 | 0 | 619 | 997 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.4 | 1.3 | 0.0 | 11.4 | 2.3 | 0.0 | 1.0 | 9.1 | 0.0 | 15.0 | 10.7 | 0.0 |
| Cycle Q Clear(g_c), s | 2.4 | 1.3 | 0.0 | 11.4 | 2.3 | 0.0 | 1.0 | 9.1 | 0.0 | 15.0 | 10.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 68 | 402 | 125 | 596 | 1088 | 339 | 36 | 1026 | 0 | 749 | 2402 | 0 |
| V/C Ratio(X) | 0.72 | 0.20 | 0.00 | 0.79 | 0.16 | 0.00 | 0.55 | 0.46 | 0.00 | 0.83 | 0.42 | 0.00 |
| Avail Cap(c_a), veh/h | 626 | 2084 | 649 | 1411 | 2084 | 649 | 615 | 1739 | 0 | 1215 | 2402 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 38.6 | 34.7 | 0.0 | 31.6 | 25.0 | 0.0 | 39.4 | 23.3 | 0.0 | 29.6 | 12.4 | 0.0 |
| Incr Delay (d2), s/veh | 13.6 | 0.2 | 0.0 | 2.4 | 0.1 | 0.0 | 12.6 | 0.3 | 0.0 | 2.6 | 0.1 | 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 | 1.3 | 0.6 | 0.0 | 5.2 | 1.0 | 0.0 | 0.6 | 2.9 | 0.0 | 6.9 | 4.6 | 0.0 |
| LnGrp Delay(d),s/veh | 52.2 | 34.9 | 0.0 | 34.0 | 25.1 | 0.0 | 52.0 | 23.7 | 0.0 | 32.1 | 12.5 | 0.0 |
| LnGrp LOS | D | C | | C | C | | D | C | | C | B | |
| Approach Vol, veh/h | | 129 | | | 640 | | | 493 | | | 1616 | |
| Approach Delay, s/veh | | 41.5 | | | 31.6 | | | 24.8 | | | 20.0 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 23.1 | 28.2 | 19.2 | 10.9 | 5.8 | 45.5 | 7.3 | 22.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 17.0 | 11.1 | 13.4 | 3.3 | 3.0 | 12.7 | 4.4 | 4.3 |
| Green Ext Time (p_c), s | 2.1 | 12.7 | 1.8 | 1.9 | 0.0 | 13.4 | 0.1 | 1.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 24.4 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 159 | 210 | 330 | 88 | 395 | 20 | 280 | 164 | 23 | 27 | 133 | 124 |
| Future Volume (veh/h) | 159 | 210 | 330 | 88 | 395 | 20 | 280 | 164 | 23 | 27 | 133 | 124 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 173 | 228 | 64 | 96 | 429 | 17 | 304 | 178 | 15 | 29 | 145 | 21 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 292 | 1130 | 297 | 126 | 1351 | 53 | 346 | 1087 | 91 | 57 | 518 | 73 |
| Arrive On Green | 0.08 | 0.28 | 0.28 | 0.07 | 0.27 | 0.27 | 0.19 | 0.33 | 0.33 | 0.03 | 0.17 | 0.17 |
| Sat Flow, veh/h | 3442 | 3984 | 1046 | 1774 | 5012 | 197 | 1774 | 3298 | 275 | 1774 | 3094 | 439 |
| Grp Volume(v), veh/h | 173 | 192 | 100 | 96 | 289 | 157 | 304 | 95 | 98 | 29 | 82 | 84 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1640 | 1774 | 1695 | 1819 | 1774 | 1770 | 1803 | 1774 | 1770 | 1763 |
| Q Serve(g_s), s | 2.7 | 2.4 | 2.6 | 3.0 | 3.8 | 3.9 | 9.4 | 2.1 | 2.2 | 0.9 | 2.3 | 2.4 |
| Cycle Q Clear(g_c), s | 2.7 | 2.4 | 2.6 | 3.0 | 3.8 | 3.9 | 9.4 | 2.1 | 2.2 | 0.9 | 2.3 | 2.4 |
| Prop In Lane | 1.00 | | 0.64 | 1.00 | | 0.11 | 1.00 | | 0.15 | 1.00 | | 0.25 |
| Lane Grp Cap(c), veh/h | 292 | 961 | 465 | 126 | 914 | 490 | 346 | 583 | 595 | 57 | 296 | 295 |
| V/C Ratio(X) | 0.59 | 0.20 | 0.22 | 0.76 | 0.32 | 0.32 | 0.88 | 0.16 | 0.17 | 0.51 | 0.28 | 0.29 |
| Avail Cap(c_a), veh/h | 975 | 2161 | 1045 | 503 | 2161 | 1160 | 346 | 1128 | 1150 | 346 | 1128 | 1124 |
| 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 | 24.9 | 15.4 | 15.4 | 25.8 | 16.5 | 16.5 | 22.1 | 13.4 | 13.4 | 26.9 | 20.5 | 20.6 |
| Incr Delay (d2), s/veh | 1.9 | 0.1 | 0.2 | 9.1 | 0.2 | 0.4 | 22.0 | 0.1 | 0.1 | 6.7 | 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 | 1.4 | 1.1 | 1.2 | 1.8 | 1.8 | 2.0 | 6.7 | 1.0 | 1.1 | 0.6 | 1.2 | 1.2 |
| LnGrp Delay(d),s/veh | 26.8 | 15.5 | 15.7 | 34.9 | 16.7 | 16.9 | 44.1 | 13.5 | 13.5 | 33.6 | 21.0 | 21.1 |
| LnGrp LOS | C | B | B | C | B | B | D | B | B | C | C | C |
| Approach Vol, veh/h | | 465 | | | 542 | | | 497 | | | 195 | |
| Approach Delay, s/veh | | 19.7 | | | 19.9 | | | 32.2 | | | 22.9 | |
| Approach LOS | | B | | | B | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 5.8 | 22.6 | 8.0 | 20.0 | 15.0 | 13.4 | 8.8 | 19.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 2.9 | 4.2 | 5.0 | 4.6 | 11.4 | 4.4 | 4.7 | 5.9 |
| Green Ext Time (p_c), s | 0.0 | 2.2 | 0.1 | 5.6 | 0.0 | 2.2 | 0.4 | 5.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 23.8 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.9 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 18 | 212 | 492 | 188 | 163 | 28 |
| Future Vol, veh/h | 18 | 212 | 492 | 188 | 163 | 28 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 22 | 255 | 593 | 227 | 196 | 34 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 603 | 0 | - | 0 | 751 | 316 |
| Stage 1 | - | - | - | - | 603 | - |
| Stage 2 | - | - | - | - | 148 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 606 | - | - | - | 413 | 580 |
| Stage 1 | - | - | - | - | 420 | - |
| Stage 2 | - | - | - | - | 794 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 601 | - | - | - | 391 | 570 |
| Mov Cap-2 Maneuver | - | - | - | - | 391 | - |
| Stage 1 | - | - | - | - | 417 | - |
| Stage 2 | - | - | - | - | 759 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.9 | 0 | 21.4 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 601 | - | - | - | 391 | 570 |
| HCM Lane V/C Ratio | 0.036 | - | - | - | 0.502 | 0.059 |
| HCM Control Delay (s) | 11.2 | - | - | - | 23.1 | 11.7 |
| HCM Lane LOS | B | - | - | - | C | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 2.7 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 147 | 399 | 196 | 68 | 605 | 291 | 162 | 253 | 69 | 238 | 433 | 88 |
| Future Volume (veh/h) | 147 | 399 | 196 | 68 | 605 | 291 | 162 | 253 | 69 | 238 | 433 | 88 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.81 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 179 | 487 | 109 | 83 | 738 | 0 | 198 | 309 | 0 | 290 | 528 | 102 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 292 | 307 | 210 | 564 | 592 | 503 | 188 | 482 | 410 | 292 | 482 | 93 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.32 | 0.32 | 0.00 | 0.11 | 0.26 | 0.00 | 0.16 | 0.32 | 0.32 |
| Sat Flow, veh/h | 1774 | 1863 | 1275 | 1774 | 1863 | 1583 | 1774 | 1863 | 1583 | 1774 | 1517 | 293 |
| Grp Volume(v), veh/h | 179 | 487 | 109 | 83 | 738 | 0 | 198 | 309 | 0 | 290 | 0 | 630 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1275 | 1774 | 1863 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1810 |
| Q Serve(g_s), s | 15.9 | 28.0 | 13.3 | 5.7 | 54.0 | 0.0 | 18.0 | 25.1 | 0.0 | 27.7 | 0.0 | 54.0 |
| Cycle Q Clear(g_c), s | 15.9 | 28.0 | 13.3 | 5.7 | 54.0 | 0.0 | 18.0 | 25.1 | 0.0 | 27.7 | 0.0 | 54.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 292 | 307 | 210 | 564 | 592 | 503 | 188 | 482 | 410 | 292 | 0 | 575 |
| V/C Ratio(X) | 0.61 | 1.59 | 0.52 | 0.15 | 1.25 | 0.00 | 1.05 | 0.64 | 0.00 | 0.99 | 0.00 | 1.10 |
| Avail Cap(c_a), veh/h | 292 | 307 | 210 | 564 | 592 | 503 | 188 | 592 | 503 | 292 | 0 | 575 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 66.0 | 71.0 | 64.8 | 41.5 | 58.0 | 0.0 | 76.0 | 56.0 | 0.0 | 70.9 | 0.0 | 58.0 |
| Incr Delay (d2), s/veh | 3.7 | 279.3 | 2.2 | 0.1 | 124.9 | 0.0 | 80.7 | 1.7 | 0.0 | 50.5 | 0.0 | 66.4 |
| 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 | 8.1 | 38.2 | 4.8 | 2.8 | 48.3 | 0.0 | 13.0 | 13.1 | 0.0 | 17.7 | 0.0 | 37.6 |
| LnGrp Delay(d),s/veh | 69.7 | 350.3 | 67.1 | 41.6 | 182.9 | 0.0 | 156.7 | 57.6 | 0.0 | 121.4 | 0.0 | 124.4 |
| LnGrp LOS | E | F | E | D | F | | F | E | | F | | F |
| Approach Vol, veh/h | | 775 | | | 821 | | | 507 | | | 920 | |
| Approach Delay, s/veh | | 245.7 | | | 168.7 | | | 96.3 | | | 123.5 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 48.0 | | 32.0 | 22.0 | 58.0 | | 58.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 29.7 | 27.1 | | 30.0 | 20.0 | 56.0 | | 56.0 |
| Green Ext Time (p_c), s | 0.0 | 7.1 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 162.5 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 15.1 |
| Intersection LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 104 | 0 | 2 | 407 | 263 | 102 |
| Future Vol, veh/h | 104 | 0 | 2 | 407 | 263 | 102 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 122 | 0 | 2 | 479 | 309 | 120 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 1 | 1 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 1 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 1 |
| HCM Control Delay | 10.7 | 16.1 | 15.3 |
| HCM LOS | B | C | C |

| Lane | EBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 100% | 0% |
| Vol Thru, % | 0% | 0% | 0% | 0% |
| Vol Right, % | 0% | 100% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 104 | 409 | 263 | 102 |
| LT Vol | 104 | 0 | 263 | 0 |
| Through Vol | 0 | 2 | 0 | 0 |
| RT Vol | 0 | 407 | 0 | 102 |
| Lane Flow Rate | 122 | 481 | 309 | 120 |
| Geometry Grp | 2 | 2 | 7 | 7 |
| Degree of Util (X) | 0.206 | 0.644 | 0.566 | 0.179 |
| Departure Headway (Hd) | 6.064 | 4.815 | 6.58 | 5.364 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 591 | 755 | 548 | 668 |
| Service Time | 4.117 | 2.815 | 4.319 | 3.103 |
| HCM Lane V/C Ratio | 0.206 | 0.637 | 0.564 | 0.18 |
| HCM Control Delay | 10.7 | 16.1 | 17.6 | 9.3 |
| HCM Lane LOS | B | C | C | A |
| HCM 95th-tile Q | 0.8 | 4.7 | 3.5 | 0.6 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 220 | 39 | 29 | 363 | 42 | 46 |
| Future Vol, veh/h | 220 | 39 | 29 | 363 | 42 | 46 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 81 | 81 | 81 | 81 | 81 | 81 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 272 | 48 | 36 | 448 | 52 | 57 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 327 | 0 | 830 | 310 |
| Stage 1 | - | - | - | - | 303 | - |
| Stage 2 | - | - | - | - | 527 | - |
| 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 | - | - | 1233 | - | 340 | 730 |
| Stage 1 | - | - | - | - | 749 | - |
| Stage 2 | - | - | - | - | 592 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1226 | - | 323 | 722 |
| Mov Cap-2 Maneuver | - | - | - | - | 323 | - |
| Stage 1 | - | - | - | - | 745 | - |
| Stage 2 | - | - | - | - | 566 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.6 | 15.4 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 454 | - | - | 1226 | - |
| HCM Lane V/C Ratio | 0.239 | - | - | 0.029 | - |
| HCM Control Delay (s) | 15.4 | - | - | 8 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.9 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.6 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 256 | 5 | 6 | 396 | 19 | 7 |
| Future Vol, veh/h | 256 | 5 | 6 | 396 | 19 | 7 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 291 | 6 | 7 | 450 | 22 | 8 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 304 | 0 | 772 | 308 |
| Stage 1 | - | - | - | - | 301 | - |
| Stage 2 | - | - | - | - | 471 | - |
| 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 | - | - | 1257 | - | 368 | 732 |
| Stage 1 | - | - | - | - | 751 | - |
| Stage 2 | - | - | - | - | 628 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1250 | - | 361 | 723 |
| Mov Cap-2 Maneuver | - | - | - | - | 361 | - |
| Stage 1 | - | - | - | - | 747 | - |
| Stage 2 | - | - | - | - | 620 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 14.3 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 417 | - | - | 1250 | - |
| HCM Lane V/C Ratio | 0.071 | - | - | 0.005 | - |
| HCM Control Delay (s) | 14.3 | - | - | 7.9 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 77.3 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 84 | 136 | 6 | 8 | 285 | 214 | 22 | 147 | 13 | 257 | 197 | 124 |
| Future Vol, veh/h | 84 | 136 | 6 | 8 | 285 | 214 | 22 | 147 | 13 | 257 | 197 | 124 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 92 | 149 | 7 | 9 | 313 | 235 | 24 | 162 | 14 | 282 | 216 | 136 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 17.9 | 161.5 | 16.4 | 45.9 |
| HCM LOS | C | F | C | E |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 31% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 72% | 0% |
| Vol Thru, % | 69% | 100% | 0% | 0% | 100% | 0% | 0% | 57% | 28% | 44% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 43% | 0% | 56% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 71 | 98 | 13 | 84 | 136 | 6 | 8 | 499 | 356 | 223 |
| LT Vol | 22 | 0 | 0 | 84 | 0 | 0 | 8 | 0 | 257 | 0 |
| Through Vol | 49 | 98 | 0 | 0 | 136 | 0 | 0 | 285 | 99 | 99 |
| RT Vol | 0 | 0 | 13 | 0 | 0 | 6 | 0 | 214 | 0 | 124 |
| Lane Flow Rate | 78 | 108 | 14 | 92 | 149 | 7 | 9 | 548 | 391 | 245 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.21 | 0.285 | 0.035 | 0.252 | 0.387 | 0.016 | 0.022 | 1.27 | 0.936 | 0.536 |
| Departure Headway (Hd) | 10.514 | 10.352 | 9.62 | 10.553 | 10.032 | 9.301 | 9.154 | 8.335 | 9.279 | 8.506 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 343 | 349 | 374 | 342 | 362 | 387 | 391 | 439 | 395 | 428 |
| Service Time | 8.214 | 8.052 | 7.32 | 8.253 | 7.732 | 7.001 | 6.905 | 6.086 | 6.979 | 6.206 |
| HCM Lane V/C Ratio | 0.227 | 0.309 | 0.037 | 0.269 | 0.412 | 0.018 | 0.023 | 1.248 | 0.99 | 0.572 |
| HCM Control Delay | 16 | 17.1 | 12.7 | 16.8 | 18.9 | 12.2 | 12.1 | 163.9 | 61.7 | 20.6 |
| HCM Lane LOS | C | C | B | C | C | B | B | F | F | C |
| HCM 95th-tile Q | 0.8 | 1.2 | 0.1 | 1 | 1.8 | 0 | 0.1 | 23.3 | 10.2 | 3.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 669 | 429 | 248 | 49 | 296 | 323 | 144 | 517 | 94 | 239 | 570 | 535 |
| Future Volume (veh/h) | 669 | 429 | 248 | 49 | 296 | 323 | 144 | 517 | 94 | 239 | 570 | 535 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 704 | 452 | 0 | 52 | 312 | 0 | 152 | 544 | 0 | 252 | 615 | 305 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 843 | 1452 | 650 | 70 | 725 | 844 | 231 | 1003 | 449 | 348 | 1171 | 479 |
| Arrive On Green | 0.24 | 0.41 | 0.00 | 0.04 | 0.20 | 0.00 | 0.07 | 0.28 | 0.00 | 0.10 | 0.31 | 0.31 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1523 |
| Grp Volume(v), veh/h | 704 | 452 | 0 | 52 | 312 | 0 | 152 | 544 | 0 | 252 | 615 | 305 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1523 |
| Q Serve(g_s), s | 18.4 | 8.2 | 0.0 | 2.7 | 7.3 | 0.0 | 4.1 | 12.3 | 0.0 | 6.5 | 12.8 | 16.3 |
| Cycle Q Clear(g_c), s | 18.4 | 8.2 | 0.0 | 2.7 | 7.3 | 0.0 | 4.1 | 12.3 | 0.0 | 6.5 | 12.8 | 16.3 |
| 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 | 843 | 1452 | 650 | 70 | 725 | 844 | 231 | 1003 | 449 | 348 | 1171 | 479 |
| V/C Ratio(X) | 0.84 | 0.31 | 0.00 | 0.75 | 0.43 | 0.00 | 0.66 | 0.54 | 0.00 | 0.72 | 0.53 | 0.64 |
| Avail Cap(c_a), veh/h | 3741 | 4296 | 1922 | 543 | 1531 | 1479 | 835 | 2279 | 1019 | 1086 | 2634 | 1077 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.0 | 18.9 | 0.0 | 45.0 | 32.9 | 0.0 | 43.1 | 28.7 | 0.0 | 41.5 | 26.7 | 27.8 |
| Incr Delay (d2), s/veh | 2.3 | 0.1 | 0.0 | 14.5 | 0.4 | 0.0 | 3.2 | 0.5 | 0.0 | 2.9 | 0.4 | 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 | 9.0 | 4.0 | 0.0 | 1.6 | 3.6 | 0.0 | 2.0 | 6.1 | 0.0 | 3.3 | 6.6 | 7.0 |
| LnGrp Delay(d),s/veh | 36.2 | 19.0 | 0.0 | 59.5 | 33.3 | 0.0 | 46.3 | 29.2 | 0.0 | 44.3 | 27.0 | 29.3 |
| LnGrp LOS | D | B | | E | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 1156 | | | 364 | | | 696 | | | 1172 | |
| Approach Delay, s/veh | | 29.5 | | | 37.0 | | | 32.9 | | | 31.3 | |
| Approach LOS | | C | | | D | | | C | | | C | |
| **Timer** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 13.3 | 30.8 | 7.7 | 42.9 | 10.4 | 33.8 | 27.2 | 23.4 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | | | |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 8.5 | 14.3 | 4.7 | 10.2 | 6.1 | 18.3 | 20.4 | 9.3 | | | | |
| Green Ext Time (p_c), s | 0.8 | 11.4 | 0.1 | 5.8 | 0.4 | 11.4 | 2.8 | 5.5 | | | | |
| **Intersection Summary** | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | | | 31.6 | | | | | | | | | |
| HCM 2010 LOS | | | C | | | | | | | | | |
| **Notes** | | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 245 | 460 | 30 | 63 | 338 | 299 | 42 | 455 | 69 | 299 | 184 | 31 |
| Future Volume (veh/h) | 245 | 460 | 30 | 63 | 338 | 299 | 42 | 455 | 69 | 299 | 184 | 31 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 263 | 495 | 29 | 68 | 363 | 204 | 45 | 489 | 64 | 322 | 198 | 21 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 308 | 1316 | 77 | 89 | 574 | 316 | 66 | 825 | 107 | 425 | 1126 | 118 |
| Arrive On Green | 0.17 | 0.39 | 0.39 | 0.05 | 0.26 | 0.26 | 0.04 | 0.26 | 0.26 | 0.12 | 0.35 | 0.35 |
| Sat Flow, veh/h | 1774 | 3393 | 198 | 1774 | 2170 | 1194 | 1774 | 3138 | 409 | 3442 | 3227 | 338 |
| Grp Volume(v), veh/h | 263 | 258 | 266 | 68 | 295 | 272 | 45 | 275 | 278 | 322 | 108 | 111 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1821 | 1774 | 1770 | 1594 | 1774 | 1770 | 1777 | 1721 | 1770 | 1796 |
| Q Serve(g_s), s | 13.1 | 9.5 | 9.6 | 3.4 | 13.4 | 13.8 | 2.3 | 12.3 | 12.5 | 8.2 | 3.8 | 3.9 |
| Cycle Q Clear(g_c), s | 13.1 | 9.5 | 9.6 | 3.4 | 13.4 | 13.8 | 2.3 | 12.3 | 12.5 | 8.2 | 3.8 | 3.9 |
| Prop In Lane | 1.00 | | 0.11 | 1.00 | | 0.75 | 1.00 | | 0.23 | 1.00 | | 0.19 |
| Lane Grp Cap(c), veh/h | 308 | 686 | 706 | 89 | 468 | 422 | 66 | 465 | 467 | 425 | 618 | 627 |
| V/C Ratio(X) | 0.85 | 0.38 | 0.38 | 0.77 | 0.63 | 0.65 | 0.68 | 0.59 | 0.60 | 0.76 | 0.17 | 0.18 |
| Avail Cap(c_a), veh/h | 623 | 816 | 840 | 390 | 583 | 525 | 156 | 719 | 722 | 945 | 1049 | 1065 |
| 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 | 36.5 | 20.0 | 20.0 | 42.7 | 29.5 | 29.7 | 43.3 | 29.3 | 29.3 | 38.6 | 20.5 | 20.6 |
| Incr Delay (d2), s/veh | 6.8 | 0.3 | 0.3 | 12.7 | 1.5 | 1.9 | 11.5 | 1.2 | 1.2 | 2.8 | 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 | 7.0 | 4.7 | 4.9 | 2.0 | 6.7 | 6.3 | 1.3 | 6.2 | 6.3 | 4.1 | 1.9 | 2.0 |
| LnGrp Delay(d),s/veh | 43.3 | 20.3 | 20.3 | 55.4 | 31.0 | 31.6 | 54.8 | 30.5 | 30.5 | 41.4 | 20.7 | 20.7 |
| LnGrp LOS | D | C | C | E | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 787 | | | 635 | | | 598 | | | 541 | |
| Approach Delay, s/veh | | 28.0 | | | 33.9 | | | 32.3 | | | 33.0 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 15.2 | 27.9 | 8.6 | 39.3 | 7.4 | 35.8 | 19.8 | 28.1 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 10.2 | 14.5 | 5.4 | 11.6 | 4.3 | 5.9 | 15.1 | 15.8 |
| Green Ext Time (p_c), s | 1.0 | 5.1 | 0.1 | 8.5 | 0.0 | 5.8 | 0.7 | 6.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 31.5 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 12.7 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 61 | 185 | 10 | 79 | 89 | 54 | 2 | 156 | 66 | 97 | 173 | 17 |
| Future Vol, veh/h | 61 | 185 | 10 | 79 | 89 | 54 | 2 | 156 | 66 | 97 | 173 | 17 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 68 | 206 | 11 | 88 | 99 | 60 | 2 | 173 | 73 | 108 | 192 | 19 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 12.3 | 11.8 | 12.5 | 14 |
| HCM LOS | B | B | B | B |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 3% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 53% | 0% |
| Vol Thru, % | 97% | 54% | 0% | 100% | 86% | 0% | 100% | 35% | 47% | 84% |
| Vol Right, % | 0% | 46% | 0% | 0% | 14% | 0% | 0% | 65% | 0% | 16% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 80 | 144 | 61 | 123 | 72 | 79 | 59 | 84 | 184 | 104 |
| LT Vol | 2 | 0 | 61 | 0 | 0 | 79 | 0 | 0 | 97 | 0 |
| Through Vol | 78 | 78 | 0 | 123 | 62 | 0 | 59 | 30 | 87 | 87 |
| RT Vol | 0 | 66 | 0 | 0 | 10 | 0 | 0 | 54 | 0 | 17 |
| Lane Flow Rate | 89 | 160 | 68 | 137 | 80 | 88 | 66 | 93 | 204 | 115 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.181 | 0.31 | 0.148 | 0.28 | 0.16 | 0.194 | 0.137 | 0.181 | 0.417 | 0.223 |
| Departure Headway (Hd) | 7.322 | 6.986 | 7.861 | 7.35 | 7.25 | 7.97 | 7.459 | 6.996 | 7.367 | 6.985 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 490 | 515 | 456 | 489 | 495 | 450 | 481 | 513 | 489 | 514 |
| Service Time | 5.064 | 4.728 | 5.605 | 5.094 | 4.994 | 5.713 | 5.201 | 4.738 | 5.107 | 4.726 |
| HCM Lane V/C Ratio | 0.182 | 0.311 | 0.149 | 0.28 | 0.162 | 0.196 | 0.137 | 0.181 | 0.417 | 0.224 |
| HCM Control Delay | 11.7 | 12.9 | 12 | 12.9 | 11.4 | 12.6 | 11.4 | 11.3 | 15.3 | 11.7 |
| HCM Lane LOS | B | B | B | B | B | B | B | B | C | B |
| HCM 95th-tile Q | 0.7 | 1.3 | 0.5 | 1.1 | 0.6 | 0.7 | 0.5 | 0.7 | 2 | 0.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 135 | 264 | 35 | 26 | 166 | 92 | 75 | 559 | 39 | 154 | 537 | 159 |
| Future Volume (veh/h) | 135 | 264 | 35 | 26 | 166 | 92 | 75 | 559 | 39 | 154 | 537 | 159 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 142 | 278 | 8 | 27 | 175 | 0 | 79 | 588 | 0 | 162 | 565 | 81 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 122 | 401 | 334 | 41 | 316 | 269 | 151 | 794 | 675 | 207 | 929 | 786 |
| Arrive On Green | 0.07 | 0.22 | 0.22 | 0.02 | 0.17 | 0.00 | 0.04 | 0.43 | 0.00 | 0.12 | 0.50 | 0.50 |
| Sat Flow, veh/h | 1774 | 1863 | 1554 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Grp Volume(v), veh/h | 142 | 278 | 8 | 27 | 175 | 0 | 79 | 588 | 0 | 162 | 565 | 81 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1554 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Q Serve(g_s), s | 5.0 | 10.0 | 0.3 | 1.1 | 6.3 | 0.0 | 1.6 | 19.3 | 0.0 | 6.5 | 15.9 | 2.0 |
| Cycle Q Clear(g_c), s | 5.0 | 10.0 | 0.3 | 1.1 | 6.3 | 0.0 | 1.6 | 19.3 | 0.0 | 6.5 | 15.9 | 2.0 |
| 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 | 122 | 401 | 334 | 41 | 316 | 269 | 151 | 794 | 675 | 207 | 929 | 786 |
| V/C Ratio(X) | 1.17 | 0.69 | 0.02 | 0.66 | 0.55 | 0.00 | 0.52 | 0.74 | 0.00 | 0.78 | 0.61 | 0.10 |
| Avail Cap(c_a), veh/h | 122 | 1021 | 852 | 146 | 1047 | 890 | 613 | 2400 | 2040 | 584 | 2681 | 2266 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.0 | 26.4 | 22.6 | 35.4 | 27.8 | 0.0 | 34.1 | 17.6 | 0.0 | 31.3 | 13.2 | 9.7 |
| Incr Delay (d2), s/veh | 133.8 | 2.2 | 0.0 | 16.5 | 1.5 | 0.0 | 2.8 | 1.4 | 0.0 | 6.4 | 0.6 | 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 | 6.9 | 5.4 | 0.1 | 0.7 | 3.3 | 0.0 | 0.8 | 10.1 | 0.0 | 3.5 | 8.3 | 0.9 |
| LnGrp Delay(d),s/veh | 167.8 | 28.6 | 22.6 | 51.9 | 29.3 | 0.0 | 37.0 | 18.9 | 0.0 | 37.8 | 13.8 | 9.7 |
| LnGrp LOS | F | C | C | D | C | | D | B | | D | B | A |
| Approach Vol, veh/h | | 428 | | | 202 | | | 667 | | | 808 | |
| Approach Delay, s/veh | | 74.7 | | | 32.3 | | | 21.1 | | | 18.2 | |
| Approach LOS | | E | | | C | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 12.5 | 35.1 | 5.7 | 19.7 | 7.2 | 40.4 | 9.0 | 16.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 8.5 | 21.3 | 3.1 | 12.0 | 3.6 | 17.9 | 7.0 | 8.3 |
| Green Ext Time (p_c), s | 0.3 | 9.8 | 0.0 | 3.0 | 0.1 | 9.8 | 0.0 | 3.1 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 31.9 |
| HCM 2010 LOS | | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 209 | 477 | 37 | 183 | 307 | 417 | 69 | 1182 | 419 | 424 | 307 | 291 |
| Future Volume (veh/h) | 209 | 477 | 37 | 183 | 307 | 417 | 69 | 1182 | 419 | 424 | 307 | 291 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 225 | 513 | 0 | 197 | 330 | 0 | 74 | 1271 | 0 | 456 | 330 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 238 | 1315 | 392 | 229 | 971 | 302 | 72 | 1568 | 0 | 490 | 2325 | 0 |
| Arrive On Green | 0.14 | 0.28 | 0.00 | 0.07 | 0.21 | 0.00 | 0.04 | 0.43 | 0.00 | 0.15 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 225 | 513 | 0 | 197 | 330 | 0 | 74 | 1271 | 0 | 456 | 330 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 34.2 | 22.2 | 0.0 | 15.4 | 15.1 | 0.0 | 11.0 | 77.4 | 0.0 | 35.6 | 9.6 | 0.0 |
| Cycle Q Clear(g_c), s | 34.2 | 22.2 | 0.0 | 15.4 | 15.1 | 0.0 | 11.0 | 77.4 | 0.0 | 35.6 | 9.6 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 238 | 1315 | 392 | 229 | 971 | 302 | 72 | 1568 | 0 | 490 | 2325 | 0 |
| V/C Ratio(X) | 0.94 | 0.39 | 0.00 | 0.86 | 0.34 | 0.00 | 1.03 | 0.81 | 0.00 | 0.93 | 0.14 | 0.00 |
| Avail Cap(c_a), veh/h | 287 | 1315 | 392 | 809 | 971 | 302 | 72 | 1568 | 0 | 581 | 2325 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 73.7 | 0.0 | 116.0 | 85.7 | 0.0 | 120.8 | 62.7 | 0.0 | 105.6 | 28.7 | 0.0 |
| Incr Delay (d2), s/veh | 35.1 | 0.9 | 0.0 | 9.0 | 1.0 | 0.0 | 115.8 | 4.7 | 0.0 | 19.8 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 18.0 | 9.8 | 0.0 | 7.1 | 6.7 | 0.0 | 7.3 | 26.6 | 0.0 | 17.1 | 3.8 | 0.0 |
| LnGrp Delay(d),s/veh | 142.1 | 74.6 | 0.0 | 125.0 | 86.6 | 0.0 | 237.2 | 67.3 | 0.0 | 125.4 | 28.8 | 0.0 |
| LnGrp LOS | F | E | | F | F | | F | E | | F | C | |
| Approach Vol, veh/h | | 738 | | | 527 | | | 1345 | | | 786 | |
| Approach Delay, s/veh | | 95.2 | | | 101.0 | | | 76.7 | | | 84.8 | |
| Approach LOS | | F | | | F | | | E | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 42.8 | 113.2 | 22.2 | 74.5 | 15.0 | 141.0 | 40.6 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 37.6 | 79.4 | 17.4 | 24.2 | 13.0 | 11.6 | 36.2 | 17.1 |
| Green Ext Time (p_c), s | 1.2 | 13.1 | 0.7 | 3.5 | 0.0 | 22.0 | 0.4 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 86.4 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 288 | 570 | 169 | 82 | 300 | 20 | 233 | 172 | 101 | 42 | 109 | 173 |
| Future Volume (veh/h) | 288 | 570 | 169 | 82 | 300 | 20 | 233 | 172 | 101 | 42 | 109 | 173 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.98 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 303 | 600 | 135 | 86 | 316 | 16 | 245 | 181 | 43 | 44 | 115 | 22 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 443 | 1463 | 322 | 112 | 1421 | 71 | 301 | 880 | 203 | 73 | 540 | 101 |
| Arrive On Green | 0.13 | 0.35 | 0.35 | 0.06 | 0.29 | 0.29 | 0.17 | 0.31 | 0.31 | 0.04 | 0.18 | 0.18 |
| Sat Flow, veh/h | 3442 | 4148 | 914 | 1774 | 4956 | 248 | 1774 | 2838 | 656 | 1774 | 2967 | 553 |
| Grp Volume(v), veh/h | 303 | 488 | 247 | 86 | 215 | 117 | 245 | 111 | 113 | 44 | 67 | 70 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1671 | 1774 | 1695 | 1814 | 1774 | 1770 | 1724 | 1774 | 1770 | 1750 |
| Q Serve(g_s), s | 5.8 | 7.5 | 7.7 | 3.3 | 3.3 | 3.4 | 9.1 | 3.2 | 3.3 | 1.7 | 2.2 | 2.3 |
| Cycle Q Clear(g_c), s | 5.8 | 7.5 | 7.7 | 3.3 | 3.3 | 3.4 | 9.1 | 3.2 | 3.3 | 1.7 | 2.2 | 2.3 |
| Prop In Lane | 1.00 | | 0.55 | 1.00 | | 0.14 | 1.00 | | 0.38 | 1.00 | | 0.32 |
| Lane Grp Cap(c), veh/h | 443 | 1195 | 589 | 112 | 972 | 520 | 301 | 549 | 534 | 73 | 322 | 318 |
| V/C Ratio(X) | 0.68 | 0.41 | 0.42 | 0.77 | 0.22 | 0.22 | 0.82 | 0.20 | 0.21 | 0.60 | 0.21 | 0.22 |
| Avail Cap(c_a), veh/h | 1806 | 2273 | 1120 | 284 | 1779 | 952 | 672 | 1496 | 1457 | 129 | 1057 | 1046 |
| 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 | 28.6 | 16.8 | 16.9 | 31.7 | 18.6 | 18.7 | 27.5 | 17.4 | 17.5 | 32.3 | 23.9 | 23.9 |
| Incr Delay (d2), s/veh | 1.9 | 0.2 | 0.5 | 10.6 | 0.1 | 0.2 | 5.4 | 0.2 | 0.2 | 7.6 | 0.3 | 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 | 2.9 | 3.5 | 3.6 | 1.9 | 1.6 | 1.7 | 4.9 | 1.6 | 1.6 | 1.0 | 1.1 | 1.2 |
| LnGrp Delay(d),s/veh | 30.4 | 17.0 | 17.3 | 42.3 | 18.8 | 18.9 | 32.8 | 17.6 | 17.7 | 39.9 | 24.2 | 24.3 |
| LnGrp LOS | C | B | B | D | B | B | C | B | B | D | C | C |
| Approach Vol, veh/h | | 1038 | | | 418 | | | 469 | | | 181 | |
| Approach Delay, s/veh | | 21.0 | | | 23.6 | | | 25.6 | | | 28.0 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 6.8 | 25.3 | 8.3 | 28.2 | 15.6 | 16.5 | 12.8 | 23.7 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 3.7 | 5.3 | 5.3 | 9.7 | 11.1 | 4.3 | 7.8 | 5.4 |
| Green Ext Time (p_c), s | 0.0 | 2.3 | 0.1 | 9.1 | 0.6 | 2.3 | 1.1 | 8.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 23.2 |
| HCM 2010 LOS | C |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 3.3 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 38 | 603 | 316 | 131 | 180 | 21 |
| Future Vol, veh/h | 38 | 603 | 316 | 131 | 180 | 21 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 41 | 648 | 340 | 141 | 194 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 341 | 0 | - | 0 | 683 | 172 |
| Stage 1 | - | - | - | - | 341 | - |
| Stage 2 | - | - | - | - | 342 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 804 | - | - | - | 446 | 716 |
| Stage 1 | - | - | - | - | 599 | - |
| Stage 2 | - | - | - | - | 633 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 803 | - | - | - | 423 | 715 |
| Mov Cap-2 Maneuver | - | - | - | - | 423 | - |
| Stage 1 | - | - | - | - | 599 | - |
| Stage 2 | - | - | - | - | 600 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.6 | 0 | 19.4 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 803 | - | - | - | 423 | 715 |
| HCM Lane V/C Ratio | 0.051 | - | - | - | 0.458 | 0.032 |
| HCM Control Delay (s) | 9.7 | - | - | - | 20.5 | 10.2 |
| HCM Lane LOS | A | - | - | - | C | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 2.3 | 0.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 139 | 560 | 182 | 43 | 392 | 174 | 119 | 376 | 60 | 187 | 284 | 161 |
| Future Volume (veh/h) | 139 | 560 | 182 | 43 | 392 | 174 | 119 | 376 | 60 | 187 | 284 | 161 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 156 | 629 | 122 | 48 | 440 | 0 | 134 | 422 | 0 | 210 | 319 | 168 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 373 | 392 | 331 | 373 | 392 | 333 | 73 | 664 | 564 | 230 | 512 | 270 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.36 | 0.00 | 0.13 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1576 | 1774 | 1863 | 1583 | 1774 | 1863 | 1583 | 1774 | 1150 | 606 |
| Grp Volume(v), veh/h | 156 | 629 | 122 | 48 | 440 | 0 | 134 | 422 | 0 | 210 | 0 | 487 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1576 | 1774 | 1863 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1755 |
| Q Serve(g_s), s | 13.0 | 36.0 | 11.3 | 3.8 | 36.0 | 0.0 | 7.0 | 32.3 | 0.0 | 20.0 | 0.0 | 36.5 |
| Cycle Q Clear(g_c), s | 13.0 | 36.0 | 11.3 | 3.8 | 36.0 | 0.0 | 7.0 | 32.3 | 0.0 | 20.0 | 0.0 | 36.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.34 |
| Lane Grp Cap(c), veh/h | 373 | 392 | 331 | 373 | 392 | 333 | 73 | 664 | 564 | 230 | 0 | 781 |
| V/C Ratio(X) | 0.42 | 1.61 | 0.37 | 0.13 | 1.12 | 0.00 | 1.85 | 0.64 | 0.00 | 0.91 | 0.00 | 0.62 |
| Avail Cap(c_a), veh/h | 373 | 392 | 331 | 373 | 392 | 333 | 73 | 664 | 564 | 269 | 0 | 781 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 58.5 | 67.6 | 57.9 | 54.9 | 67.6 | 0.0 | 82.1 | 45.9 | 0.0 | 73.5 | 0.0 | 36.5 |
| Incr Delay (d2), s/veh | 0.7 | 284.4 | 0.7 | 0.2 | 83.4 | 0.0 | 429.4 | 4.6 | 0.0 | 30.2 | 0.0 | 3.7 |
| 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 | 6.5 | 49.4 | 5.0 | 1.9 | 27.6 | 0.0 | 12.1 | 17.5 | 0.0 | 11.7 | 0.0 | 18.5 |
| LnGrp Delay(d),s/veh | 59.3 | 352.0 | 58.6 | 55.0 | 151.0 | 0.0 | 511.5 | 50.5 | 0.0 | 103.7 | 0.0 | 40.2 |
| LnGrp LOS | E | F | E | E | F | | F | D | | F | | D |
| Approach Vol, veh/h | | 907 | | | 488 | | | 556 | | | 697 | |
| Approach Delay, s/veh | | 262.2 | | | 141.6 | | | 161.6 | | | 59.3 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 26.2 | 65.0 | | 40.0 | 11.0 | 80.2 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 22.0 | 34.3 | | 38.0 | 9.0 | 38.5 | | 38.0 |
| Green Ext Time (p_c), s | 0.2 | 6.7 | | 0.0 | 0.0 | 6.3 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 165.4 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 21.8 |
| Intersection LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 94 | 3 | 1 | 263 | 460 | 63 |
| Future Vol, veh/h | 94 | 3 | 1 | 263 | 460 | 63 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 3 | 1 | 280 | 489 | 67 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 1 | 1 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 1 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 1 |
| HCM Control Delay | 10.6 | 11.7 | 29 |
| HCM LOS | B | B | D |

| Lane | EBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 97% | 0% | 100% | 0% |
| Vol Thru, % | 3% | 0% | 0% | 0% |
| Vol Right, % | 0% | 100% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 97 | 264 | 460 | 63 |
| LT Vol | 94 | 0 | 460 | 0 |
| Through Vol | 3 | 1 | 0 | 0 |
| RT Vol | 0 | 263 | 0 | 63 |
| Lane Flow Rate | 103 | 281 | 489 | 67 |
| Geometry Grp | 2 | 2 | 7 | 7 |
| Degree of Util (X) | 0.178 | 0.405 | 0.83 | 0.091 |
| Departure Headway (Hd) | 6.22 | 5.19 | 6.107 | 4.896 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 576 | 697 | 592 | 733 |
| Service Time | 4.272 | 3.19 | 3.834 | 2.623 |
| HCM Lane V/C Ratio | 0.179 | 0.403 | 0.826 | 0.091 |
| HCM Control Delay | 10.6 | 11.7 | 31.9 | 8.1 |
| HCM Lane LOS | B | B | D | A |
| HCM 95th-tile Q | 0.6 | 2 | 8.6 | 0.3 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 456 | 6 | 4 | 255 | 7 | 5 |
| Future Vol, veh/h | 456 | 6 | 4 | 255 | 7 | 5 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 490 | 6 | 4 | 274 | 8 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 503 | 0 | 789 | 506 |
| Stage 1 | - | - | - | - | 500 | - |
| Stage 2 | - | - | - | - | 289 | - |
| 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 | - | - | 1061 | - | 359 | 566 |
| Stage 1 | - | - | - | - | 609 | - |
| Stage 2 | - | - | - | - | 760 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1056 | - | 354 | 560 |
| Mov Cap-2 Maneuver | - | - | - | - | 354 | - |
| Stage 1 | - | - | - | - | 606 | - |
| Stage 2 | - | - | - | - | 753 | - |

| Approach | EB | | WB | | NB |
|---|---|---|---|---|---|
| HCM Control Delay, s | 0 | | 0.1 | | 13.9 |
| HCM LOS | | | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 418 | - | - | 1056 | - |
| HCM Lane V/C Ratio | 0.031 | - | - | 0.004 | - |
| HCM Control Delay (s) | 13.9 | - | - | 8.4 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.4 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 450 | 16 | 10 | 249 | 9 | 7 |
| Future Vol, veh/h | 450 | 16 | 10 | 249 | 9 | 7 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 474 | 17 | 11 | 262 | 9 | 7 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 496 | 0 | 775 | 492 |
| Stage 1 | - | - | - | - | 487 | - |
| Stage 2 | - | - | - | - | 288 | - |
| 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 | - | - | 1068 | - | 366 | 577 |
| Stage 1 | - | - | - | - | 618 | - |
| Stage 2 | - | - | - | - | 761 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1064 | - | 359 | 572 |
| Mov Cap-2 Maneuver | - | - | - | - | 359 | - |
| Stage 1 | - | - | - | - | 615 | - |
| Stage 2 | - | - | - | - | 749 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.3 | 13.7 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 429 | - | - | 1064 | - |
| HCM Lane V/C Ratio | 0.039 | - | - | 0.01 | - |
| HCM Control Delay (s) | 13.7 | - | - | 8.4 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 75.5 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 84 | 377 | 8 | 24 | 226 | 191 | 5 | 219 | 70 | 298 | 121 | 66 |
| Future Vol, veh/h | 84 | 377 | 8 | 24 | 226 | 191 | 5 | 219 | 70 | 298 | 121 | 66 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 86 | 385 | 8 | 24 | 231 | 195 | 5 | 223 | 71 | 304 | 123 | 67 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 79.6 | 113.5 | 19.6 | 70.9 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 6% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 83% | 0% |
| Vol Thru, % | 94% | 100% | 0% | 0% | 100% | 0% | 0% | 54% | 17% | 48% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 46% | 0% | 52% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 78 | 146 | 70 | 84 | 377 | 8 | 24 | 417 | 359 | 127 |
| LT Vol | 5 | 0 | 0 | 84 | 0 | 0 | 24 | 0 | 298 | 0 |
| Through Vol | 73 | 146 | 0 | 0 | 377 | 0 | 0 | 226 | 61 | 61 |
| RT Vol | 0 | 0 | 70 | 0 | 0 | 8 | 0 | 191 | 0 | 66 |
| Lane Flow Rate | 80 | 149 | 71 | 86 | 385 | 8 | 24 | 426 | 366 | 129 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.235 | 0.439 | 0.197 | 0.245 | 1.049 | 0.021 | 0.071 | 1.132 | 1.027 | 0.335 |
| Departure Headway (Hd) | 11.325 | 11.291 | 10.551 | 10.889 | 10.365 | 9.633 | 10.743 | 9.89 | 10.638 | 9.824 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 319 | 322 | 342 | 332 | 354 | 374 | 336 | 370 | 344 | 368 |
| Service Time | 9.025 | 8.991 | 8.251 | 8.589 | 8.065 | 7.333 | 8.443 | 7.59 | 8.338 | 7.524 |
| HCM Lane V/C Ratio | 0.251 | 0.463 | 0.208 | 0.259 | 1.088 | 0.021 | 0.071 | 1.151 | 1.064 | 0.351 |
| HCM Control Delay | 17.5 | 22.5 | 15.8 | 17.1 | 94.9 | 12.5 | 14.3 | 119.2 | 89.8 | 17.4 |
| HCM Lane LOS | C | C | C | C | F | B | B | F | F | C |
| HCM 95th-tile Q | 0.9 | 2.1 | 0.7 | 0.9 | 12.8 | 0.1 | 0.2 | 15.8 | 12 | 1.4 |

# APPENDIX C: NEAR TERM LOS WORKSHEETS

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 280 | 130 | 90 | 360 | 240 | 200 | 430 | 100 | 320 | 720 | 690 |
| Future Volume (veh/h) | 320 | 280 | 130 | 90 | 360 | 240 | 200 | 430 | 100 | 320 | 720 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 304 | 0 | 98 | 391 | 0 | 217 | 467 | 0 | 348 | 861 | 418 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 452 | 1039 | 465 | 127 | 828 | 1012 | 314 | 1100 | 492 | 458 | 1299 | 537 |
| Arrive On Green | 0.13 | 0.29 | 0.00 | 0.07 | 0.23 | 0.00 | 0.09 | 0.31 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 304 | 0 | 98 | 391 | 0 | 217 | 467 | 0 | 348 | 861 | 418 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.0 | 5.5 | 0.0 | 4.5 | 7.8 | 0.0 | 5.0 | 8.6 | 0.0 | 7.8 | 16.1 | 19.9 |
| Cycle Q Clear(g_c), s | 8.0 | 5.5 | 0.0 | 4.5 | 7.8 | 0.0 | 5.0 | 8.6 | 0.0 | 7.8 | 16.1 | 19.9 |
| 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 | 1039 | 465 | 127 | 828 | 1012 | 314 | 1100 | 492 | 458 | 1299 | 537 |
| V/C Ratio(X) | 0.77 | 0.29 | 0.00 | 0.77 | 0.47 | 0.00 | 0.69 | 0.42 | 0.00 | 0.76 | 0.66 | 0.78 |
| Avail Cap(c_a), veh/h | 754 | 1551 | 694 | 389 | 1551 | 1581 | 796 | 1335 | 597 | 821 | 1406 | 581 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.5 | 22.4 | 0.0 | 37.5 | 27.1 | 0.0 | 36.2 | 22.5 | 0.0 | 34.5 | 22.7 | 23.9 |
| Incr Delay (d2), s/veh | 2.8 | 0.2 | 0.0 | 9.3 | 0.4 | 0.0 | 2.7 | 0.3 | 0.0 | 2.6 | 1.1 | 6.2 |
| 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 | 4.0 | 2.7 | 0.0 | 2.5 | 3.8 | 0.0 | 2.5 | 4.3 | 0.0 | 4.0 | 8.4 | 9.3 |
| LnGrp Delay(d),s/veh | 37.3 | 22.6 | 0.0 | 46.8 | 27.5 | 0.0 | 38.9 | 22.7 | 0.0 | 37.2 | 23.7 | 30.1 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 652 | | | 489 | | | 684 | | | 1627 | |
| Approach Delay, s/veh | | 30.4 | | | 31.4 | | | 27.9 | | | 28.2 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.6 | 29.5 | 9.9 | 28.1 | 11.5 | 32.6 | 14.8 | 23.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 9.8 | 10.6 | 6.5 | 7.5 | 7.0 | 21.9 | 10.0 | 9.8 |
| Green Ext Time (p_c), s | 0.8 | 10.6 | 0.2 | 4.8 | 0.5 | 6.1 | 0.8 | 4.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.0 |
| HCM 2010 LOS | C |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 80 | 260 | 40 | 120 | 450 | 190 | 10 | 330 | 90 | 300 | 420 | 240 |
| Future Volume (veh/h) | 80 | 260 | 40 | 120 | 450 | 190 | 10 | 330 | 90 | 300 | 420 | 240 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 93 | 302 | 33 | 140 | 523 | 174 | 12 | 384 | 84 | 349 | 488 | 224 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 121 | 923 | 100 | 178 | 831 | 275 | 26 | 808 | 175 | 436 | 923 | 421 |
| Arrive On Green | 0.07 | 0.29 | 0.29 | 0.10 | 0.32 | 0.32 | 0.01 | 0.28 | 0.28 | 0.13 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3213 | 348 | 1774 | 2604 | 862 | 1774 | 2887 | 625 | 3442 | 2355 | 1074 |
| Grp Volume(v), veh/h | 93 | 165 | 170 | 140 | 355 | 342 | 12 | 234 | 234 | 349 | 366 | 346 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1791 | 1774 | 1770 | 1697 | 1774 | 1770 | 1742 | 1721 | 1770 | 1659 |
| Q Serve(g_s), s | 4.0 | 5.7 | 5.8 | 6.0 | 13.3 | 13.4 | 0.5 | 8.5 | 8.7 | 7.7 | 12.3 | 12.4 |
| Cycle Q Clear(g_c), s | 4.0 | 5.7 | 5.8 | 6.0 | 13.3 | 13.4 | 0.5 | 8.5 | 8.7 | 7.7 | 12.3 | 12.4 |
| Prop In Lane | 1.00 | | 0.19 | 1.00 | | 0.51 | 1.00 | | 0.36 | 1.00 | | 0.65 |
| Lane Grp Cap(c), veh/h | 121 | 508 | 514 | 178 | 565 | 542 | 26 | 495 | 488 | 436 | 694 | 650 |
| V/C Ratio(X) | 0.77 | 0.32 | 0.33 | 0.79 | 0.63 | 0.63 | 0.46 | 0.47 | 0.48 | 0.80 | 0.53 | 0.53 |
| Avail Cap(c_a), veh/h | 365 | 1389 | 1406 | 365 | 1389 | 1332 | 251 | 820 | 807 | 487 | 820 | 769 |
| 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 | 35.6 | 21.8 | 21.8 | 34.2 | 22.5 | 22.6 | 38.0 | 23.2 | 23.3 | 33.0 | 18.1 | 18.2 |
| Incr Delay (d2), s/veh | 9.6 | 0.4 | 0.4 | 7.5 | 1.2 | 1.2 | 12.1 | 0.7 | 0.7 | 8.4 | 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 | 2.3 | 2.8 | 2.9 | 3.3 | 6.7 | 6.5 | 0.3 | 4.3 | 4.3 | 4.1 | 6.1 | 5.8 |
| LnGrp Delay(d),s/veh | 45.2 | 22.1 | 22.2 | 41.6 | 23.7 | 23.8 | 50.1 | 23.9 | 24.0 | 41.4 | 18.7 | 18.8 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | B | B |
| Approach Vol, veh/h | | 428 | | | 837 | | | 480 | | | 1061 | |
| Approach Delay, s/veh | | 27.2 | | | 26.7 | | | 24.6 | | | 26.2 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 13.8 | 25.8 | 11.8 | 26.3 | 5.1 | 34.5 | 9.3 | 28.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 9.7 | 10.7 | 8.0 | 7.8 | 2.5 | 14.4 | 6.0 | 15.4 |
| Green Ext Time (p_c), s | 0.2 | 8.9 | 0.2 | 8.7 | 0.0 | 8.3 | 0.1 | 8.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 26.2 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.1 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 220 | 30 | 80 | 210 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 220 | 30 | 80 | 210 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 278 | 38 | 101 | 266 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.1 | 20.4 | 17.9 | 20.5 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 15% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 43% | 0% |
| Vol Thru, % | 85% | 79% | 0% | 100% | 57% | 0% | 100% | 39% | 57% | 72% |
| Vol Right, % | 0% | 21% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 28% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 130 | 140 | 80 | 53 | 47 | 50 | 167 | 213 | 185 | 145 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 110 | 110 | 0 | 53 | 27 | 0 | 167 | 83 | 105 | 105 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 165 | 177 | 101 | 68 | 59 | 63 | 211 | 270 | 234 | 184 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.409 | 0.429 | 0.28 | 0.177 | 0.15 | 0.159 | 0.501 | 0.608 | 0.576 | 0.43 |
| Departure Headway (Hd) | 8.943 | 8.713 | 9.965 | 9.444 | 9.131 | 9.071 | 8.553 | 8.112 | 8.857 | 8.442 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 403 | 413 | 361 | 380 | 393 | 396 | 422 | 446 | 407 | 426 |
| Service Time | 6.695 | 6.465 | 7.724 | 7.203 | 6.89 | 6.819 | 6.302 | 5.861 | 6.608 | 6.193 |
| HCM Lane V/C Ratio | 0.409 | 0.429 | 0.28 | 0.179 | 0.15 | 0.159 | 0.5 | 0.605 | 0.575 | 0.432 |
| HCM Control Delay | 17.8 | 17.9 | 16.6 | 14.2 | 13.5 | 13.5 | 19.6 | 22.7 | 23 | 17.4 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 1.9 | 2.1 | 1.1 | 0.6 | 0.5 | 0.6 | 2.7 | 3.9 | 3.5 | 2.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 550 | 40 | 110 | 710 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 550 | 40 | 110 | 710 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 632 | 0 | 126 | 816 | 81 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| Arrive On Green | 0.05 | 0.24 | 0.24 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 632 | 0 | 126 | 816 | 81 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 23.3 | 0.0 | 5.6 | 34.9 | 2.4 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 23.3 | 0.0 | 5.6 | 34.9 | 2.4 |
| 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 | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.78 | 0.00 | 0.79 | 0.98 | 0.12 |
| Avail Cap(c_a), veh/h | 176 | 922 | 779 | 176 | 922 | 784 | 426 | 830 | 706 | 220 | 830 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 37.9 | 25.3 | 23.7 | 38.2 | 29.1 | 0.0 | 36.1 | 19.4 | 0.0 | 36.0 | 22.1 | 13.1 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 4.6 | 0.0 | 12.7 | 27.0 | 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 | 1.8 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.2 | 13.0 | 0.0 | 3.3 | 23.9 | 1.1 |
| LnGrp Delay(d),s/veh | 51.4 | 25.7 | 23.7 | 47.9 | 31.7 | 0.0 | 39.3 | 23.9 | 0.0 | 48.8 | 49.1 | 13.2 |
| LnGrp LOS | D | C | C | D | C | | D | C | | D | D | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 827 | | | 1023 | |
| Approach Delay, s/veh | | 34.5 | | | 33.8 | | | 27.5 | | | 46.2 | |
| Approach LOS | | C | | | C | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.2 | 39.3 | 7.2 | 23.0 | 10.6 | 40.0 | 8.0 | 22.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 25.3 | 4.1 | 6.5 | 6.5 | 36.9 | 5.1 | 14.5 |
| Green Ext Time (p_c), s | 0.1 | 6.7 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 37.0 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 90 | 40 | 510 | 180 | 360 | 20 | 470 | 230 | 630 | 990 | 180 |
| Future Volume (veh/h) | 50 | 90 | 40 | 510 | 180 | 360 | 20 | 470 | 230 | 630 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 93 | 0 | 526 | 186 | 0 | 21 | 485 | 0 | 649 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 68 | 426 | 133 | 650 | 1191 | 371 | 37 | 955 | 0 | 773 | 2337 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.20 | 0.25 | 0.00 | 0.02 | 0.28 | 0.00 | 0.24 | 0.50 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 93 | 0 | 526 | 186 | 0 | 21 | 485 | 0 | 649 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.7 | 1.6 | 0.0 | 13.4 | 2.6 | 0.0 | 1.1 | 10.1 | 0.0 | 16.5 | 11.9 | 0.0 |
| Cycle Q Clear(g_c), s | 2.7 | 1.6 | 0.0 | 13.4 | 2.6 | 0.0 | 1.1 | 10.1 | 0.0 | 16.5 | 11.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 68 | 426 | 133 | 650 | 1191 | 371 | 37 | 955 | 0 | 773 | 2337 | 0 |
| V/C Ratio(X) | 0.76 | 0.22 | 0.00 | 0.81 | 0.16 | 0.00 | 0.57 | 0.51 | 0.00 | 0.84 | 0.44 | 0.00 |
| Avail Cap(c_a), veh/h | 598 | 1989 | 619 | 1346 | 1989 | 619 | 587 | 1660 | 0 | 1159 | 2337 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.5 | 36.0 | 0.0 | 32.4 | 24.8 | 0.0 | 41.3 | 26.0 | 0.0 | 30.8 | 13.9 | 0.0 |
| Incr Delay (d2), s/veh | 15.8 | 0.3 | 0.0 | 2.5 | 0.1 | 0.0 | 12.8 | 0.4 | 0.0 | 3.6 | 0.1 | 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 | 1.5 | 0.7 | 0.0 | 6.1 | 1.1 | 0.0 | 0.6 | 3.2 | 0.0 | 7.6 | 5.1 | 0.0 |
| LnGrp Delay(d),s/veh | 56.3 | 36.3 | 0.0 | 34.9 | 24.9 | 0.0 | 54.1 | 26.4 | 0.0 | 34.4 | 14.0 | 0.0 |
| LnGrp LOS | E | D | | C | C | | D | C | | C | B | |
| Approach Vol, veh/h | | 145 | | | 712 | | | 506 | | | 1670 | |
| Approach Delay, s/veh | | 43.5 | | | 32.3 | | | 27.6 | | | 21.9 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 24.7 | 27.6 | 21.4 | 11.7 | 6.0 | 46.3 | 7.5 | 25.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 18.5 | 12.1 | 15.4 | 3.6 | 3.1 | 13.9 | 4.7 | 4.6 |
| Green Ext Time (p_c), s | 2.2 | 11.1 | 2.0 | 2.1 | 0.0 | 13.5 | 0.1 | 2.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 26.3 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | ↰↰ | ↑↑↑↱ | | ↰ | ↑↑↑↱ | | ↰ | ↑↑↱ | | ↰ | ↑↑↱ | |
| Traffic Volume (veh/h) | 180 | 260 | 340 | 90 | 440 | 30 | 290 | 170 | 30 | 50 | 140 | 160 |
| Future Volume (veh/h) | 180 | 260 | 340 | 90 | 440 | 30 | 290 | 170 | 30 | 50 | 140 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 130 | 98 | 478 | 24 | 315 | 185 | 20 | 54 | 152 | 24 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 317 | 1074 | 452 | 129 | 1432 | 71 | 325 | 973 | 104 | 88 | 516 | 80 |
| Arrive On Green | 0.09 | 0.31 | 0.31 | 0.07 | 0.29 | 0.29 | 0.18 | 0.30 | 0.30 | 0.05 | 0.17 | 0.17 |
| Sat Flow, veh/h | 3442 | 3478 | 1465 | 1774 | 4952 | 247 | 1774 | 3215 | 343 | 1774 | 3054 | 471 |
| Grp Volume(v), veh/h | 196 | 275 | 138 | 98 | 326 | 176 | 315 | 101 | 104 | 54 | 87 | 89 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1553 | 1774 | 1695 | 1808 | 1774 | 1770 | 1788 | 1774 | 1770 | 1755 |
| Q Serve(g_s), s | 3.3 | 3.7 | 4.0 | 3.3 | 4.5 | 4.6 | 10.6 | 2.5 | 2.6 | 1.8 | 2.6 | 2.7 |
| Cycle Q Clear(g_c), s | 3.3 | 3.7 | 4.0 | 3.3 | 4.5 | 4.6 | 10.6 | 2.5 | 2.6 | 1.8 | 2.6 | 2.7 |
| Prop In Lane | 1.00 | | 0.94 | 1.00 | | 0.14 | 1.00 | | 0.19 | 1.00 | | 0.27 |
| Lane Grp Cap(c), veh/h | 317 | 1047 | 480 | 129 | 980 | 523 | 325 | 536 | 541 | 88 | 299 | 297 |
| V/C Ratio(X) | 0.62 | 0.26 | 0.29 | 0.76 | 0.33 | 0.34 | 0.97 | 0.19 | 0.19 | 0.62 | 0.29 | 0.30 |
| Avail Cap(c_a), veh/h | 917 | 2033 | 931 | 473 | 2033 | 1084 | 325 | 1061 | 1072 | 325 | 1061 | 1052 |
| 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 | 26.2 | 15.6 | 15.7 | 27.3 | 16.8 | 16.8 | 24.4 | 15.5 | 15.5 | 28.0 | 21.8 | 21.8 |
| Incr Delay (d2), s/veh | 2.0 | 0.1 | 0.3 | 8.9 | 0.2 | 0.4 | 41.5 | 0.2 | 0.2 | 6.8 | 0.5 | 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 | 1.6 | 1.7 | 1.8 | 1.9 | 2.2 | 2.4 | 8.9 | 1.3 | 1.3 | 1.0 | 1.3 | 1.3 |
| LnGrp Delay(d),s/veh | 28.2 | 15.7 | 16.1 | 36.3 | 17.0 | 17.2 | 65.9 | 15.6 | 15.7 | 34.8 | 22.3 | 22.4 |
| LnGrp LOS | C | B | B | D | B | B | E | B | B | C | C | C |
| Approach Vol, veh/h | | 609 | | | 600 | | | 520 | | | 230 | |
| Approach Delay, s/veh | | 19.8 | | | 20.2 | | | 46.1 | | | 25.3 | |
| Approach LOS | | B | | | C | | | D | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.0 | 22.2 | 8.4 | 22.5 | 15.0 | 14.2 | 9.5 | 21.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 3.8 | 4.6 | 5.3 | 6.0 | 12.6 | 4.7 | 5.3 | 6.6 |
| Green Ext Time (p_c), s | 0.0 | 2.3 | 0.2 | 7.2 | 0.0 | 2.3 | 0.5 | 7.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 27.6 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 20 | 310 | 550 | 210 | 210 | 30 |
| Future Vol, veh/h | 20 | 310 | 550 | 210 | 210 | 30 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 24 | 373 | 663 | 253 | 253 | 36 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 673 | 0 | - | 0 | 873 | 351 |
| Stage 1 | - | - | - | - | 673 | - |
| Stage 2 | - | - | - | - | 200 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 561 | - | - | - | 359 | 551 |
| Stage 1 | - | - | - | - | 381 | - |
| Stage 2 | - | - | - | - | 748 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 556 | - | - | - | 338 | 542 |
| Mov Cap-2 Maneuver | - | - | - | - | 338 | - |
| Stage 1 | - | - | - | - | 378 | - |
| Stage 2 | - | - | - | - | 710 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 37.8 |
| HCM LOS | | | E |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 556 | - | - | - | 338 | 542 |
| HCM Lane V/C Ratio | 0.043 | - | - | - | 0.749 | 0.067 |
| HCM Control Delay (s) | 11.8 | - | - | - | 41.5 | 12.1 |
| HCM Lane LOS | B | - | - | - | E | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 5.8 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 150 | 560 | 200 | 70 | 680 | 300 | 170 | 260 | 80 | 270 | 440 | 90 |
| Future Volume (veh/h) | 150 | 560 | 200 | 70 | 680 | 300 | 170 | 260 | 80 | 270 | 440 | 90 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.81 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 183 | 683 | 103 | 85 | 829 | 0 | 207 | 317 | 0 | 329 | 537 | 105 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 124 | 490 | 219 | 94 | 963 | 463 | 195 | 500 | 425 | 303 | 499 | 97 |
| Arrive On Green | 0.17 | 0.17 | 0.17 | 0.29 | 0.29 | 0.00 | 0.11 | 0.27 | 0.00 | 0.17 | 0.33 | 0.33 |
| Sat Flow, veh/h | 726 | 2870 | 1285 | 321 | 3295 | 1583 | 1774 | 1863 | 1583 | 1774 | 1513 | 296 |
| Grp Volume(v), veh/h | 460 | 406 | 103 | 488 | 426 | 0 | 207 | 317 | 0 | 329 | 0 | 642 |
| Grp Sat Flow(s),veh/h/ln | 1826 | 1770 | 1285 | 1847 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1809 |
| Q Serve(g_s), s | 28.0 | 28.0 | 11.8 | 41.7 | 36.8 | 0.0 | 18.0 | 24.6 | 0.0 | 28.0 | 0.0 | 54.0 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 11.8 | 41.7 | 36.8 | 0.0 | 18.0 | 24.6 | 0.0 | 28.0 | 0.0 | 54.0 |
| Prop In Lane | 0.40 | | 1.00 | 0.17 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 312 | 302 | 219 | 540 | 517 | 463 | 195 | 500 | 425 | 303 | 0 | 596 |
| V/C Ratio(X) | 1.48 | 1.34 | 0.47 | 0.90 | 0.82 | 0.00 | 1.06 | 0.63 | 0.00 | 1.09 | 0.00 | 1.08 |
| Avail Cap(c_a), veh/h | 312 | 302 | 219 | 608 | 583 | 522 | 195 | 614 | 522 | 303 | 0 | 596 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.0 | 68.0 | 61.3 | 55.8 | 54.0 | 0.0 | 73.0 | 52.9 | 0.0 | 68.0 | 0.0 | 55.0 |
| Incr Delay (d2), s/veh | 230.4 | 174.7 | 1.6 | 15.9 | 8.4 | 0.0 | 82.0 | 1.5 | 0.0 | 76.5 | 0.0 | 59.4 |
| 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 | 34.1 | 28.4 | 4.3 | 23.7 | 19.2 | 0.0 | 13.3 | 12.9 | 0.0 | 20.2 | 0.0 | 36.8 |
| LnGrp Delay(d),s/veh | 298.4 | 242.6 | 62.8 | 71.7 | 62.5 | 0.0 | 155.0 | 54.4 | 0.0 | 144.5 | 0.0 | 114.3 |
| LnGrp LOS | F | F | E | E | E | | F | D | | F | | F |
| Approach Vol, veh/h | | 969 | | | 914 | | | 524 | | | 971 | |
| Approach Delay, s/veh | | 250.0 | | | 67.4 | | | 94.1 | | | 124.5 | |
| Approach LOS | | F | | | E | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 48.0 | | 32.0 | 22.0 | 58.0 | | 51.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 30.0 | 26.6 | | 30.0 | 20.0 | 56.0 | | 43.7 |
| Green Ext Time (p_c), s | 0.0 | 7.3 | | 0.0 | 0.0 | 0.0 | | 4.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 140.4 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 16.3 |
| Intersection LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 110 | 0 | 10 | 420 | 270 | 110 |
| Future Vol, veh/h | 110 | 0 | 10 | 420 | 270 | 110 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 129 | 0 | 12 | 494 | 318 | 129 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 1 | 1 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 1 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 1 |
| HCM Control Delay | 11 | 18 | 16 |
| HCM LOS | B | C | C |

| Lane | EBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 100% | 0% | 100% | 0% |
| Vol Thru, % | 0% | 2% | 0% | 0% |
| Vol Right, % | 0% | 98% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 110 | 430 | 270 | 110 |
| LT Vol | 110 | 0 | 270 | 0 |
| Through Vol | 0 | 10 | 0 | 0 |
| RT Vol | 0 | 420 | 0 | 110 |
| Lane Flow Rate | 129 | 506 | 318 | 129 |
| Geometry Grp | 2 | 2 | 7 | 7 |
| Degree of Util (X) | 0.222 | 0.688 | 0.589 | 0.196 |
| Departure Headway (Hd) | 6.166 | 4.897 | 6.679 | 5.463 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 580 | 744 | 540 | 656 |
| Service Time | 4.225 | 2.897 | 4.423 | 3.206 |
| HCM Lane V/C Ratio | 0.222 | 0.68 | 0.589 | 0.197 |
| HCM Control Delay | 11 | 18 | 18.6 | 9.5 |
| HCM Lane LOS | B | C | C | A |
| HCM 95th-tile Q | 0.8 | 5.5 | 3.8 | 0.7 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 2.6 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 230 | 40 | 30 | 370 | 50 | 60 |
| Future Vol, veh/h | 230 | 40 | 30 | 370 | 50 | 60 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 81 | 81 | 81 | 81 | 81 | 81 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 284 | 49 | 37 | 457 | 62 | 74 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 340 | 0 | 854 | 323 |
| Stage 1 | - | - | - | - | 316 | - |
| Stage 2 | - | - | - | - | 538 | - |
| 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 | - | - | 1219 | - | 329 | 718 |
| Stage 1 | - | - | - | - | 739 | - |
| Stage 2 | - | - | - | - | 585 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1212 | - | 312 | 710 |
| Mov Cap-2 Maneuver | - | - | - | - | 312 | - |
| Stage 1 | - | - | - | - | 735 | - |
| Stage 2 | - | - | - | - | 558 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.6 | 16.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 449 | - | - | 1212 | - |
| HCM Lane V/C Ratio | 0.302 | - | - | 0.031 | - |
| HCM Control Delay (s) | 16.5 | - | - | 8.1 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 1.3 | - | - | 0.1 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.9 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 270 | 10 | 10 | 410 | 20 | 20 |
| Future Vol, veh/h | 270 | 10 | 10 | 410 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 307 | 11 | 11 | 466 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 325 | 0 | 816 | 327 |
| Stage 1 | - | - | - | - | 320 | - |
| Stage 2 | - | - | - | - | 496 | - |
| 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 | - | - | 1235 | - | 347 | 714 |
| Stage 1 | - | - | - | - | 736 | - |
| Stage 2 | - | - | - | - | 612 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1228 | - | 339 | 706 |
| Mov Cap-2 Maneuver | - | - | - | - | 339 | - |
| Stage 1 | - | - | - | - | 732 | - |
| Stage 2 | - | - | - | - | 601 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 13.7 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 458 | - | - | 1228 | - |
| HCM Lane V/C Ratio | 0.099 | - | - | 0.009 | - |
| HCM Control Delay (s) | 13.7 | - | - | 8 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.3 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 95.2 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 150 | 10 | 10 | 300 | 220 | 30 | 150 | 20 | 270 | 200 | 130 |
| Future Vol, veh/h | 90 | 150 | 10 | 10 | 300 | 220 | 30 | 150 | 20 | 270 | 200 | 130 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 99 | 165 | 11 | 11 | 330 | 242 | 33 | 165 | 22 | 297 | 220 | 143 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 19.5 | 204.3 | 17.3 | 56.4 |
| HCM LOS | C | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 38% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 73% | 0% |
| Vol Thru, % | 62% | 100% | 0% | 0% | 100% | 0% | 0% | 58% | 27% | 43% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 42% | 0% | 57% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 80 | 100 | 20 | 90 | 150 | 10 | 10 | 520 | 370 | 230 |
| LT Vol | 30 | 0 | 0 | 90 | 0 | 0 | 10 | 0 | 270 | 0 |
| Through Vol | 50 | 100 | 0 | 0 | 150 | 0 | 0 | 300 | 100 | 100 |
| RT Vol | 0 | 0 | 20 | 0 | 0 | 10 | 0 | 220 | 0 | 130 |
| Lane Flow Rate | 88 | 110 | 22 | 99 | 165 | 11 | 11 | 571 | 407 | 253 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.243 | 0.298 | 0.055 | 0.276 | 0.437 | 0.027 | 0.029 | 1.376 | 0.996 | 0.566 |
| Departure Headway (Hd) | 11.033 | 10.837 | 10.101 | 10.991 | 10.467 | 9.734 | 9.483 | 8.667 | 9.7 | 8.915 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 328 | 334 | 357 | 329 | 346 | 370 | 378 | 423 | 378 | 407 |
| Service Time | 8.733 | 8.537 | 7.801 | 8.691 | 8.167 | 7.434 | 7.228 | 6.411 | 7.4 | 6.615 |
| HCM Lane V/C Ratio | 0.268 | 0.329 | 0.062 | 0.301 | 0.477 | 0.03 | 0.029 | 1.35 | 1.077 | 0.622 |
| HCM Control Delay | 17.2 | 18.1 | 13.4 | 17.8 | 21 | 12.7 | 12.5 | 208 | 77.4 | 22.6 |
| HCM Lane LOS | C | C | B | C | C | B | B | F | F | C |
| HCM 95th-tile Q | 0.9 | 1.2 | 0.2 | 1.1 | 2.1 | 0.1 | 0.1 | 27.2 | 11.7 | 3.4 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 560 | 260 | 90 | 400 | 350 | 150 | 550 | 120 | 280 | 590 | 430 |
| Future Volume (veh/h) | 700 | 560 | 260 | 90 | 400 | 350 | 150 | 550 | 120 | 280 | 590 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 589 | 0 | 95 | 421 | 0 | 158 | 579 | 0 | 295 | 621 | 218 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 863 | 1434 | 642 | 122 | 791 | 924 | 230 | 945 | 423 | 384 | 1148 | 469 |
| Arrive On Green | 0.25 | 0.41 | 0.00 | 0.07 | 0.22 | 0.00 | 0.07 | 0.27 | 0.00 | 0.11 | 0.31 | 0.31 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1522 |
| Grp Volume(v), veh/h | 737 | 589 | 0 | 95 | 421 | 0 | 158 | 579 | 0 | 295 | 621 | 218 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1522 |
| Q Serve(g_s), s | 21.7 | 12.6 | 0.0 | 5.6 | 11.1 | 0.0 | 4.8 | 15.2 | 0.0 | 8.6 | 14.7 | 12.3 |
| Cycle Q Clear(g_c), s | 21.7 | 12.6 | 0.0 | 5.6 | 11.1 | 0.0 | 4.8 | 15.2 | 0.0 | 8.6 | 14.7 | 12.3 |
| 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 | 863 | 1434 | 642 | 122 | 791 | 924 | 230 | 945 | 423 | 384 | 1148 | 469 |
| V/C Ratio(X) | 0.85 | 0.41 | 0.00 | 0.78 | 0.53 | 0.00 | 0.69 | 0.61 | 0.00 | 0.77 | 0.54 | 0.46 |
| Avail Cap(c_a), veh/h | 3336 | 3830 | 1713 | 484 | 1366 | 1377 | 745 | 2032 | 909 | 968 | 2349 | 960 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 38.0 | 22.5 | 0.0 | 48.7 | 36.4 | 0.0 | 48.5 | 34.1 | 0.0 | 46.1 | 30.5 | 29.7 |
| Incr Delay (d2), s/veh | 2.5 | 0.2 | 0.0 | 10.0 | 0.6 | 0.0 | 3.6 | 0.6 | 0.0 | 3.3 | 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 | 10.6 | 6.2 | 0.0 | 3.1 | 5.5 | 0.0 | 2.4 | 7.5 | 0.0 | 4.4 | 7.7 | 5.3 |
| LnGrp Delay(d),s/veh | 40.5 | 22.7 | 0.0 | 58.7 | 36.9 | 0.0 | 52.1 | 34.8 | 0.0 | 49.3 | 30.9 | 30.4 |
| LnGrp LOS | D | C | | E | D | | D | C | | D | C | C |
| Approach Vol, veh/h | | 1326 | | | 516 | | | 737 | | | 1134 | |
| Approach Delay, s/veh | | 32.6 | | | 40.9 | | | 38.5 | | | 35.6 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 15.5 | 32.4 | 11.3 | 47.1 | 11.1 | 36.8 | 30.7 | 27.7 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 10.6 | 17.2 | 7.6 | 14.6 | 6.8 | 16.7 | 23.7 | 13.1 |
| Green Ext Time (p_c), s | 0.9 | 11.1 | 0.2 | 8.4 | 0.4 | 11.4 | 3.0 | 7.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 35.8 |
| HCM 2010 LOS | D |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 260 | 540 | 40 | 100 | 400 | 310 | 50 | 480 | 90 | 340 | 280 | 110 |
| Future Volume (veh/h) | 260 | 540 | 40 | 100 | 400 | 310 | 50 | 480 | 90 | 340 | 280 | 110 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 280 | 581 | 39 | 108 | 430 | 231 | 54 | 516 | 85 | 366 | 301 | 85 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 319 | 1233 | 83 | 137 | 582 | 309 | 69 | 810 | 133 | 458 | 985 | 273 |
| Arrive On Green | 0.18 | 0.37 | 0.37 | 0.08 | 0.26 | 0.26 | 0.04 | 0.27 | 0.27 | 0.13 | 0.36 | 0.36 |
| Sat Flow, veh/h | 1774 | 3360 | 225 | 1774 | 2201 | 1169 | 1774 | 3031 | 497 | 3442 | 2728 | 756 |
| Grp Volume(v), veh/h | 280 | 306 | 314 | 108 | 345 | 316 | 54 | 300 | 301 | 366 | 193 | 193 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1815 | 1774 | 1770 | 1600 | 1774 | 1770 | 1759 | 1721 | 1770 | 1714 |
| Q Serve(g_s), s | 15.8 | 13.6 | 13.7 | 6.2 | 18.3 | 18.7 | 3.1 | 15.4 | 15.6 | 10.6 | 8.1 | 8.3 |
| Cycle Q Clear(g_c), s | 15.8 | 13.6 | 13.7 | 6.2 | 18.3 | 18.7 | 3.1 | 15.4 | 15.6 | 10.6 | 8.1 | 8.3 |
| Prop In Lane | 1.00 | | 0.12 | 1.00 | | 0.73 | 1.00 | | 0.28 | 1.00 | | 0.44 |
| Lane Grp Cap(c), veh/h | 319 | 650 | 666 | 137 | 468 | 423 | 69 | 473 | 470 | 458 | 639 | 619 |
| V/C Ratio(X) | 0.88 | 0.47 | 0.47 | 0.79 | 0.74 | 0.75 | 0.78 | 0.63 | 0.64 | 0.80 | 0.30 | 0.31 |
| Avail Cap(c_a), veh/h | 551 | 721 | 740 | 344 | 515 | 466 | 138 | 635 | 632 | 835 | 927 | 898 |
| 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 | 41.1 | 24.9 | 25.0 | 46.7 | 34.6 | 34.7 | 49.1 | 33.3 | 33.4 | 43.3 | 23.6 | 23.7 |
| Incr Delay (d2), s/veh | 8.0 | 0.5 | 0.5 | 9.5 | 5.0 | 5.9 | 16.7 | 1.4 | 1.5 | 3.3 | 0.3 | 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 | 8.5 | 6.7 | 6.9 | 3.4 | 9.6 | 9.0 | 1.9 | 7.7 | 7.7 | 5.2 | 4.0 | 4.0 |
| LnGrp Delay(d),s/veh | 49.2 | 25.5 | 25.5 | 56.2 | 39.6 | 40.7 | 65.8 | 34.7 | 34.8 | 46.6 | 23.9 | 24.0 |
| LnGrp LOS | D | C | C | E | D | D | E | C | C | D | C | C |
| Approach Vol, veh/h | | 900 | | | 769 | | | 655 | | | 752 | |
| Approach Delay, s/veh | | 32.9 | | | 42.4 | | | 37.3 | | | 35.0 | |
| Approach LOS | | C | | | D | | | D | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 17.7 | 31.5 | 12.0 | 41.8 | 8.0 | 41.2 | 22.5 | 31.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 12.6 | 17.6 | 8.2 | 15.7 | 5.1 | 10.3 | 17.8 | 20.7 |
| Green Ext Time (p_c), s | 1.1 | 6.4 | 0.2 | 9.9 | 0.0 | 7.9 | 0.7 | 5.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 36.7 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 16.6 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 180 | 70 | 110 | 220 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 180 | 70 | 110 | 220 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 200 | 78 | 122 | 244 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.9 | 14.4 | 15.9 | 19.7 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 18% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 50% | 0% |
| Vol Thru, % | 82% | 56% | 0% | 100% | 81% | 0% | 100% | 44% | 50% | 79% |
| Vol Right, % | 0% | 44% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 21% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 110 | 160 | 90 | 167 | 103 | 80 | 93 | 107 | 220 | 140 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 90 | 90 | 0 | 167 | 83 | 0 | 93 | 47 | 110 | 110 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 122 | 178 | 100 | 185 | 115 | 89 | 104 | 119 | 244 | 156 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.294 | 0.408 | 0.25 | 0.435 | 0.266 | 0.228 | 0.252 | 0.274 | 0.581 | 0.352 |
| Departure Headway (Hd) | 8.665 | 8.262 | 8.983 | 8.466 | 8.326 | 9.249 | 8.731 | 8.324 | 8.555 | 8.15 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 414 | 436 | 400 | 426 | 432 | 388 | 412 | 431 | 425 | 443 |
| Service Time | 6.418 | 6.014 | 6.733 | 6.216 | 6.076 | 7.002 | 6.484 | 6.076 | 6.255 | 5.85 |
| HCM Lane V/C Ratio | 0.295 | 0.408 | 0.25 | 0.434 | 0.266 | 0.229 | 0.252 | 0.276 | 0.574 | 0.352 |
| HCM Control Delay | 15 | 16.6 | 14.7 | 17.6 | 14.1 | 14.7 | 14.4 | 14.2 | 22.5 | 15.2 |
| HCM Lane LOS | B | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.2 | 1.9 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.6 | 1.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 590 | 40 | 160 | 550 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 590 | 40 | 160 | 550 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 621 | 0 | 168 | 579 | 88 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 112 | 398 | 332 | 45 | 328 | 279 | 147 | 818 | 695 | 211 | 960 | 811 |
| Arrive On Green | 0.06 | 0.21 | 0.21 | 0.03 | 0.18 | 0.00 | 0.04 | 0.44 | 0.00 | 0.12 | 0.52 | 0.52 |
| Sat Flow, veh/h | 1774 | 1863 | 1554 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Grp Volume(v), veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 621 | 0 | 168 | 579 | 88 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1554 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Q Serve(g_s), s | 5.0 | 11.7 | 0.3 | 1.4 | 7.3 | 0.0 | 1.9 | 22.1 | 0.0 | 7.3 | 17.3 | 2.3 |
| Cycle Q Clear(g_c), s | 5.0 | 11.7 | 0.3 | 1.4 | 7.3 | 0.0 | 1.9 | 22.1 | 0.0 | 7.3 | 17.3 | 2.3 |
| 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 | 112 | 398 | 332 | 45 | 328 | 279 | 147 | 818 | 695 | 211 | 960 | 811 |
| V/C Ratio(X) | 1.31 | 0.74 | 0.02 | 0.71 | 0.58 | 0.00 | 0.57 | 0.76 | 0.00 | 0.80 | 0.60 | 0.11 |
| Avail Cap(c_a), veh/h | 112 | 944 | 788 | 135 | 968 | 823 | 567 | 2219 | 1886 | 540 | 2479 | 2096 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 37.0 | 29.0 | 24.5 | 38.2 | 29.8 | 0.0 | 37.1 | 18.6 | 0.0 | 33.8 | 13.5 | 9.8 |
| Incr Delay (d2), s/veh | 188.5 | 2.7 | 0.0 | 18.1 | 1.6 | 0.0 | 3.5 | 1.5 | 0.0 | 6.7 | 0.6 | 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 | 8.3 | 6.3 | 0.1 | 0.9 | 3.9 | 0.0 | 1.0 | 11.5 | 0.0 | 3.9 | 9.0 | 1.0 |
| LnGrp Delay(d),s/veh | 225.4 | 31.7 | 24.5 | 56.3 | 31.4 | 0.0 | 40.5 | 20.1 | 0.0 | 40.5 | 14.1 | 9.9 |
| LnGrp LOS | F | C | C | E | C | | D | C | | D | B | A |
| Approach Vol, veh/h | | 450 | | | 221 | | | 705 | | | 835 | |
| Approach Delay, s/veh | | 94.9 | | | 35.0 | | | 22.5 | | | 19.0 | |
| Approach LOS | | F | | | D | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 13.4 | 38.6 | 6.0 | 20.9 | 7.4 | 44.7 | 9.0 | 17.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 9.3 | 24.1 | 3.4 | 13.7 | 3.9 | 19.3 | 7.0 | 9.3 |
| Green Ext Time (p_c), s | 0.4 | 10.5 | 0.0 | 3.2 | 0.1 | 10.6 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 37.2 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 510 | 40 | 230 | 330 | 460 | 70 | 1210 | 530 | 460 | 320 | 300 |
| Future Volume (veh/h) | 220 | 510 | 40 | 230 | 330 | 460 | 70 | 1210 | 530 | 460 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 548 | 0 | 247 | 355 | 0 | 75 | 1301 | 0 | 495 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1264 | 376 | 281 | 963 | 300 | 71 | 1510 | 0 | 526 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.27 | 0.00 | 0.09 | 0.20 | 0.00 | 0.04 | 0.42 | 0.00 | 0.16 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 548 | 0 | 247 | 355 | 0 | 75 | 1301 | 0 | 495 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 24.5 | 0.0 | 19.5 | 16.5 | 0.0 | 11.0 | 83.1 | 0.0 | 39.1 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 24.5 | 0.0 | 19.5 | 16.5 | 0.0 | 11.0 | 83.1 | 0.0 | 39.1 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1264 | 376 | 281 | 963 | 300 | 71 | 1510 | 0 | 526 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.43 | 0.00 | 0.88 | 0.37 | 0.00 | 1.06 | 0.86 | 0.00 | 0.94 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1264 | 376 | 802 | 963 | 300 | 71 | 1510 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 77.2 | 0.0 | 114.8 | 87.2 | 0.0 | 121.9 | 67.7 | 0.0 | 105.1 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.1 | 0.0 | 8.7 | 1.1 | 0.0 | 122.9 | 6.7 | 0.0 | 22.9 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 10.8 | 0.0 | 8.9 | 7.3 | 0.0 | 7.4 | 28.8 | 0.0 | 18.9 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 78.3 | 0.0 | 123.5 | 88.3 | 0.0 | 246.1 | 74.4 | 0.0 | 128.0 | 29.7 | 0.0 |
| LnGrp LOS | F | E | | F | F | | F | E | | F | C | |
| Approach Vol, veh/h | | 785 | | | 602 | | | 1376 | | | 839 | |
| Approach Delay, s/veh | | 98.2 | | | 102.8 | | | 83.7 | | | 87.7 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 46.0 | 110.0 | 26.4 | 72.3 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 41.1 | 85.1 | 21.5 | 26.5 | 13.0 | 12.3 | 38.4 | 18.5 |
| Green Ext Time (p_c), s | 0.9 | 11.0 | 0.9 | 2.9 | 0.0 | 23.3 | 0.3 | 7.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 91.0 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 180 | 90 | 380 | 40 | 240 | 180 | 110 | 90 | 120 | 200 |
| Future Volume (veh/h) | 310 | 700 | 180 | 90 | 380 | 40 | 240 | 180 | 110 | 90 | 120 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 154 | 95 | 400 | 34 | 253 | 189 | 43 | 95 | 126 | 22 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 457 | 1548 | 320 | 123 | 1455 | 122 | 304 | 811 | 180 | 118 | 538 | 92 |
| Arrive On Green | 0.13 | 0.37 | 0.37 | 0.07 | 0.30 | 0.30 | 0.17 | 0.28 | 0.28 | 0.07 | 0.18 | 0.18 |
| Sat Flow, veh/h | 3442 | 4204 | 868 | 1774 | 4775 | 400 | 1774 | 2862 | 634 | 1774 | 3014 | 514 |
| Grp Volume(v), veh/h | 326 | 593 | 298 | 95 | 282 | 152 | 253 | 115 | 117 | 95 | 73 | 75 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1682 | 1774 | 1695 | 1785 | 1774 | 1770 | 1727 | 1774 | 1770 | 1758 |
| Q Serve(g_s), s | 6.8 | 10.1 | 10.3 | 4.0 | 4.8 | 4.9 | 10.4 | 3.7 | 3.9 | 4.0 | 2.7 | 2.8 |
| Cycle Q Clear(g_c), s | 6.8 | 10.1 | 10.3 | 4.0 | 4.8 | 4.9 | 10.4 | 3.7 | 3.9 | 4.0 | 2.7 | 2.8 |
| Prop In Lane | 1.00 | | 0.52 | 1.00 | | 0.22 | 1.00 | | 0.37 | 1.00 | | 0.29 |
| Lane Grp Cap(c), veh/h | 457 | 1249 | 619 | 123 | 1033 | 544 | 304 | 502 | 490 | 118 | 316 | 314 |
| V/C Ratio(X) | 0.71 | 0.47 | 0.48 | 0.77 | 0.27 | 0.28 | 0.83 | 0.23 | 0.24 | 0.81 | 0.23 | 0.24 |
| Avail Cap(c_a), veh/h | 1645 | 2071 | 1027 | 259 | 1621 | 853 | 612 | 1363 | 1330 | 118 | 963 | 957 |
| 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 | 31.3 | 18.2 | 18.3 | 34.5 | 19.9 | 19.9 | 30.1 | 20.7 | 20.7 | 34.7 | 26.5 | 26.6 |
| Incr Delay (d2), s/veh | 2.1 | 0.3 | 0.6 | 9.8 | 0.1 | 0.3 | 5.9 | 0.2 | 0.2 | 32.4 | 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 | 3.4 | 4.7 | 4.8 | 2.3 | 2.3 | 2.4 | 5.6 | 1.9 | 1.9 | 3.0 | 1.3 | 1.4 |
| LnGrp Delay(d),s/veh | 33.4 | 18.5 | 18.8 | 44.3 | 20.0 | 20.2 | 36.0 | 20.9 | 21.0 | 67.0 | 26.9 | 26.9 |
| LnGrp LOS | C | B | B | D | B | C | D | C | C | E | C | C |
| Approach Vol, veh/h | | 1217 | | | 529 | | | 485 | | | 243 | |
| Approach Delay, s/veh | | 22.6 | | | 24.4 | | | 28.8 | | | 42.6 | |
| Approach LOS | | C | | | C | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 25.4 | 9.2 | 31.7 | 16.9 | 17.4 | 14.0 | 27.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 6.0 | 5.9 | 6.0 | 12.3 | 12.4 | 4.8 | 8.8 | 6.9 |
| Green Ext Time (p_c), s | 0.0 | 2.4 | 0.1 | 11.8 | 0.6 | 2.4 | 1.2 | 11.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 26.1 |
| HCM 2010 LOS | C |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 6.3 | | | | | |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 40 | 850 | 420 | 170 | 230 | 30 |
| Future Vol, veh/h | 40 | 850 | 420 | 170 | 230 | 30 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 43 | 914 | 452 | 183 | 247 | 32 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 453 | 0 | - | 0 | 906 | 228 |
| Stage 1 | - | - | - | - | 453 | - |
| Stage 2 | - | - | - | - | 453 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 713 | - | - | - | 346 | 660 |
| Stage 1 | - | - | - | - | 515 | - |
| Stage 2 | - | - | - | - | 555 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 712 | - | - | - | 325 | 659 |
| Mov Cap-2 Maneuver | - | - | - | - | 325 | - |
| Stage 1 | - | - | - | - | 515 | - |
| Stage 2 | - | - | - | - | 521 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0 | 40.2 |
| HCM LOS | | | E |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 712 | - | - | - | 325 | 659 |
| HCM Lane V/C Ratio | 0.06 | - | - | - | 0.761 | 0.049 |
| HCM Control Delay (s) | 10.4 | - | - | - | 44.1 | 10.7 |
| HCM Lane LOS | B | - | - | - | E | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 5.9 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 150 | 890 | 190 | 50 | 550 | 200 | 130 | 390 | 70 | 200 | 290 | 170 |
| Future Volume (veh/h) | 150 | 890 | 190 | 50 | 550 | 200 | 130 | 390 | 70 | 200 | 290 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 169 | 1000 | 125 | 56 | 618 | 0 | 146 | 438 | 0 | 225 | 326 | 178 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 104 | 650 | 329 | 59 | 687 | 326 | 72 | 660 | 561 | 244 | 512 | 279 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 498 | 3109 | 1576 | 287 | 3331 | 1583 | 1774 | 1863 | 1583 | 1774 | 1134 | 619 |
| Grp Volume(v), veh/h | 623 | 546 | 125 | 360 | 314 | 0 | 146 | 438 | 0 | 225 | 0 | 504 |
| Grp Sat Flow(s),veh/h/ln | 1838 | 1770 | 1576 | 1848 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1753 |
| Q Serve(g_s), s | 36.0 | 36.0 | 11.7 | 33.1 | 29.5 | 0.0 | 7.0 | 34.2 | 0.0 | 21.6 | 0.0 | 38.1 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 11.7 | 33.1 | 29.5 | 0.0 | 7.0 | 34.2 | 0.0 | 21.6 | 0.0 | 38.1 |
| Prop In Lane | 0.27 | | 1.00 | 0.16 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.35 |
| Lane Grp Cap(c), veh/h | 384 | 370 | 329 | 381 | 365 | 326 | 72 | 660 | 561 | 244 | 0 | 791 |
| V/C Ratio(X) | 1.62 | 1.47 | 0.38 | 0.95 | 0.86 | 0.00 | 2.02 | 0.66 | 0.00 | 0.92 | 0.00 | 0.64 |
| Avail Cap(c_a), veh/h | 384 | 370 | 329 | 386 | 370 | 331 | 72 | 660 | 561 | 268 | 0 | 791 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.1 | 68.1 | 58.5 | 67.4 | 66.0 | 0.0 | 82.6 | 47.0 | 0.0 | 73.3 | 0.0 | 36.4 |
| Incr Delay (d2), s/veh | 292.1 | 227.8 | 0.7 | 31.9 | 18.0 | 0.0 | 506.1 | 5.2 | 0.0 | 33.2 | 0.0 | 3.9 |
| 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 | 49.4 | 41.0 | 5.2 | 20.3 | 16.3 | 0.0 | 13.6 | 18.6 | 0.0 | 12.9 | 0.0 | 19.3 |
| LnGrp Delay(d),s/veh | 360.2 | 295.9 | 59.2 | 99.3 | 83.9 | 0.0 | 588.7 | 52.2 | 0.0 | 106.5 | 0.0 | 40.3 |
| LnGrp LOS | F | F | E | F | F | | F | D | | F | | D |
| Approach Vol, veh/h | | 1294 | | | 674 | | | 584 | | | 729 | |
| Approach Delay, s/veh | | 304.0 | | | 92.2 | | | 186.3 | | | 60.7 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.7 | 65.0 | | 40.0 | 11.0 | 81.7 | | 39.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 36.2 | | 38.0 | 9.0 | 40.1 | | 35.1 |
| Green Ext Time (p_c), s | 0.2 | 6.8 | | 0.0 | 0.0 | 6.4 | | 0.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 185.5 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 23.9 |
| Intersection LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 100 | 10 | 10 | 270 | 470 | 70 |
| Future Vol, veh/h | 100 | 10 | 10 | 270 | 470 | 70 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 106 | 11 | 11 | 287 | 500 | 74 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 |

| Approach | EB | WB | SB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 1 | 1 | 0 |
| Conflicting Approach Left | SB | | WB |
| Conflicting Lanes Left | 2 | 0 | 1 |
| Conflicting Approach Right | | SB | EB |
| Conflicting Lanes Right | 0 | 2 | 1 |
| HCM Control Delay | 11 | 12.3 | 32.6 |
| HCM LOS | B | B | D |

| Lane | EBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 91% | 0% | 100% | 0% |
| Vol Thru, % | 9% | 4% | 0% | 0% |
| Vol Right, % | 0% | 96% | 0% | 100% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 110 | 280 | 470 | 70 |
| LT Vol | 100 | 0 | 470 | 0 |
| Through Vol | 10 | 10 | 0 | 0 |
| RT Vol | 0 | 270 | 0 | 70 |
| Lane Flow Rate | 117 | 298 | 500 | 74 |
| Geometry Grp | 2 | 2 | 7 | 7 |
| Degree of Util (X) | 0.205 | 0.435 | 0.863 | 0.103 |
| Departure Headway (Hd) | 6.307 | 5.258 | 6.21 | 4.998 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 568 | 682 | 585 | 718 |
| Service Time | 4.364 | 3.307 | 3.934 | 2.722 |
| HCM Lane V/C Ratio | 0.206 | 0.437 | 0.855 | 0.103 |
| HCM Control Delay | 11 | 12.3 | 36.2 | 8.3 |
| HCM Lane LOS | B | B | E | A |
| HCM 95th-tile Q | 0.8 | 2.2 | 9.6 | 0.3 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 470 | 10 | 10 | 260 | 10 | 10 |
| Future Vol, veh/h | 470 | 10 | 10 | 260 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 505 | 11 | 11 | 280 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 522 | 0 | 824 | 523 |
| Stage 1 | - | - | - | - | 517 | - |
| Stage 2 | - | - | - | - | 307 | - |
| 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 | - | - | 1044 | - | 343 | 554 |
| Stage 1 | - | - | - | - | 598 | - |
| Stage 2 | - | - | - | - | 746 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1039 | - | 335 | 548 |
| Mov Cap-2 Maneuver | - | - | - | - | 335 | - |
| Stage 1 | - | - | - | - | 595 | - |
| Stage 2 | - | - | - | - | 733 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.3 | 14.1 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 416 | - | - | 1039 | - |
| HCM Lane V/C Ratio | 0.052 | - | - | 0.01 | - |
| HCM Control Delay (s) | 14.1 | - | - | 8.5 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.6 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 460 | 20 | 20 | 260 | 10 | 10 |
| Future Vol, veh/h | 460 | 20 | 20 | 260 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 484 | 21 | 21 | 274 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 510 | 0 | 821 | 505 |
| Stage 1 | - | - | - | - | 500 | - |
| 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 | - | - | 1055 | - | 344 | 567 |
| Stage 1 | - | - | - | - | 609 | - |
| Stage 2 | - | - | - | - | 735 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1051 | - | 333 | 562 |
| Mov Cap-2 Maneuver | - | - | - | - | 333 | - |
| Stage 1 | - | - | - | - | 606 | - |
| Stage 2 | - | - | - | - | 714 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.6 | 14.1 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 418 | - | - | 1051 | - |
| HCM Lane V/C Ratio | 0.05 | - | - | 0.02 | - |
| HCM Control Delay (s) | 14.1 | - | - | 8.5 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 91.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 390 | 10 | 30 | 240 | 200 | 10 | 230 | 80 | 310 | 130 | 80 |
| Future Vol, veh/h | 90 | 390 | 10 | 30 | 240 | 200 | 10 | 230 | 80 | 310 | 130 | 80 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 92 | 398 | 10 | 31 | 245 | 204 | 10 | 235 | 82 | 316 | 133 | 82 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 94.5 | 143 | 20.9 | 85.2 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 12% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 83% | 0% |
| Vol Thru, % | 88% | 100% | 0% | 0% | 100% | 0% | 0% | 55% | 17% | 45% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 45% | 0% | 55% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 87 | 153 | 80 | 90 | 390 | 10 | 30 | 440 | 375 | 145 |
| LT Vol | 10 | 0 | 0 | 90 | 0 | 0 | 30 | 0 | 310 | 0 |
| Through Vol | 77 | 153 | 0 | 0 | 390 | 0 | 0 | 240 | 65 | 65 |
| RT Vol | 0 | 0 | 80 | 0 | 0 | 10 | 0 | 200 | 0 | 80 |
| Lane Flow Rate | 88 | 156 | 82 | 92 | 398 | 10 | 31 | 449 | 383 | 148 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.264 | 0.465 | 0.227 | 0.268 | 1.105 | 0.026 | 0.09 | 1.218 | 1.091 | 0.389 |
| Departure Headway (Hd) | 11.836 | 11.775 | 11.032 | 11.348 | 10.823 | 10.087 | 11.13 | 10.277 | 11.045 | 10.209 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 305 | 308 | 327 | 319 | 338 | 357 | 324 | 359 | 333 | 355 |
| Service Time | 9.536 | 9.475 | 8.732 | 9.048 | 8.523 | 7.787 | 8.83 | 7.977 | 8.745 | 7.909 |
| HCM Lane V/C Ratio | 0.289 | 0.506 | 0.251 | 0.288 | 1.178 | 0.028 | 0.096 | 1.251 | 1.15 | 0.417 |
| HCM Control Delay | 18.7 | 24.3 | 16.9 | 18.2 | 114.2 | 13.1 | 14.9 | 151.7 | 110.7 | 19.3 |
| HCM Lane LOS | C | C | C | C | F | B | B | F | F | C |
| HCM 95th-tile Q | 1 | 2.3 | 0.9 | 1.1 | 14.1 | 0.1 | 0.3 | 18.3 | 13.5 | 1.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 283 | 130 | 91 | 361 | 240 | 200 | 455 | 102 | 320 | 728 | 690 |
| Future Volume (veh/h) | 320 | 283 | 130 | 91 | 361 | 240 | 200 | 455 | 102 | 320 | 728 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 308 | 0 | 99 | 392 | 0 | 217 | 495 | 0 | 348 | 866 | 421 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 452 | 1036 | 464 | 129 | 829 | 1012 | 314 | 1102 | 493 | 458 | 1301 | 538 |
| Arrive On Green | 0.13 | 0.29 | 0.00 | 0.07 | 0.23 | 0.00 | 0.09 | 0.31 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 308 | 0 | 99 | 392 | 0 | 217 | 495 | 0 | 348 | 866 | 421 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.1 | 5.6 | 0.0 | 4.5 | 7.9 | 0.0 | 5.0 | 9.2 | 0.0 | 7.8 | 16.2 | 20.2 |
| Cycle Q Clear(g_c), s | 8.1 | 5.6 | 0.0 | 4.5 | 7.9 | 0.0 | 5.0 | 9.2 | 0.0 | 7.8 | 16.2 | 20.2 |
| 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 | 452 | 1036 | 464 | 129 | 829 | 1012 | 314 | 1102 | 493 | 458 | 1301 | 538 |
| V/C Ratio(X) | 0.77 | 0.30 | 0.00 | 0.77 | 0.47 | 0.00 | 0.69 | 0.45 | 0.00 | 0.76 | 0.67 | 0.78 |
| Avail Cap(c_a), veh/h | 752 | 1546 | 692 | 387 | 1546 | 1577 | 793 | 1331 | 596 | 818 | 1401 | 580 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.6 | 22.6 | 0.0 | 37.5 | 27.2 | 0.0 | 36.3 | 22.7 | 0.0 | 34.7 | 22.7 | 24.0 |
| Incr Delay (d2), s/veh | 2.8 | 0.2 | 0.0 | 9.2 | 0.4 | 0.0 | 2.7 | 0.3 | 0.0 | 2.6 | 1.1 | 6.4 |
| 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 | 4.0 | 2.7 | 0.0 | 2.5 | 3.9 | 0.0 | 2.5 | 4.5 | 0.0 | 4.0 | 8.5 | 9.5 |
| LnGrp Delay(d),s/veh | 37.4 | 22.7 | 0.0 | 46.8 | 27.6 | 0.0 | 39.1 | 23.0 | 0.0 | 37.3 | 23.8 | 30.4 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 656 | | | 491 | | | 712 | | | 1635 | |
| Approach Delay, s/veh | | 30.5 | | | 31.5 | | | 27.9 | | | 28.4 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.6 | 29.7 | 10.0 | 28.1 | 11.5 | 32.8 | 14.8 | 23.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 9.8 | 11.2 | 6.5 | 7.6 | 7.0 | 22.2 | 10.1 | 9.9 |
| Green Ext Time (p_c), s | 0.8 | 10.7 | 0.2 | 4.9 | 0.5 | 6.1 | 0.8 | 4.8 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 29.1 |
| HCM 2010 LOS | | C |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 118 | 277 | 43 | 120 | 455 | 190 | 11 | 330 | 90 | 300 | 420 | 252 |
| Future Volume (veh/h) | 118 | 277 | 43 | 120 | 455 | 190 | 11 | 330 | 90 | 300 | 420 | 252 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 137 | 322 | 37 | 140 | 529 | 173 | 13 | 384 | 84 | 349 | 488 | 230 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 173 | 997 | 114 | 177 | 822 | 268 | 28 | 782 | 169 | 428 | 886 | 415 |
| Arrive On Green | 0.10 | 0.31 | 0.31 | 0.10 | 0.31 | 0.31 | 0.02 | 0.27 | 0.27 | 0.12 | 0.38 | 0.38 |
| Sat Flow, veh/h | 1774 | 3194 | 364 | 1774 | 2617 | 852 | 1774 | 2887 | 625 | 3442 | 2332 | 1093 |
| Grp Volume(v), veh/h | 137 | 177 | 182 | 140 | 357 | 345 | 13 | 234 | 234 | 349 | 370 | 348 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1788 | 1774 | 1770 | 1699 | 1774 | 1770 | 1742 | 1721 | 1770 | 1656 |
| Q Serve(g_s), s | 6.3 | 6.3 | 6.5 | 6.4 | 14.4 | 14.5 | 0.6 | 9.2 | 9.4 | 8.2 | 13.6 | 13.7 |
| Cycle Q Clear(g_c), s | 6.3 | 6.3 | 6.5 | 6.4 | 14.4 | 14.5 | 0.6 | 9.2 | 9.4 | 8.2 | 13.6 | 13.7 |
| Prop In Lane | 1.00 | | 0.20 | 1.00 | | 0.50 | 1.00 | | 0.36 | 1.00 | | 0.66 |
| Lane Grp Cap(c), veh/h | 173 | 553 | 558 | 177 | 556 | 534 | 28 | 479 | 472 | 428 | 672 | 629 |
| V/C Ratio(X) | 0.79 | 0.32 | 0.33 | 0.79 | 0.64 | 0.65 | 0.47 | 0.49 | 0.50 | 0.82 | 0.55 | 0.55 |
| Avail Cap(c_a), veh/h | 342 | 1302 | 1316 | 342 | 1302 | 1250 | 235 | 768 | 756 | 457 | 768 | 719 |
| 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 | 36.6 | 21.8 | 21.8 | 36.5 | 24.4 | 24.5 | 40.5 | 25.4 | 25.5 | 35.4 | 20.2 | 20.2 |
| Incr Delay (d2), s/veh | 7.8 | 0.3 | 0.3 | 7.8 | 1.2 | 1.3 | 11.9 | 0.8 | 0.8 | 10.4 | 0.7 | 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 | 3.5 | 3.2 | 3.2 | 3.5 | 7.2 | 7.0 | 0.4 | 4.6 | 4.6 | 4.5 | 6.7 | 6.3 |
| LnGrp Delay(d),s/veh | 44.4 | 22.1 | 22.2 | 44.3 | 25.7 | 25.8 | 52.3 | 26.2 | 26.3 | 45.8 | 20.9 | 21.0 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 496 | | | 842 | | | 481 | | | 1067 | |
| Approach Delay, s/veh | | 28.3 | | | 28.8 | | | 26.9 | | | 29.1 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.3 | 26.5 | 12.3 | 29.9 | 5.3 | 35.5 | 12.1 | 30.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 10.2 | 11.4 | 8.4 | 8.5 | 2.6 | 15.7 | 8.3 | 16.5 |
| Green Ext Time (p_c), s | 0.1 | 8.8 | 0.2 | 9.0 | 0.0 | 8.1 | 0.2 | 8.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.5 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.2 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 222 | 30 | 80 | 211 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 222 | 30 | 80 | 211 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 281 | 38 | 101 | 267 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.1 | 20.6 | 18 | 20.7 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 15% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 43% | 0% |
| Vol Thru, % | 85% | 79% | 0% | 100% | 57% | 0% | 100% | 39% | 57% | 73% |
| Vol Right, % | 0% | 21% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 27% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 131 | 141 | 80 | 53 | 47 | 50 | 167 | 213 | 186 | 146 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 111 | 111 | 0 | 53 | 27 | 0 | 167 | 83 | 106 | 106 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 166 | 178 | 101 | 68 | 59 | 63 | 211 | 270 | 235 | 184 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.413 | 0.433 | 0.281 | 0.178 | 0.15 | 0.16 | 0.503 | 0.61 | 0.579 | 0.433 |
| Departure Headway (Hd) | 8.957 | 8.728 | 9.989 | 9.468 | 9.156 | 9.092 | 8.575 | 8.133 | 8.876 | 8.462 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 401 | 412 | 359 | 379 | 392 | 395 | 420 | 443 | 406 | 425 |
| Service Time | 6.712 | 6.483 | 7.751 | 7.23 | 6.917 | 6.842 | 6.325 | 5.883 | 6.628 | 6.214 |
| HCM Lane V/C Ratio | 0.414 | 0.432 | 0.281 | 0.179 | 0.151 | 0.159 | 0.502 | 0.609 | 0.579 | 0.433 |
| HCM Control Delay | 17.9 | 18 | 16.6 | 14.3 | 13.5 | 13.6 | 19.7 | 22.9 | 23.2 | 17.6 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 2 | 2.1 | 1.1 | 0.6 | 0.5 | 0.6 | 2.7 | 4 | 3.5 | 2.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 577 | 40 | 110 | 718 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 577 | 40 | 110 | 718 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 663 | 0 | 126 | 825 | 82 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| Arrive On Green | 0.05 | 0.24 | 0.24 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 663 | 0 | 126 | 825 | 82 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 25.1 | 0.0 | 5.6 | 35.6 | 2.5 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 25.1 | 0.0 | 5.6 | 35.6 | 2.5 |
| 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 | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.81 | 0.00 | 0.79 | 0.99 | 0.12 |
| Avail Cap(c_a), veh/h | 176 | 922 | 779 | 176 | 922 | 784 | 426 | 830 | 706 | 220 | 830 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 37.9 | 25.3 | 23.7 | 38.2 | 29.1 | 0.0 | 36.1 | 19.9 | 0.0 | 36.0 | 22.3 | 13.1 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 6.2 | 0.0 | 12.7 | 29.7 | 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 | 1.8 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.2 | 14.3 | 0.0 | 3.3 | 24.9 | 1.1 |
| LnGrp Delay(d),s/veh | 51.4 | 25.7 | 23.7 | 47.9 | 31.7 | 0.0 | 39.3 | 26.0 | 0.0 | 48.8 | 51.9 | 13.2 |
| LnGrp LOS | D | C | C | D | C | | D | C | | D | D | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 858 | | | 1033 | |
| Approach Delay, s/veh | | 34.5 | | | 33.8 | | | 29.0 | | | 48.5 | |
| Approach LOS | | C | | | C | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.2 | 39.3 | 7.2 | 23.0 | 10.6 | 40.0 | 8.0 | 22.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 27.1 | 4.1 | 6.5 | 6.5 | 37.6 | 5.1 | 14.5 |
| Green Ext Time (p_c), s | 0.1 | 6.0 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.4 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 93 | 40 | 542 | 191 | 371 | 20 | 470 | 240 | 633 | 990 | 180 |
| Future Volume (veh/h) | 50 | 93 | 40 | 542 | 191 | 371 | 20 | 470 | 240 | 633 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 96 | 0 | 559 | 197 | 0 | 21 | 485 | 0 | 653 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 68 | 432 | 134 | 683 | 1247 | 388 | 37 | 927 | 0 | 774 | 2301 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.21 | 0.26 | 0.00 | 0.02 | 0.27 | 0.00 | 0.24 | 0.49 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 96 | 0 | 559 | 197 | 0 | 21 | 485 | 0 | 653 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.7 | 1.6 | 0.0 | 14.5 | 2.8 | 0.0 | 1.1 | 10.4 | 0.0 | 17.0 | 12.3 | 0.0 |
| Cycle Q Clear(g_c), s | 2.7 | 1.6 | 0.0 | 14.5 | 2.8 | 0.0 | 1.1 | 10.4 | 0.0 | 17.0 | 12.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 68 | 432 | 134 | 683 | 1247 | 388 | 37 | 927 | 0 | 774 | 2301 | 0 |
| V/C Ratio(X) | 0.77 | 0.22 | 0.00 | 0.82 | 0.16 | 0.00 | 0.57 | 0.52 | 0.00 | 0.84 | 0.44 | 0.00 |
| Avail Cap(c_a), veh/h | 585 | 1949 | 607 | 1319 | 1949 | 607 | 575 | 1626 | 0 | 1136 | 2301 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 41.4 | 36.7 | 0.0 | 32.6 | 24.6 | 0.0 | 42.1 | 27.1 | 0.0 | 31.4 | 14.6 | 0.0 |
| Incr Delay (d2), s/veh | 16.5 | 0.3 | 0.0 | 2.5 | 0.1 | 0.0 | 13.0 | 0.5 | 0.0 | 4.0 | 0.1 | 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 | 1.6 | 0.7 | 0.0 | 6.6 | 1.2 | 0.0 | 0.6 | 3.4 | 0.0 | 7.9 | 5.3 | 0.0 |
| LnGrp Delay(d),s/veh | 57.9 | 36.9 | 0.0 | 35.1 | 24.7 | 0.0 | 55.1 | 27.6 | 0.0 | 35.4 | 14.7 | 0.0 |
| LnGrp LOS | E | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 148 | | | 756 | | | 506 | | | 1674 | |
| Approach Delay, s/veh | | 44.3 | | | 32.4 | | | 28.7 | | | 22.8 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 25.1 | 27.4 | 22.6 | 12.0 | 6.0 | 46.5 | 7.6 | 27.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 19.0 | 12.4 | 16.5 | 3.6 | 3.1 | 14.3 | 4.7 | 4.8 |
| Green Ext Time (p_c), s | 2.1 | 10.6 | 2.1 | 2.2 | 0.0 | 13.4 | 0.1 | 2.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 27.1 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 356 | 101 | 440 | 30 | 343 | 242 | 67 | 50 | 162 | 160 |
| Future Volume (veh/h) | 180 | 260 | 356 | 101 | 440 | 30 | 343 | 242 | 67 | 50 | 162 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 135 | 110 | 478 | 24 | 373 | 263 | 49 | 54 | 176 | 25 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 314 | 1015 | 442 | 144 | 1413 | 70 | 316 | 937 | 172 | 87 | 578 | 81 |
| Arrive On Green | 0.09 | 0.30 | 0.30 | 0.08 | 0.29 | 0.29 | 0.18 | 0.32 | 0.32 | 0.05 | 0.19 | 0.19 |
| Sat Flow, veh/h | 3442 | 3436 | 1498 | 1774 | 4952 | 247 | 1774 | 2970 | 544 | 1774 | 3103 | 432 |
| Grp Volume(v), veh/h | 196 | 279 | 139 | 110 | 326 | 176 | 373 | 155 | 157 | 54 | 99 | 102 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1544 | 1774 | 1695 | 1808 | 1774 | 1770 | 1744 | 1774 | 1770 | 1766 |
| Q Serve(g_s), s | 3.4 | 3.9 | 4.3 | 3.8 | 4.7 | 4.8 | 11.0 | 4.1 | 4.2 | 1.8 | 3.0 | 3.1 |
| Cycle Q Clear(g_c), s | 3.4 | 3.9 | 4.3 | 3.8 | 4.7 | 4.8 | 11.0 | 4.1 | 4.2 | 1.8 | 3.0 | 3.1 |
| Prop In Lane | 1.00 | | 0.97 | 1.00 | | 0.14 | 1.00 | | 0.31 | 1.00 | | 0.24 |
| Lane Grp Cap(c), veh/h | 314 | 1001 | 456 | 144 | 967 | 516 | 316 | 558 | 550 | 87 | 330 | 329 |
| V/C Ratio(X) | 0.62 | 0.28 | 0.31 | 0.76 | 0.34 | 0.34 | 1.18 | 0.28 | 0.29 | 0.62 | 0.30 | 0.31 |
| Avail Cap(c_a), veh/h | 891 | 1976 | 900 | 460 | 1976 | 1054 | 316 | 1031 | 1017 | 316 | 1031 | 1029 |
| 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 | 27.0 | 16.7 | 16.9 | 27.8 | 17.5 | 17.5 | 25.4 | 15.9 | 15.9 | 28.8 | 21.7 | 21.7 |
| Incr Delay (d2), s/veh | 2.0 | 0.1 | 0.4 | 8.0 | 0.2 | 0.4 | 109.1 | 0.3 | 0.3 | 7.1 | 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 | 1.7 | 1.8 | 1.9 | 2.2 | 2.2 | 2.4 | 14.8 | 2.0 | 2.1 | 1.1 | 1.5 | 1.6 |
| LnGrp Delay(d),s/veh | 29.1 | 16.9 | 17.2 | 35.8 | 17.7 | 17.9 | 134.4 | 16.1 | 16.2 | 35.9 | 22.2 | 22.2 |
| LnGrp LOS | C | B | B | D | B | B | F | B | B | D | C | C |
| Approach Vol, veh/h | | 614 | | | 612 | | | 685 | | | 255 | |
| Approach Delay, s/veh | | 20.8 | | | 21.0 | | | 80.6 | | | 25.1 | |
| Approach LOS | | C | | | C | | | F | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.0 | 23.5 | 9.0 | 22.2 | 15.0 | 15.5 | 9.6 | 21.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 3.8 | 6.2 | 5.8 | 6.3 | 13.0 | 5.1 | 5.4 | 6.8 |
| Green Ext Time (p_c), s | 0.0 | 3.2 | 0.2 | 7.2 | 0.0 | 3.2 | 0.5 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 40.3 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.6 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 22 | 345 | 561 | 210 | 210 | 31 |
| Future Vol, veh/h | 22 | 345 | 561 | 210 | 210 | 31 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 27 | 416 | 676 | 253 | 253 | 37 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 686 | 0 | - | 0 | 907 | 358 |
| Stage 1 | - | - | - | - | 686 | - |
| Stage 2 | - | - | - | - | 221 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 553 | - | - | - | 346 | 545 |
| Stage 1 | - | - | - | - | 374 | - |
| Stage 2 | - | - | - | - | 730 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 548 | - | - | - | 323 | 536 |
| Mov Cap-2 Maneuver | - | - | - | - | 323 | - |
| Stage 1 | - | - | - | - | 371 | - |
| Stage 2 | - | - | - | - | 688 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 42.3 |
| HCM LOS | | | E |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 548 | - | - | - | 323 | 536 |
| HCM Lane V/C Ratio | 0.048 | - | - | - | 0.783 | 0.07 |
| HCM Control Delay (s) | 11.9 | - | - | - | 46.8 | 12.2 |
| HCM Lane LOS | B | - | - | - | E | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 6.3 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 200 | 74 | 686 | 300 | 170 | 273 | 93 | 270 | 444 | 94 |
| Future Volume (veh/h) | 164 | 579 | 200 | 74 | 686 | 300 | 170 | 273 | 93 | 270 | 444 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.80 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 706 | 107 | 90 | 837 | 0 | 207 | 333 | 0 | 329 | 541 | 110 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 120 | 449 | 200 | 97 | 946 | 456 | 180 | 568 | 483 | 281 | 543 | 110 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.29 | 0.29 | 0.00 | 0.10 | 0.31 | 0.00 | 0.16 | 0.36 | 0.36 |
| Sat Flow, veh/h | 758 | 2836 | 1264 | 336 | 3280 | 1583 | 1774 | 1863 | 1583 | 1774 | 1502 | 305 |
| Grp Volume(v), veh/h | 481 | 425 | 107 | 495 | 432 | 0 | 207 | 333 | 0 | 329 | 0 | 651 |
| Grp Sat Flow(s),veh/h/ln | 1825 | 1770 | 1264 | 1846 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1808 |
| Q Serve(g_s), s | 28.0 | 28.0 | 13.8 | 46.2 | 40.7 | 0.0 | 18.0 | 26.8 | 0.0 | 28.0 | 0.0 | 63.6 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 13.8 | 46.2 | 40.7 | 0.0 | 18.0 | 26.8 | 0.0 | 28.0 | 0.0 | 63.6 |
| Prop In Lane | 0.42 | | 1.00 | 0.18 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.17 |
| Lane Grp Cap(c), veh/h | 289 | 280 | 200 | 532 | 510 | 456 | 180 | 568 | 483 | 281 | 0 | 653 |
| V/C Ratio(X) | 1.67 | 1.52 | 0.54 | 0.93 | 0.85 | 0.00 | 1.15 | 0.59 | 0.00 | 1.17 | 0.00 | 1.00 |
| Avail Cap(c_a), veh/h | 289 | 280 | 200 | 563 | 540 | 483 | 180 | 568 | 483 | 281 | 0 | 653 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 74.5 | 74.5 | 68.5 | 61.3 | 59.3 | 0.0 | 79.5 | 52.1 | 0.0 | 74.5 | 0.0 | 56.4 |
| Incr Delay (d2), s/veh | 315.3 | 250.4 | 2.8 | 21.7 | 11.5 | 0.0 | 112.3 | 4.4 | 0.0 | 108.8 | 0.0 | 34.3 |
| 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 | 39.4 | 33.1 | 5.0 | 26.7 | 21.5 | 0.0 | 14.4 | 14.5 | 0.0 | 22.2 | 0.0 | 38.1 |
| LnGrp Delay(d),s/veh | 389.8 | 324.9 | 71.3 | 82.9 | 70.8 | 0.0 | 191.8 | 56.4 | 0.0 | 183.3 | 0.0 | 90.7 |
| LnGrp LOS | F | F | E | F | E | | F | E | | F | | F |
| Approach Vol, veh/h | | 1013 | | | 927 | | | 540 | | | 980 | |
| Approach Delay, s/veh | | 328.9 | | | 77.3 | | | 108.3 | | | 121.8 | |
| Approach LOS | | F | | | E | | | F | | | F | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 32.0 | 58.0 | | 32.0 | 22.0 | 68.0 | | 55.0 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 | | | | |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 30.0 | 28.8 | | 30.0 | 20.0 | 65.6 | | 48.2 | | | | |
| Green Ext Time (p_c), s | 0.0 | 7.4 | | 0.0 | 0.0 | 0.0 | | 2.9 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | | | 168.4 | | | | | | | | | |
| HCM 2010 LOS | | | F | | | | | | | | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 23.2 |
| Intersection LOS | C |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 11 | 446 | 258 | 2 | 278 | 162 |
| Future Vol, veh/h | 11 | 446 | 258 | 2 | 278 | 162 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 525 | 304 | 2 | 327 | 191 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 30.1 | 17.5 | 19.3 |
| HCM LOS | D | C | C |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 2% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 98% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 260 | 457 | 278 | 162 |
| LT Vol | 0 | 11 | 278 | 0 |
| Through Vol | 258 | 0 | 0 | 162 |
| RT Vol | 2 | 446 | 0 | 0 |
| Lane Flow Rate | 306 | 538 | 327 | 191 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.553 | 0.83 | 0.656 | 0.356 |
| Departure Headway (Hd) | 6.511 | 5.555 | 7.226 | 6.715 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 551 | 645 | 497 | 532 |
| Service Time | 4.608 | 3.638 | 5.025 | 4.513 |
| HCM Lane V/C Ratio | 0.555 | 0.834 | 0.658 | 0.359 |
| HCM Control Delay | 17.5 | 30.1 | 22.9 | 13.2 |
| HCM Lane LOS | C | D | C | B |
| HCM 95th-tile Q | 3.3 | 8.9 | 4.7 | 1.6 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 4.1 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 232 | 48 | 44 | 371 | 76 | 105 |
| Future Vol, veh/h | 232 | 48 | 44 | 371 | 76 | 105 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 258 | 53 | 49 | 412 | 84 | 117 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 318 | 0 | 808 | 298 |
| Stage 1 | - | - | - | - | 291 | - |
| Stage 2 | - | - | - | - | 517 | - |
| 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 | - | - | 1242 | - | 350 | 741 |
| Stage 1 | - | - | - | - | 759 | - |
| Stage 2 | - | - | - | - | 598 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1235 | - | 328 | 732 |
| Mov Cap-2 Maneuver | - | - | - | - | 328 | - |
| Stage 1 | - | - | - | - | 755 | - |
| Stage 2 | - | - | - | - | 564 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.9 | 17.7 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 482 | - | - | 1235 | - |
| HCM Lane V/C Ratio | 0.417 | - | - | 0.04 | - |
| HCM Control Delay (s) | 17.7 | - | - | 8 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 2 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 317 | 10 | 10 | 424 | 20 | 20 |
| Future Vol, veh/h | 317 | 10 | 10 | 424 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 360 | 11 | 11 | 482 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 379 | 0 | 885 | 380 |
| Stage 1 | - | - | - | - | 373 | - |
| Stage 2 | - | - | - | - | 512 | - |
| 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 | - | - | 1179 | - | 315 | 667 |
| Stage 1 | - | - | - | - | 696 | - |
| Stage 2 | - | - | - | - | 602 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1172 | - | 307 | 659 |
| Mov Cap-2 Maneuver | - | - | - | - | 307 | - |
| Stage 1 | - | - | - | - | 692 | - |
| Stage 2 | - | - | - | - | 591 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 14.6 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 419 | - | - | 1172 | - |
| HCM Lane V/C Ratio | 0.108 | - | - | 0.01 | - |
| HCM Control Delay (s) | 14.6 | - | - | 8.1 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.4 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 100 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 116 | 171 | 10 | 10 | 306 | 220 | 30 | 150 | 20 | 270 | 200 | 138 |
| Future Vol, veh/h | 116 | 171 | 10 | 10 | 306 | 220 | 30 | 150 | 20 | 270 | 200 | 138 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 127 | 188 | 11 | 11 | 336 | 242 | 33 | 165 | 22 | 297 | 220 | 152 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 21.8 | 218.1 | 17.9 | 61.2 |
| HCM LOS | C | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 38% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 73% | 0% |
| Vol Thru, % | 62% | 100% | 0% | 0% | 100% | 0% | 0% | 58% | 27% | 42% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 42% | 0% | 58% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 80 | 100 | 20 | 116 | 171 | 10 | 10 | 526 | 370 | 238 |
| LT Vol | 30 | 0 | 0 | 116 | 0 | 0 | 10 | 0 | 270 | 0 |
| Through Vol | 50 | 100 | 0 | 0 | 171 | 0 | 0 | 306 | 100 | 100 |
| RT Vol | 0 | 0 | 20 | 0 | 0 | 10 | 0 | 220 | 0 | 138 |
| Lane Flow Rate | 88 | 110 | 22 | 127 | 188 | 11 | 11 | 578 | 407 | 262 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.25 | 0.307 | 0.057 | 0.359 | 0.503 | 0.027 | 0.029 | 1.407 | 1.019 | 0.6 |
| Departure Headway (Hd) | 11.409 | 11.211 | 10.474 | 11.145 | 10.621 | 9.887 | 9.818 | 9.003 | 9.981 | 9.183 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 316 | 323 | 344 | 325 | 342 | 364 | 367 | 410 | 366 | 395 |
| Service Time | 9.109 | 8.911 | 8.174 | 8.845 | 8.321 | 7.587 | 7.518 | 6.703 | 7.681 | 6.883 |
| HCM Lane V/C Ratio | 0.278 | 0.341 | 0.064 | 0.391 | 0.55 | 0.03 | 0.03 | 1.41 | 1.112 | 0.663 |
| HCM Control Delay | 17.9 | 18.8 | 13.8 | 20 | 23.6 | 12.9 | 12.8 | 222 | 84.7 | 24.7 |
| HCM Lane LOS | C | C | B | C | C | B | B | F | F | C |
| HCM 95th-tile Q | 1 | 1.3 | 0.2 | 1.6 | 2.7 | 0.1 | 0.1 | 27.9 | 12.2 | 3.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 561 | 260 | 92 | 403 | 350 | 150 | 565 | 121 | 280 | 615 | 430 |
| Future Volume (veh/h) | 700 | 561 | 260 | 92 | 403 | 350 | 150 | 565 | 121 | 280 | 615 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 591 | 0 | 97 | 424 | 0 | 158 | 595 | 0 | 295 | 647 | 218 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 861 | 1422 | 636 | 125 | 785 | 918 | 229 | 965 | 432 | 382 | 1169 | 478 |
| Arrive On Green | 0.25 | 0.40 | 0.00 | 0.07 | 0.22 | 0.00 | 0.07 | 0.27 | 0.00 | 0.11 | 0.31 | 0.31 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1523 |
| Grp Volume(v), veh/h | 737 | 591 | 0 | 97 | 424 | 0 | 158 | 595 | 0 | 295 | 647 | 218 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1523 |
| Q Serve(g_s), s | 22.1 | 13.0 | 0.0 | 5.8 | 11.5 | 0.0 | 4.9 | 15.9 | 0.0 | 8.8 | 15.6 | 12.4 |
| Cycle Q Clear(g_c), s | 22.1 | 13.0 | 0.0 | 5.8 | 11.5 | 0.0 | 4.9 | 15.9 | 0.0 | 8.8 | 15.6 | 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 | 861 | 1422 | 636 | 125 | 785 | 918 | 229 | 965 | 432 | 382 | 1169 | 478 |
| V/C Ratio(X) | 0.86 | 0.42 | 0.00 | 0.78 | 0.54 | 0.00 | 0.69 | 0.62 | 0.00 | 0.77 | 0.55 | 0.46 |
| Avail Cap(c_a), veh/h | 3272 | 3756 | 1681 | 475 | 1339 | 1355 | 731 | 1993 | 891 | 950 | 2304 | 942 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 38.8 | 23.3 | 0.0 | 49.5 | 37.3 | 0.0 | 49.5 | 34.4 | 0.0 | 47.0 | 30.9 | 29.8 |
| Incr Delay (d2), s/veh | 2.6 | 0.2 | 0.0 | 10.0 | 0.6 | 0.0 | 3.7 | 0.6 | 0.0 | 3.3 | 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 | 10.9 | 6.4 | 0.0 | 3.2 | 5.7 | 0.0 | 2.4 | 7.9 | 0.0 | 4.5 | 8.1 | 5.3 |
| LnGrp Delay(d),s/veh | 41.4 | 23.5 | 0.0 | 59.6 | 37.9 | 0.0 | 53.2 | 35.1 | 0.0 | 50.4 | 31.3 | 30.4 |
| LnGrp LOS | D | C | | E | D | | D | D | | D | C | C |
| Approach Vol, veh/h | | 1328 | | | 521 | | | 753 | | | 1160 | |
| Approach Delay, s/veh | | 33.4 | | | 41.9 | | | 38.9 | | | 36.0 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 15.7 | 33.5 | 11.6 | 47.5 | 11.2 | 38.0 | 31.1 | 28.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 10.8 | 17.9 | 7.8 | 15.0 | 6.9 | 17.6 | 24.1 | 13.5 |
| Green Ext Time (p_c), s | 0.9 | 11.6 | 0.2 | 8.5 | 0.4 | 11.9 | 3.0 | 7.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 36.5 |
| HCM 2010 LOS | D |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 282 | 550 | 41 | 100 | 417 | 310 | 53 | 480 | 90 | 340 | 280 | 148 |
| Future Volume (veh/h) | 282 | 550 | 41 | 100 | 417 | 310 | 53 | 480 | 90 | 340 | 280 | 148 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 303 | 591 | 40 | 108 | 448 | 235 | 57 | 516 | 85 | 366 | 301 | 102 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 341 | 1266 | 86 | 137 | 581 | 302 | 73 | 799 | 131 | 454 | 921 | 305 |
| Arrive On Green | 0.19 | 0.38 | 0.38 | 0.08 | 0.26 | 0.26 | 0.04 | 0.26 | 0.26 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 1774 | 3358 | 227 | 1774 | 2220 | 1153 | 1774 | 3031 | 497 | 3442 | 2600 | 862 |
| Grp Volume(v), veh/h | 303 | 311 | 320 | 108 | 356 | 327 | 57 | 300 | 301 | 366 | 203 | 200 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1815 | 1774 | 1770 | 1603 | 1774 | 1770 | 1759 | 1721 | 1770 | 1692 |
| Q Serve(g_s), s | 17.7 | 14.2 | 14.2 | 6.4 | 19.8 | 20.1 | 3.4 | 16.0 | 16.2 | 11.0 | 8.9 | 9.2 |
| Cycle Q Clear(g_c), s | 17.7 | 14.2 | 14.2 | 6.4 | 19.8 | 20.1 | 3.4 | 16.0 | 16.2 | 11.0 | 8.9 | 9.2 |
| Prop In Lane | 1.00 | | 0.13 | 1.00 | | 0.72 | 1.00 | | 0.28 | 1.00 | | 0.51 |
| Lane Grp Cap(c), veh/h | 341 | 667 | 684 | 137 | 464 | 420 | 73 | 467 | 464 | 454 | 627 | 600 |
| V/C Ratio(X) | 0.89 | 0.47 | 0.47 | 0.79 | 0.77 | 0.78 | 0.78 | 0.64 | 0.65 | 0.81 | 0.32 | 0.33 |
| Avail Cap(c_a), veh/h | 533 | 698 | 715 | 333 | 498 | 451 | 133 | 615 | 611 | 808 | 897 | 858 |
| 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 | 41.9 | 25.1 | 25.1 | 48.3 | 36.3 | 36.4 | 50.6 | 34.8 | 34.8 | 44.9 | 25.1 | 25.2 |
| Incr Delay (d2), s/veh | 11.2 | 0.5 | 0.5 | 9.7 | 6.7 | 7.9 | 15.9 | 1.5 | 1.5 | 3.4 | 0.3 | 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 | 9.7 | 7.0 | 7.2 | 3.5 | 10.6 | 9.8 | 2.0 | 8.0 | 8.1 | 5.5 | 4.4 | 4.3 |
| LnGrp Delay(d),s/veh | 53.1 | 25.6 | 25.6 | 58.0 | 43.0 | 44.3 | 66.5 | 36.3 | 36.4 | 48.3 | 25.4 | 25.5 |
| LnGrp LOS | D | C | C | E | D | D | E | D | D | D | C | C |
| Approach Vol, veh/h | | 934 | | | 791 | | | 658 | | | 769 | |
| Approach Delay, s/veh | | 34.5 | | | 45.6 | | | 38.9 | | | 36.3 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 18.1 | 32.1 | 12.2 | 44.2 | 8.4 | 41.8 | 24.5 | 31.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 13.0 | 18.2 | 8.4 | 16.2 | 5.4 | 11.2 | 19.7 | 22.1 |
| Green Ext Time (p_c), s | 1.1 | 6.5 | 0.2 | 10.1 | 0.0 | 8.1 | 0.7 | 4.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.7 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 16.7 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 181 | 70 | 110 | 222 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 181 | 70 | 110 | 222 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 201 | 78 | 122 | 247 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.9 | 14.4 | 16 | 19.7 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 18% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 50% | 0% |
| Vol Thru, % | 82% | 56% | 0% | 100% | 81% | 0% | 100% | 44% | 50% | 79% |
| Vol Right, % | 0% | 44% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 21% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 111 | 161 | 90 | 167 | 103 | 80 | 93 | 107 | 221 | 141 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 91 | 91 | 0 | 167 | 83 | 0 | 93 | 47 | 111 | 111 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 123 | 178 | 100 | 185 | 115 | 89 | 104 | 119 | 246 | 157 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.296 | 0.41 | 0.25 | 0.436 | 0.266 | 0.229 | 0.252 | 0.275 | 0.581 | 0.353 |
| Departure Headway (Hd) | 8.679 | 8.277 | 8.999 | 8.482 | 8.342 | 9.266 | 8.748 | 8.34 | 8.522 | 8.119 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 415 | 435 | 400 | 426 | 431 | 388 | 411 | 431 | 425 | 443 |
| Service Time | 6.423 | 6.021 | 6.743 | 6.226 | 6.086 | 7.011 | 6.493 | 6.085 | 6.264 | 5.861 |
| HCM Lane V/C Ratio | 0.296 | 0.409 | 0.25 | 0.434 | 0.267 | 0.229 | 0.253 | 0.276 | 0.579 | 0.354 |
| HCM Control Delay | 15 | 16.7 | 14.7 | 17.7 | 14.1 | 14.8 | 14.4 | 14.2 | 22.5 | 15.2 |
| HCM Lane LOS | B | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.2 | 2 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.6 | 1.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 606 | 40 | 160 | 577 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 606 | 40 | 160 | 577 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 638 | 0 | 168 | 607 | 85 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 109 | 394 | 329 | 45 | 327 | 278 | 146 | 836 | 710 | 210 | 977 | 826 |
| Arrive On Green | 0.06 | 0.21 | 0.21 | 0.03 | 0.18 | 0.00 | 0.04 | 0.45 | 0.00 | 0.12 | 0.52 | 0.52 |
| Sat Flow, veh/h | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Grp Volume(v), veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 638 | 0 | 168 | 607 | 85 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Q Serve(g_s), s | 5.0 | 12.1 | 0.3 | 1.5 | 7.6 | 0.0 | 2.0 | 23.5 | 0.0 | 7.5 | 18.8 | 2.2 |
| Cycle Q Clear(g_c), s | 5.0 | 12.1 | 0.3 | 1.5 | 7.6 | 0.0 | 2.0 | 23.5 | 0.0 | 7.5 | 18.8 | 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 | 109 | 394 | 329 | 45 | 327 | 278 | 146 | 836 | 710 | 210 | 977 | 826 |
| V/C Ratio(X) | 1.35 | 0.75 | 0.02 | 0.71 | 0.58 | 0.00 | 0.57 | 0.76 | 0.00 | 0.80 | 0.62 | 0.10 |
| Avail Cap(c_a), veh/h | 109 | 913 | 761 | 130 | 935 | 795 | 548 | 2145 | 1823 | 521 | 2396 | 2026 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 38.3 | 30.1 | 25.5 | 39.5 | 30.9 | 0.0 | 38.4 | 18.9 | 0.0 | 35.1 | 13.7 | 9.8 |
| Incr Delay (d2), s/veh | 207.5 | 2.9 | 0.0 | 18.8 | 1.6 | 0.0 | 3.5 | 1.5 | 0.0 | 6.9 | 0.7 | 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 | 8.7 | 6.5 | 0.1 | 0.9 | 4.0 | 0.0 | 1.0 | 12.4 | 0.0 | 4.1 | 9.8 | 1.0 |
| LnGrp Delay(d),s/veh | 245.8 | 33.0 | 25.5 | 58.3 | 32.5 | 0.0 | 41.9 | 20.4 | 0.0 | 41.9 | 14.3 | 9.8 |
| LnGrp LOS | F | C | C | E | C | | D | C | | D | B | A |
| Approach Vol, veh/h | | 450 | | | 221 | | | 722 | | | 860 | |
| Approach Delay, s/veh | | 102.4 | | | 36.2 | | | 22.9 | | | 19.3 | |
| Approach LOS | | F | | | D | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 13.7 | 40.6 | 6.1 | 21.3 | 7.5 | 46.8 | 9.0 | 18.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 9.5 | 25.5 | 3.5 | 14.1 | 4.0 | 20.8 | 7.0 | 9.6 |
| Green Ext Time (p_c), s | 0.4 | 11.2 | 0.0 | 3.2 | 0.1 | 11.2 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.7 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 520 | 40 | 248 | 336 | 466 | 70 | 1210 | 561 | 470 | 320 | 300 |
| Future Volume (veh/h) | 220 | 520 | 40 | 248 | 336 | 466 | 70 | 1210 | 561 | 470 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 559 | 0 | 267 | 361 | 0 | 75 | 1301 | 0 | 505 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1234 | 367 | 302 | 963 | 300 | 71 | 1500 | 0 | 535 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.26 | 0.00 | 0.09 | 0.20 | 0.00 | 0.04 | 0.41 | 0.00 | 0.17 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 559 | 0 | 267 | 361 | 0 | 75 | 1301 | 0 | 505 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 25.3 | 0.0 | 21.1 | 16.8 | 0.0 | 11.0 | 83.5 | 0.0 | 39.9 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 25.3 | 0.0 | 21.1 | 16.8 | 0.0 | 11.0 | 83.5 | 0.0 | 39.9 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1234 | 367 | 302 | 963 | 300 | 71 | 1500 | 0 | 535 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.45 | 0.00 | 0.89 | 0.37 | 0.00 | 1.06 | 0.87 | 0.00 | 0.94 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1234 | 367 | 802 | 963 | 300 | 71 | 1500 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 78.8 | 0.0 | 114.0 | 87.3 | 0.0 | 121.9 | 68.3 | 0.0 | 104.8 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.2 | 0.0 | 8.5 | 1.1 | 0.0 | 122.9 | 7.0 | 0.0 | 23.7 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 11.2 | 0.0 | 9.7 | 7.4 | 0.0 | 7.4 | 28.9 | 0.0 | 19.4 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 80.0 | 0.0 | 122.5 | 88.5 | 0.0 | 246.1 | 75.3 | 0.0 | 128.5 | 29.7 | 0.0 |
| LnGrp LOS | F | E | | F | F | | F | E | | F | C | |
| Approach Vol, veh/h | | 796 | | | 628 | | | 1376 | | | 849 | |
| Approach Delay, s/veh | | 99.2 | | | 102.9 | | | 84.6 | | | 88.5 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 46.7 | 109.3 | 28.1 | 70.6 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 41.9 | 85.5 | 23.1 | 27.3 | 13.0 | 12.3 | 38.4 | 18.8 |
| Green Ext Time (p_c), s | 0.8 | 10.8 | 1.0 | 2.6 | 0.0 | 23.3 | 0.3 | 7.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 91.8 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 232 | 126 | 380 | 40 | 271 | 222 | 131 | 90 | 192 | 200 |
| Future Volume (veh/h) | 310 | 700 | 232 | 126 | 380 | 40 | 271 | 222 | 131 | 90 | 192 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 197 | 133 | 400 | 34 | 285 | 234 | 77 | 95 | 202 | 65 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 438 | 1347 | 355 | 165 | 1453 | 122 | 329 | 867 | 277 | 100 | 535 | 167 |
| Arrive On Green | 0.13 | 0.34 | 0.34 | 0.09 | 0.30 | 0.30 | 0.19 | 0.33 | 0.33 | 0.06 | 0.20 | 0.20 |
| Sat Flow, veh/h | 3442 | 3982 | 1050 | 1774 | 4775 | 400 | 1774 | 2620 | 836 | 1774 | 2642 | 823 |
| Grp Volume(v), veh/h | 326 | 626 | 308 | 133 | 282 | 152 | 285 | 156 | 155 | 95 | 133 | 134 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1642 | 1774 | 1695 | 1785 | 1774 | 1770 | 1686 | 1774 | 1770 | 1696 |
| Q Serve(g_s), s | 8.1 | 13.3 | 13.5 | 6.5 | 5.6 | 5.7 | 13.8 | 5.7 | 6.0 | 4.7 | 5.7 | 6.0 |
| Cycle Q Clear(g_c), s | 8.1 | 13.3 | 13.5 | 6.5 | 5.6 | 5.7 | 13.8 | 5.7 | 6.0 | 4.7 | 5.7 | 6.0 |
| Prop In Lane | 1.00 | | 0.64 | 1.00 | | 0.22 | 1.00 | | 0.50 | 1.00 | | 0.49 |
| Lane Grp Cap(c), veh/h | 438 | 1147 | 555 | 165 | 1032 | 543 | 329 | 586 | 558 | 100 | 358 | 343 |
| V/C Ratio(X) | 0.74 | 0.55 | 0.55 | 0.80 | 0.27 | 0.28 | 0.87 | 0.27 | 0.28 | 0.95 | 0.37 | 0.39 |
| Avail Cap(c_a), veh/h | 1401 | 1763 | 854 | 221 | 1380 | 726 | 521 | 1160 | 1106 | 100 | 820 | 786 |
| 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 | 37.2 | 23.8 | 23.8 | 39.3 | 23.4 | 23.4 | 35.0 | 21.7 | 21.8 | 41.6 | 30.4 | 30.6 |
| Incr Delay (d2), s/veh | 2.5 | 0.4 | 0.9 | 14.5 | 0.1 | 0.3 | 9.0 | 0.2 | 0.3 | 72.8 | 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 | 4.0 | 6.2 | 6.2 | 3.8 | 2.6 | 2.9 | 7.5 | 2.8 | 2.8 | 4.3 | 2.9 | 2.9 |
| LnGrp Delay(d),s/veh | 39.8 | 24.2 | 24.7 | 53.8 | 23.5 | 23.7 | 43.9 | 21.9 | 22.1 | 114.4 | 31.1 | 31.3 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | F | C | C |
| Approach Vol, veh/h | | 1260 | | | 567 | | | 596 | | | 362 | |
| Approach Delay, s/veh | | 28.3 | | | 30.6 | | | 32.5 | | | 53.0 | |
| Approach LOS | | C | | | C | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 33.3 | 12.2 | 33.9 | 20.4 | 21.9 | 15.3 | 30.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 6.7 | 8.0 | 8.5 | 15.5 | 15.8 | 8.0 | 10.1 | 7.7 |
| Green Ext Time (p_c), s | 0.0 | 3.9 | 0.1 | 11.9 | 0.6 | 3.8 | 1.2 | 11.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 32.9 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 41 | 870 | 455 | 170 | 230 | 32 |
| Future Vol, veh/h | 41 | 870 | 455 | 170 | 230 | 32 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 44 | 935 | 489 | 183 | 247 | 34 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 490 | 0 | - | 0 | 953 | 247 |
| Stage 1 | - | - | - | - | 490 | - |
| Stage 2 | - | - | - | - | 463 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 685 | - | - | - | 328 | 642 |
| Stage 1 | - | - | - | - | 490 | - |
| Stage 2 | - | - | - | - | 549 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 684 | - | - | - | 306 | 641 |
| Mov Cap-2 Maneuver | - | - | - | - | 306 | - |
| Stage 1 | - | - | - | - | 490 | - |
| Stage 2 | - | - | - | - | 513 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0 | 47 |
| HCM LOS | | | E |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 684 | - | - | - | 306 | 641 |
| HCM Lane V/C Ratio | 0.064 | - | - | - | 0.808 | 0.054 |
| HCM Control Delay (s) | 10.6 | - | - | - | 52 | 10.9 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 6.6 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 158 | 901 | 190 | 63 | 569 | 200 | 130 | 398 | 77 | 200 | 303 | 184 |
| Future Volume (veh/h) | 158 | 901 | 190 | 63 | 569 | 200 | 130 | 398 | 77 | 200 | 303 | 184 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 178 | 1012 | 126 | 71 | 639 | 0 | 146 | 447 | 0 | 225 | 340 | 192 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 107 | 644 | 328 | 72 | 681 | 330 | 72 | 658 | 559 | 244 | 504 | 284 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 515 | 3091 | 1576 | 345 | 3270 | 1583 | 1774 | 1863 | 1583 | 1774 | 1119 | 632 |
| Grp Volume(v), veh/h | 635 | 555 | 126 | 379 | 331 | 0 | 146 | 447 | 0 | 225 | 0 | 532 |
| Grp Sat Flow(s),veh/h/ln | 1837 | 1770 | 1576 | 1845 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1751 |
| Q Serve(g_s), s | 36.0 | 36.0 | 11.9 | 35.4 | 31.4 | 0.0 | 7.0 | 35.3 | 0.0 | 21.6 | 0.0 | 41.5 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 11.9 | 35.4 | 31.4 | 0.0 | 7.0 | 35.3 | 0.0 | 21.6 | 0.0 | 41.5 |
| Prop In Lane | 0.28 | | 1.00 | 0.19 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.36 |
| Lane Grp Cap(c), veh/h | 383 | 369 | 328 | 384 | 369 | 330 | 72 | 658 | 559 | 244 | 0 | 788 |
| V/C Ratio(X) | 1.66 | 1.51 | 0.38 | 0.99 | 0.90 | 0.00 | 2.03 | 0.68 | 0.00 | 0.92 | 0.00 | 0.67 |
| Avail Cap(c_a), veh/h | 383 | 369 | 328 | 384 | 369 | 330 | 72 | 658 | 559 | 267 | 0 | 788 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.4 | 68.4 | 58.9 | 68.2 | 66.6 | 0.0 | 82.9 | 47.6 | 0.0 | 73.6 | 0.0 | 37.5 |
| Incr Delay (d2), s/veh | 307.6 | 241.6 | 0.7 | 42.1 | 23.6 | 0.0 | 509.1 | 5.6 | 0.0 | 33.4 | 0.0 | 4.6 |
| 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 | 50.9 | 42.3 | 5.2 | 22.5 | 17.9 | 0.0 | 13.6 | 19.2 | 0.0 | 12.9 | 0.0 | 21.1 |
| LnGrp Delay(d),s/veh | 376.0 | 310.0 | 59.6 | 110.3 | 90.2 | 0.0 | 592.0 | 53.2 | 0.0 | 107.0 | 0.0 | 42.1 |
| LnGrp LOS | F | F | E | F | F | | F | D | | F | | D |
| Approach Vol, veh/h | | 1316 | | | 710 | | | 593 | | | 757 | |
| Approach Delay, s/veh | | 317.8 | | | 100.9 | | | 185.8 | | | 61.4 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.8 | 65.0 | | 40.0 | 11.0 | 81.8 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 37.3 | | 38.0 | 9.0 | 43.5 | | 37.4 |
| Green Ext Time (p_c), s | 0.2 | 7.1 | | 0.0 | 0.0 | 6.2 | | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 191.5 |
| HCM 2010 LOS | | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 26.5 |
| Intersection LOS | D |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 285 | 201 | 1 | 496 | 217 |
| Future Vol, veh/h | 12 | 285 | 201 | 1 | 496 | 217 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 303 | 214 | 1 | 528 | 231 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 14 | 12.3 | 35.7 |
| HCM LOS | B | B | E |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 4% | 100% | 0% |
| Vol Thru, % | 100% | 0% | 0% | 100% |
| Vol Right, % | 0% | 96% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 202 | 297 | 496 | 217 |
| LT Vol | 0 | 12 | 496 | 0 |
| Through Vol | 201 | 0 | 0 | 217 |
| RT Vol | 1 | 285 | 0 | 0 |
| Lane Flow Rate | 215 | 316 | 528 | 231 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.356 | 0.493 | 0.924 | 0.372 |
| Departure Headway (Hd) | 5.961 | 5.62 | 6.305 | 5.799 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 604 | 641 | 575 | 621 |
| Service Time | 4.003 | 3.665 | 4.039 | 3.532 |
| HCM Lane V/C Ratio | 0.356 | 0.493 | 0.918 | 0.372 |
| HCM Control Delay | 12.3 | 14 | 46.1 | 11.9 |
| HCM Lane LOS | B | B | E | B |
| HCM 95th-tile Q | 1.6 | 2.7 | 11.6 | 1.7 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.7 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 471 | 36 | 54 | 262 | 25 | 36 |
| Future Vol, veh/h | 471 | 36 | 54 | 262 | 25 | 36 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 506 | 39 | 58 | 282 | 27 | 39 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 551 | 0 | 936 | 538 |
| Stage 1 | - | - | - | - | 532 | - |
| Stage 2 | - | - | - | - | 404 | - |
| 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 | - | - | 1019 | - | 294 | 543 |
| Stage 1 | - | - | - | - | 589 | - |
| Stage 2 | - | - | - | - | 674 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1014 | - | 271 | 538 |
| Mov Cap-2 Maneuver | - | - | - | - | 271 | - |
| Stage 1 | - | - | - | - | 586 | - |
| Stage 2 | - | - | - | - | 625 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 1.5 | 16.3 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 383 | - | - | 1014 | - |
| HCM Lane V/C Ratio | 0.171 | - | - | 0.057 | - |
| HCM Control Delay (s) | 16.3 | - | - | 8.8 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.6 | - | - | 0.2 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 487 | 20 | 20 | 306 | 10 | 10 |
| Future Vol, veh/h | 487 | 20 | 20 | 306 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 513 | 21 | 21 | 322 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 539 | 0 | 897 | 533 |
| Stage 1 | - | - | - | - | 528 | - |
| Stage 2 | - | - | - | - | 369 | - |
| 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 | - | - | 1029 | - | 310 | 547 |
| Stage 1 | - | - | - | - | 592 | - |
| Stage 2 | - | - | - | - | 699 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1025 | - | 300 | 542 |
| Mov Cap-2 Maneuver | - | - | - | - | 300 | - |
| Stage 1 | - | - | - | - | 590 | - |
| Stage 2 | - | - | - | - | 679 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.5 | 14.9 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 386 | - | - | 1025 | - |
| HCM Lane V/C Ratio | 0.055 | - | - | 0.021 | - |
| HCM Control Delay (s) | 14.9 | - | - | 8.6 | 0 |
| HCM Lane LOS | B | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 102.5 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 105 | 402 | 10 | 30 | 261 | 200 | 10 | 230 | 80 | 310 | 130 | 105 |
| Future Vol, veh/h | 105 | 402 | 10 | 30 | 261 | 200 | 10 | 230 | 80 | 310 | 130 | 105 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 107 | 410 | 10 | 31 | 266 | 204 | 10 | 235 | 82 | 316 | 133 | 107 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 105.2 | 171.8 | 21.6 | 84.9 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 12% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 83% | 0% |
| Vol Thru, % | 88% | 100% | 0% | 0% | 100% | 0% | 0% | 57% | 17% | 38% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 43% | 0% | 62% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 87 | 153 | 80 | 105 | 402 | 10 | 30 | 461 | 375 | 170 |
| LT Vol | 10 | 0 | 0 | 105 | 0 | 0 | 30 | 0 | 310 | 0 |
| Through Vol | 77 | 153 | 0 | 0 | 402 | 0 | 0 | 261 | 65 | 65 |
| RT Vol | 0 | 0 | 80 | 0 | 0 | 10 | 0 | 200 | 0 | 105 |
| Lane Flow Rate | 88 | 156 | 82 | 107 | 410 | 10 | 31 | 470 | 383 | 173 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.267 | 0.469 | 0.229 | 0.315 | 1.149 | 0.027 | 0.091 | 1.295 | 1.097 | 0.457 |
| Departure Headway (Hd) | 12.178 | 12.117 | 11.372 | 11.569 | 11.042 | 10.306 | 11.303 | 10.465 | 11.302 | 10.416 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 297 | 299 | 318 | 313 | 332 | 349 | 319 | 353 | 325 | 349 |
| Service Time | 9.878 | 9.817 | 9.072 | 9.269 | 8.742 | 8.006 | 9.003 | 8.165 | 9.002 | 8.116 |
| HCM Lane V/C Ratio | 0.296 | 0.522 | 0.258 | 0.342 | 1.235 | 0.029 | 0.097 | 1.331 | 1.178 | 0.496 |
| HCM Control Delay | 19.3 | 25.1 | 17.4 | 19.5 | 129.9 | 13.3 | 15.1 | 182 | 113.6 | 21.6 |
| HCM Lane LOS | C | D | C | C | F | B | C | F | F | C |
| HCM 95th-tile Q | 1.1 | 2.4 | 0.9 | 1.3 | 15.3 | 0.1 | 0.3 | 20.7 | 13.5 | 2.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 284 | 130 | 91 | 361 | 240 | 200 | 485 | 104 | 320 | 738 | 690 |
| Future Volume (veh/h) | 320 | 284 | 130 | 91 | 361 | 240 | 200 | 485 | 104 | 320 | 738 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 309 | 0 | 99 | 392 | 0 | 217 | 527 | 0 | 348 | 872 | 424 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 452 | 1035 | 463 | 129 | 828 | 1011 | 314 | 1105 | 495 | 457 | 1304 | 540 |
| Arrive On Green | 0.13 | 0.29 | 0.00 | 0.07 | 0.23 | 0.00 | 0.09 | 0.31 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 309 | 0 | 99 | 392 | 0 | 217 | 527 | 0 | 348 | 872 | 424 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.1 | 5.6 | 0.0 | 4.5 | 7.9 | 0.0 | 5.1 | 9.9 | 0.0 | 7.8 | 16.4 | 20.4 |
| Cycle Q Clear(g_c), s | 8.1 | 5.6 | 0.0 | 4.5 | 7.9 | 0.0 | 5.1 | 9.9 | 0.0 | 7.8 | 16.4 | 20.4 |
| 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 | 452 | 1035 | 463 | 129 | 828 | 1011 | 314 | 1105 | 495 | 457 | 1304 | 540 |
| V/C Ratio(X) | 0.77 | 0.30 | 0.00 | 0.77 | 0.47 | 0.00 | 0.69 | 0.48 | 0.00 | 0.76 | 0.67 | 0.79 |
| Avail Cap(c_a), veh/h | 750 | 1542 | 690 | 387 | 1542 | 1573 | 792 | 1328 | 594 | 816 | 1398 | 578 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.7 | 22.7 | 0.0 | 37.6 | 27.3 | 0.0 | 36.4 | 23.0 | 0.0 | 34.8 | 22.8 | 24.1 |
| Incr Delay (d2), s/veh | 2.8 | 0.2 | 0.0 | 9.3 | 0.4 | 0.0 | 2.7 | 0.3 | 0.0 | 2.6 | 1.1 | 6.7 |
| 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 | 4.0 | 2.8 | 0.0 | 2.6 | 3.9 | 0.0 | 2.5 | 4.9 | 0.0 | 4.0 | 8.6 | 9.6 |
| LnGrp Delay(d),s/veh | 37.5 | 22.8 | 0.0 | 46.9 | 27.7 | 0.0 | 39.2 | 23.3 | 0.0 | 37.4 | 23.9 | 30.7 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 657 | | | 491 | | | 744 | | | 1644 | |
| Approach Delay, s/veh | | 30.6 | | | 31.6 | | | 27.9 | | | 28.5 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.6 | 29.8 | 10.0 | 28.2 | 11.5 | 32.9 | 14.8 | 23.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 9.8 | 11.9 | 6.5 | 7.6 | 7.1 | 22.4 | 10.1 | 9.9 |
| Green Ext Time (p_c), s | 0.8 | 10.7 | 0.2 | 4.9 | 0.5 | 6.1 | 0.8 | 4.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.2 |
| HCM 2010 LOS | C |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 148 | 282 | 44 | 124 | 457 | 190 | 11 | 330 | 101 | 300 | 420 | 262 |
| Future Volume (veh/h) | 148 | 282 | 44 | 124 | 457 | 190 | 11 | 330 | 101 | 300 | 420 | 262 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 172 | 328 | 38 | 144 | 531 | 173 | 13 | 384 | 93 | 349 | 488 | 235 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 210 | 1039 | 119 | 180 | 809 | 262 | 27 | 754 | 181 | 422 | 865 | 414 |
| Arrive On Green | 0.12 | 0.33 | 0.33 | 0.10 | 0.31 | 0.31 | 0.02 | 0.27 | 0.27 | 0.12 | 0.37 | 0.37 |
| Sat Flow, veh/h | 1774 | 3191 | 367 | 1774 | 2619 | 849 | 1774 | 2825 | 676 | 3442 | 2314 | 1108 |
| Grp Volume(v), veh/h | 172 | 181 | 185 | 144 | 358 | 346 | 13 | 239 | 238 | 349 | 373 | 350 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1788 | 1774 | 1770 | 1699 | 1774 | 1770 | 1732 | 1721 | 1770 | 1652 |
| Q Serve(g_s), s | 8.3 | 6.7 | 6.8 | 6.9 | 15.3 | 15.4 | 0.6 | 10.0 | 10.2 | 8.6 | 14.6 | 14.7 |
| Cycle Q Clear(g_c), s | 8.3 | 6.7 | 6.8 | 6.9 | 15.3 | 15.4 | 0.6 | 10.0 | 10.2 | 8.6 | 14.6 | 14.7 |
| Prop In Lane | 1.00 | | 0.20 | 1.00 | | 0.50 | 1.00 | | 0.39 | 1.00 | | 0.67 |
| Lane Grp Cap(c), veh/h | 210 | 576 | 582 | 180 | 546 | 525 | 27 | 472 | 462 | 422 | 662 | 618 |
| V/C Ratio(X) | 0.82 | 0.31 | 0.32 | 0.80 | 0.66 | 0.66 | 0.47 | 0.51 | 0.52 | 0.83 | 0.56 | 0.57 |
| Avail Cap(c_a), veh/h | 326 | 1238 | 1251 | 326 | 1238 | 1189 | 224 | 731 | 715 | 434 | 731 | 682 |
| 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 | 37.5 | 22.1 | 22.1 | 38.3 | 26.1 | 26.2 | 42.6 | 27.1 | 27.2 | 37.3 | 21.6 | 21.7 |
| Incr Delay (d2), s/veh | 9.1 | 0.3 | 0.3 | 8.0 | 1.3 | 1.4 | 12.1 | 0.8 | 0.9 | 12.2 | 0.8 | 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 | 4.6 | 3.3 | 3.4 | 3.8 | 7.7 | 7.4 | 0.4 | 5.0 | 5.0 | 4.8 | 7.2 | 6.9 |
| LnGrp Delay(d),s/veh | 46.7 | 22.4 | 22.4 | 46.3 | 27.4 | 27.6 | 54.6 | 27.9 | 28.0 | 49.6 | 22.4 | 22.6 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 538 | | | 848 | | | 490 | | | 1072 | |
| Approach Delay, s/veh | | 30.2 | | | 30.7 | | | 28.7 | | | 31.3 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.7 | 27.3 | 12.8 | 32.4 | 5.4 | 36.6 | 14.3 | 30.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 10.6 | 12.2 | 8.9 | 8.8 | 2.6 | 16.7 | 10.3 | 17.4 |
| Green Ext Time (p_c), s | 0.1 | 8.9 | 0.2 | 9.1 | 0.0 | 8.1 | 0.2 | 8.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 30.5 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.8 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 236 | 30 | 80 | 215 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 236 | 30 | 80 | 215 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 299 | 38 | 101 | 272 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.4 | 21.1 | 18.7 | 21.4 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 14% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 43% | 0% |
| Vol Thru, % | 86% | 80% | 0% | 100% | 57% | 0% | 100% | 39% | 57% | 73% |
| Vol Right, % | 0% | 20% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 27% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 138 | 148 | 80 | 53 | 47 | 50 | 167 | 213 | 188 | 148 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 118 | 118 | 0 | 53 | 27 | 0 | 167 | 83 | 108 | 108 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 175 | 187 | 101 | 68 | 59 | 63 | 211 | 270 | 237 | 187 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.437 | 0.458 | 0.285 | 0.18 | 0.152 | 0.162 | 0.509 | 0.618 | 0.591 | 0.444 |
| Departure Headway (Hd) | 9.012 | 8.794 | 10.117 | 9.596 | 9.283 | 9.202 | 8.684 | 8.242 | 8.969 | 8.559 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 400 | 410 | 355 | 374 | 386 | 390 | 416 | 437 | 403 | 420 |
| Service Time | 6.77 | 6.552 | 7.882 | 7.36 | 7.047 | 6.956 | 6.438 | 5.996 | 6.724 | 6.314 |
| HCM Lane V/C Ratio | 0.438 | 0.456 | 0.285 | 0.182 | 0.153 | 0.162 | 0.507 | 0.618 | 0.588 | 0.445 |
| HCM Control Delay | 18.6 | 18.8 | 16.9 | 14.5 | 13.7 | 13.7 | 20.2 | 23.5 | 24 | 18 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 2.2 | 2.3 | 1.2 | 0.6 | 0.5 | 0.6 | 2.8 | 4.1 | 3.7 | 2.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 609 | 40 | 110 | 729 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 609 | 40 | 110 | 729 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 700 | 0 | 126 | 838 | 83 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| Arrive On Green | 0.05 | 0.24 | 0.24 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 700 | 0 | 126 | 838 | 83 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 27.4 | 0.0 | 5.6 | 36.0 | 2.5 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 27.4 | 0.0 | 5.6 | 36.0 | 2.5 |
| 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 | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.86 | 0.00 | 0.79 | 1.01 | 0.12 |
| Avail Cap(c_a), veh/h | 176 | 922 | 779 | 176 | 922 | 784 | 426 | 830 | 706 | 220 | 830 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 37.9 | 25.3 | 23.7 | 38.2 | 29.1 | 0.0 | 36.1 | 20.5 | 0.0 | 36.0 | 22.4 | 13.1 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 8.9 | 0.0 | 12.7 | 33.6 | 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 | 1.8 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.2 | 16.0 | 0.0 | 3.3 | 26.0 | 1.1 |
| LnGrp Delay(d),s/veh | 51.4 | 25.7 | 23.7 | 47.9 | 31.7 | 0.0 | 39.3 | 29.4 | 0.0 | 48.8 | 56.0 | 13.2 |
| LnGrp LOS | D | C | C | D | C | | D | C | | D | F | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 895 | | | 1047 | |
| Approach Delay, s/veh | | 34.5 | | | 33.8 | | | 31.5 | | | 51.7 | |
| Approach LOS | | C | | | C | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.2 | 39.3 | 7.2 | 23.0 | 10.6 | 40.0 | 8.0 | 22.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 29.4 | 4.1 | 6.5 | 6.5 | 38.0 | 5.1 | 14.5 |
| Green Ext Time (p_c), s | 0.1 | 4.8 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 40.6 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 97 | 40 | 572 | 201 | 381 | 20 | 470 | 250 | 637 | 990 | 180 |
| Future Volume (veh/h) | 50 | 97 | 40 | 572 | 201 | 381 | 20 | 470 | 250 | 637 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 100 | 0 | 590 | 207 | 0 | 21 | 485 | 0 | 657 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 67 | 439 | 137 | 713 | 1300 | 405 | 37 | 901 | 0 | 774 | 2267 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.22 | 0.28 | 0.00 | 0.02 | 0.26 | 0.00 | 0.24 | 0.48 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 100 | 0 | 590 | 207 | 0 | 21 | 485 | 0 | 657 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.8 | 1.7 | 0.0 | 15.7 | 3.0 | 0.0 | 1.1 | 10.7 | 0.0 | 17.4 | 12.8 | 0.0 |
| Cycle Q Clear(g_c), s | 2.8 | 1.7 | 0.0 | 15.7 | 3.0 | 0.0 | 1.1 | 10.7 | 0.0 | 17.4 | 12.8 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 67 | 439 | 137 | 713 | 1300 | 405 | 37 | 901 | 0 | 774 | 2267 | 0 |
| V/C Ratio(X) | 0.78 | 0.23 | 0.00 | 0.83 | 0.16 | 0.00 | 0.57 | 0.54 | 0.00 | 0.85 | 0.45 | 0.00 |
| Avail Cap(c_a), veh/h | 574 | 1911 | 595 | 1293 | 1911 | 595 | 564 | 1594 | 0 | 1113 | 2267 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.2 | 37.3 | 0.0 | 32.9 | 24.4 | 0.0 | 43.0 | 28.2 | 0.0 | 32.1 | 15.3 | 0.0 |
| Incr Delay (d2), s/veh | 17.3 | 0.3 | 0.0 | 2.5 | 0.1 | 0.0 | 13.2 | 0.5 | 0.0 | 4.4 | 0.1 | 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 | 1.6 | 0.8 | 0.0 | 7.1 | 1.3 | 0.0 | 0.6 | 3.5 | 0.0 | 8.1 | 5.5 | 0.0 |
| LnGrp Delay(d),s/veh | 59.5 | 37.6 | 0.0 | 35.4 | 24.4 | 0.0 | 56.2 | 28.7 | 0.0 | 36.5 | 15.4 | 0.0 |
| LnGrp LOS | E | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 152 | | | 797 | | | 506 | | | 1678 | |
| Approach Delay, s/veh | | 45.1 | | | 32.6 | | | 29.9 | | | 23.7 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 25.6 | 27.2 | 23.8 | 12.3 | 6.0 | 46.7 | 7.6 | 28.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 19.4 | 12.7 | 17.7 | 3.7 | 3.1 | 14.8 | 4.8 | 5.0 |
| Green Ext Time (p_c), s | 2.1 | 10.1 | 2.2 | 2.3 | 0.0 | 13.3 | 0.1 | 2.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.0 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 373 | 105 | 440 | 30 | 393 | 292 | 79 | 50 | 179 | 160 |
| Future Volume (veh/h) | 180 | 260 | 373 | 105 | 440 | 30 | 393 | 292 | 79 | 50 | 179 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 141 | 114 | 478 | 24 | 427 | 317 | 63 | 54 | 195 | 26 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 313 | 981 | 445 | 149 | 1401 | 70 | 310 | 950 | 186 | 86 | 620 | 81 |
| Arrive On Green | 0.09 | 0.29 | 0.29 | 0.08 | 0.28 | 0.28 | 0.17 | 0.32 | 0.32 | 0.05 | 0.20 | 0.20 |
| Sat Flow, veh/h | 3442 | 3390 | 1536 | 1774 | 4952 | 246 | 1774 | 2933 | 574 | 1774 | 3131 | 411 |
| Grp Volume(v), veh/h | 196 | 283 | 141 | 114 | 326 | 176 | 427 | 189 | 191 | 54 | 109 | 112 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1536 | 1774 | 1695 | 1808 | 1774 | 1770 | 1738 | 1774 | 1770 | 1771 |
| Q Serve(g_s), s | 3.5 | 4.1 | 4.5 | 4.0 | 4.8 | 4.9 | 11.0 | 5.1 | 5.3 | 1.9 | 3.3 | 3.4 |
| Cycle Q Clear(g_c), s | 3.5 | 4.1 | 4.5 | 4.0 | 4.8 | 4.9 | 11.0 | 5.1 | 5.3 | 1.9 | 3.3 | 3.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.33 | 1.00 | | 0.23 |
| Lane Grp Cap(c), veh/h | 313 | 981 | 445 | 149 | 959 | 511 | 310 | 573 | 563 | 86 | 350 | 351 |
| V/C Ratio(X) | 0.63 | 0.29 | 0.32 | 0.76 | 0.34 | 0.34 | 1.38 | 0.33 | 0.34 | 0.63 | 0.31 | 0.32 |
| Avail Cap(c_a), veh/h | 874 | 1936 | 877 | 450 | 1936 | 1033 | 310 | 1011 | 993 | 310 | 1011 | 1012 |
| 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 | 27.6 | 17.4 | 17.5 | 28.2 | 17.9 | 18.0 | 26.0 | 16.1 | 16.2 | 29.4 | 21.6 | 21.6 |
| Incr Delay (d2), s/veh | 2.1 | 0.2 | 0.4 | 7.8 | 0.2 | 0.4 | 189.7 | 0.3 | 0.4 | 7.3 | 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 | 1.7 | 1.9 | 2.0 | 2.3 | 2.3 | 2.5 | 21.6 | 2.5 | 2.5 | 1.1 | 1.7 | 1.7 |
| LnGrp Delay(d),s/veh | 29.7 | 17.5 | 17.9 | 36.1 | 18.1 | 18.4 | 215.7 | 16.5 | 16.5 | 36.7 | 22.1 | 22.2 |
| LnGrp LOS | C | B | B | D | B | B | F | B | B | D | C | C |
| Approach Vol, veh/h | | 620 | | | 616 | | | 807 | | | 275 | |
| Approach Delay, s/veh | | 21.5 | | | 21.5 | | | 121.9 | | | 25.0 | |
| Approach LOS | | C | | | C | | | F | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.1 | 24.4 | 9.3 | 22.2 | 15.0 | 16.5 | 9.7 | 21.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 3.9 | 7.3 | 6.0 | 6.5 | 13.0 | 5.4 | 5.5 | 6.9 |
| Green Ext Time (p_c), s | 0.0 | 3.8 | 0.2 | 7.2 | 0.0 | 3.9 | 0.5 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 56.9 |
| HCM 2010 LOS | E |

| Intersection | |
|---|---|
| Int Delay, s/veh | 9 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 33 | 346 | 561 | 213 | 211 | 34 |
| Future Vol, veh/h | 33 | 346 | 561 | 213 | 211 | 34 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 40 | 417 | 676 | 257 | 254 | 41 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 686 | 0 | - | 0 | 934 | 358 |
| Stage 1 | - | - | - | - | 686 | - |
| Stage 2 | - | - | - | - | 248 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 553 | - | - | - | 335 | 545 |
| Stage 1 | - | - | - | - | 374 | - |
| Stage 2 | - | - | - | - | 707 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 548 | - | - | - | 305 | 536 |
| Mov Cap-2 Maneuver | - | - | - | - | 305 | - |
| Stage 1 | - | - | - | - | 371 | - |
| Stage 2 | - | - | - | - | 650 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.1 | 0 | 49.7 |
| HCM LOS | | | E |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 548 | - | - | - | 305 | 536 |
| HCM Lane V/C Ratio | 0.073 | - | - | - | 0.833 | 0.076 |
| HCM Control Delay (s) | 12.1 | - | - | - | 55.7 | 12.3 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 7.1 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 201 | 84 | 686 | 300 | 174 | 305 | 123 | 270 | 455 | 94 |
| Future Volume (veh/h) | 164 | 579 | 201 | 84 | 686 | 300 | 174 | 305 | 123 | 270 | 455 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.80 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 706 | 107 | 102 | 837 | 0 | 212 | 372 | 0 | 329 | 555 | 110 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 120 | 447 | 199 | 109 | 941 | 460 | 180 | 566 | 481 | 280 | 544 | 108 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.29 | 0.29 | 0.00 | 0.10 | 0.30 | 0.00 | 0.16 | 0.36 | 0.36 |
| Sat Flow, veh/h | 758 | 2836 | 1263 | 375 | 3238 | 1583 | 1774 | 1863 | 1583 | 1774 | 1510 | 299 |
| Grp Volume(v), veh/h | 481 | 425 | 107 | 501 | 438 | 0 | 212 | 372 | 0 | 329 | 0 | 665 |
| Grp Sat Flow(s),veh/h/ln | 1825 | 1770 | 1263 | 1844 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1809 |
| Q Serve(g_s), s | 28.0 | 28.0 | 13.8 | 47.0 | 41.4 | 0.0 | 18.0 | 30.8 | 0.0 | 28.0 | 0.0 | 64.0 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 13.8 | 47.0 | 41.4 | 0.0 | 18.0 | 30.8 | 0.0 | 28.0 | 0.0 | 64.0 |
| Prop In Lane | 0.42 | | 1.00 | 0.20 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.17 |
| Lane Grp Cap(c), veh/h | 288 | 279 | 199 | 536 | 514 | 460 | 180 | 566 | 481 | 280 | 0 | 652 |
| V/C Ratio(X) | 1.67 | 1.52 | 0.54 | 0.94 | 0.85 | 0.00 | 1.18 | 0.66 | 0.00 | 1.18 | 0.00 | 1.02 |
| Avail Cap(c_a), veh/h | 288 | 279 | 199 | 561 | 538 | 481 | 180 | 566 | 481 | 280 | 0 | 652 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 74.8 | 74.8 | 68.8 | 61.4 | 59.4 | 0.0 | 79.8 | 53.7 | 0.0 | 74.8 | 0.0 | 56.8 |
| Incr Delay (d2), s/veh | 317.6 | 252.5 | 2.8 | 22.8 | 12.0 | 0.0 | 123.5 | 5.9 | 0.0 | 110.2 | 0.0 | 40.4 |
| 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 | 39.4 | 33.2 | 5.0 | 27.3 | 22.0 | 0.0 | 15.0 | 16.8 | 0.0 | 22.2 | 0.0 | 39.2 |
| LnGrp Delay(d),s/veh | 392.4 | 327.3 | 71.7 | 84.2 | 71.4 | 0.0 | 203.3 | 59.6 | 0.0 | 185.0 | 0.0 | 97.2 |
| LnGrp LOS | F | F | E | F | E | | F | E | | F | | F |
| Approach Vol, veh/h | | 1013 | | | 939 | | | 584 | | | 994 | |
| Approach Delay, s/veh | | 331.2 | | | 78.3 | | | 111.8 | | | 126.3 | |
| Approach LOS | | F | | | E | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 58.0 | | 32.0 | 22.0 | 68.0 | | 55.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 30.0 | 32.8 | | 30.0 | 20.0 | 66.0 | | 49.0 |
| Green Ext Time (p_c), s | 0.0 | 7.4 | | 0.0 | 0.0 | 0.0 | | 2.5 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 169.9 |
| HCM 2010 LOS | | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 47.9 |
| Intersection LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 11 | 554 | 263 | 2 | 314 | 164 |
| Future Vol, veh/h | 11 | 554 | 263 | 2 | 314 | 164 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 652 | 309 | 2 | 369 | 193 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 78.3 | 20.6 | 27.2 |
| HCM LOS | F | C | D |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 2% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 98% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 265 | 565 | 314 | 164 |
| LT Vol | 0 | 11 | 314 | 0 |
| Through Vol | 263 | 0 | 0 | 164 |
| RT Vol | 2 | 554 | 0 | 0 |
| Lane Flow Rate | 312 | 665 | 369 | 193 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.601 | 1.065 | 0.782 | 0.382 |
| Departure Headway (Hd) | 7.271 | 5.77 | 7.952 | 7.438 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 499 | 625 | 458 | 486 |
| Service Time | 5.271 | 3.837 | 5.652 | 5.138 |
| HCM Lane V/C Ratio | 0.625 | 1.064 | 0.806 | 0.397 |
| HCM Control Delay | 20.6 | 78.3 | 33.7 | 14.7 |
| HCM Lane LOS | C | F | D | B |
| HCM 95th-tile Q | 3.9 | 18.4 | 6.9 | 1.8 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 6.2 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 258 | 59 | 46 | 447 | 108 | 112 |
| Future Vol, veh/h | 258 | 59 | 46 | 447 | 108 | 112 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 287 | 66 | 51 | 497 | 120 | 124 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 359 | 0 | 932 | 333 |
| Stage 1 | - | - | - | - | 326 | - |
| Stage 2 | - | - | - | - | 606 | - |
| 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 | - | - | 1200 | - | 296 | 709 |
| Stage 1 | - | - | - | - | 731 | - |
| Stage 2 | - | - | - | - | 545 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1193 | - | 275 | 701 |
| Mov Cap-2 Maneuver | - | - | - | - | 275 | - |
| Stage 1 | - | - | - | - | 727 | - |
| Stage 2 | - | - | - | - | 510 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.8 | 27.4 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 398 | - | - | 1193 | - |
| HCM Lane V/C Ratio | 0.614 | - | - | 0.043 | - |
| HCM Control Delay (s) | 27.4 | - | - | 8.2 | 0 |
| HCM Lane LOS | D | - | - | A | A |
| HCM 95th %tile Q(veh) | 4 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 403 | 10 | 10 | 453 | 20 | 20 |
| Future Vol, veh/h | 403 | 10 | 10 | 453 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 458 | 11 | 11 | 515 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 476 | 0 | 1016 | 478 |
| Stage 1 | - | - | - | - | 471 | - |
| Stage 2 | - | - | - | - | 545 | - |
| 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 | - | - | 1086 | - | 264 | 587 |
| Stage 1 | - | - | - | - | 628 | - |
| Stage 2 | - | - | - | - | 581 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1080 | - | 257 | 580 |
| Mov Cap-2 Maneuver | - | - | - | - | 257 | - |
| Stage 1 | - | - | - | - | 624 | - |
| Stage 2 | - | - | - | - | 570 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 16.6 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 356 | - | - | 1080 | - |
| HCM Lane V/C Ratio | 0.128 | - | - | 0.011 | - |
| HCM Control Delay (s) | 16.6 | - | - | 8.4 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.4 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 112.5 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 182 | 191 | 10 | 10 | 313 | 220 | 30 | 150 | 20 | 270 | 200 | 160 |
| Future Vol, veh/h | 182 | 191 | 10 | 10 | 313 | 220 | 30 | 150 | 20 | 270 | 200 | 160 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 200 | 210 | 11 | 11 | 344 | 242 | 33 | 165 | 22 | 297 | 220 | 176 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 27.3 | 255.4 | 19.1 | 70.7 |
| HCM LOS | D | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 38% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 73% | 0% |
| Vol Thru, % | 62% | 100% | 0% | 0% | 100% | 0% | 0% | 59% | 27% | 38% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 41% | 0% | 62% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 80 | 100 | 20 | 182 | 191 | 10 | 10 | 533 | 370 | 260 |
| LT Vol | 30 | 0 | 0 | 182 | 0 | 0 | 10 | 0 | 270 | 0 |
| Through Vol | 50 | 100 | 0 | 0 | 191 | 0 | 0 | 313 | 100 | 100 |
| RT Vol | 0 | 0 | 20 | 0 | 0 | 10 | 0 | 220 | 0 | 160 |
| Lane Flow Rate | 88 | 110 | 22 | 200 | 210 | 11 | 11 | 586 | 407 | 286 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.261 | 0.32 | 0.06 | 0.568 | 0.568 | 0.028 | 0.03 | 1.493 | 1.06 | 0.682 |
| Departure Headway (Hd) | 12.113 | 11.914 | 11.172 | 11.482 | 10.956 | 10.22 | 10.322 | 9.509 | 10.52 | 9.692 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 299 | 303 | 323 | 316 | 332 | 352 | 349 | 387 | 350 | 377 |
| Service Time | 9.813 | 9.614 | 8.872 | 9.182 | 8.656 | 7.92 | 8.022 | 7.209 | 8.22 | 7.392 |
| HCM Lane V/C Ratio | 0.294 | 0.363 | 0.068 | 0.633 | 0.633 | 0.031 | 0.032 | 1.514 | 1.163 | 0.759 |
| HCM Control Delay | 19 | 20.1 | 14.6 | 28.3 | 27.1 | 13.2 | 13.3 | 259.9 | 98.8 | 30.8 |
| HCM Lane LOS | C | C | B | D | D | B | B | F | F | D |
| HCM 95th-tile Q | 1 | 1.3 | 0.2 | 3.3 | 3.3 | 0.1 | 0.1 | 30.3 | 13 | 4.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 563 | 260 | 94 | 404 | 350 | 150 | 585 | 123 | 280 | 649 | 430 |
| Future Volume (veh/h) | 700 | 563 | 260 | 94 | 404 | 350 | 150 | 585 | 123 | 280 | 649 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 593 | 0 | 99 | 425 | 0 | 158 | 616 | 0 | 295 | 683 | 233 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 858 | 1404 | 628 | 126 | 775 | 908 | 227 | 995 | 445 | 380 | 1200 | 491 |
| Arrive On Green | 0.25 | 0.40 | 0.00 | 0.07 | 0.22 | 0.00 | 0.07 | 0.28 | 0.00 | 0.11 | 0.32 | 0.32 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1524 |
| Grp Volume(v), veh/h | 737 | 593 | 0 | 99 | 425 | 0 | 158 | 616 | 0 | 295 | 683 | 233 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1524 |
| Q Serve(g_s), s | 22.8 | 13.5 | 0.0 | 6.1 | 11.9 | 0.0 | 5.0 | 16.8 | 0.0 | 9.0 | 16.9 | 13.6 |
| Cycle Q Clear(g_c), s | 22.8 | 13.5 | 0.0 | 6.1 | 11.9 | 0.0 | 5.0 | 16.8 | 0.0 | 9.0 | 16.9 | 13.6 |
| 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 | 858 | 1404 | 628 | 126 | 775 | 908 | 227 | 995 | 445 | 380 | 1200 | 491 |
| V/C Ratio(X) | 0.86 | 0.42 | 0.00 | 0.78 | 0.55 | 0.00 | 0.69 | 0.62 | 0.00 | 0.78 | 0.57 | 0.47 |
| Avail Cap(c_a), veh/h | 3187 | 3660 | 1637 | 463 | 1305 | 1326 | 712 | 1941 | 868 | 925 | 2244 | 918 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 39.9 | 24.3 | 0.0 | 50.8 | 38.6 | 0.0 | 50.8 | 34.8 | 0.0 | 48.4 | 31.3 | 30.2 |
| Incr Delay (d2), s/veh | 2.7 | 0.2 | 0.0 | 10.0 | 0.6 | 0.0 | 3.8 | 0.6 | 0.0 | 3.4 | 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 | 11.2 | 6.6 | 0.0 | 3.4 | 5.9 | 0.0 | 2.5 | 8.3 | 0.0 | 4.6 | 8.8 | 5.8 |
| LnGrp Delay(d),s/veh | 42.6 | 24.5 | 0.0 | 60.8 | 39.2 | 0.0 | 54.6 | 35.4 | 0.0 | 51.8 | 31.7 | 30.9 |
| LnGrp LOS | D | C | | E | D | | D | D | | D | C | C |
| Approach Vol, veh/h | | 1330 | | | 524 | | | 774 | | | 1211 | |
| Approach Delay, s/veh | | 34.5 | | | 43.3 | | | 39.4 | | | 36.5 | |
| Approach LOS | | C | | | D | | | D | | | D | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 15.9 | 35.3 | 11.9 | 48.1 | 11.3 | 39.8 | 31.7 | 28.3 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | | | |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 11.0 | 18.8 | 8.1 | 15.5 | 7.0 | 18.9 | 24.8 | 13.9 | | | | |
| Green Ext Time (p_c), s | 0.9 | 12.4 | 0.2 | 8.5 | 0.4 | 12.7 | 3.0 | 7.5 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | | | 37.3 | | | | | | | | | |
| HCM 2010 LOS | | | D | | | | | | | | | |
| Notes | | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 302 | 553 | 42 | 113 | 422 | 310 | 54 | 480 | 97 | 340 | 280 | 181 |
| Future Volume (veh/h) | 302 | 553 | 42 | 113 | 422 | 310 | 54 | 480 | 97 | 340 | 280 | 181 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 325 | 595 | 41 | 122 | 454 | 236 | 58 | 516 | 91 | 366 | 301 | 107 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 361 | 1261 | 87 | 152 | 574 | 296 | 75 | 783 | 137 | 451 | 899 | 312 |
| Arrive On Green | 0.20 | 0.38 | 0.38 | 0.09 | 0.26 | 0.26 | 0.04 | 0.26 | 0.26 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 1774 | 3353 | 231 | 1774 | 2227 | 1147 | 1774 | 2996 | 526 | 3442 | 2564 | 891 |
| Grp Volume(v), veh/h | 325 | 314 | 322 | 122 | 360 | 330 | 58 | 304 | 303 | 366 | 206 | 202 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1814 | 1774 | 1770 | 1604 | 1774 | 1770 | 1752 | 1721 | 1770 | 1686 |
| Q Serve(g_s), s | 19.6 | 14.7 | 14.8 | 7.4 | 20.8 | 21.1 | 3.6 | 16.8 | 17.0 | 11.3 | 9.4 | 9.7 |
| Cycle Q Clear(g_c), s | 19.6 | 14.7 | 14.8 | 7.4 | 20.8 | 21.1 | 3.6 | 16.8 | 17.0 | 11.3 | 9.4 | 9.7 |
| Prop In Lane | 1.00 | | 0.13 | 1.00 | | 0.71 | 1.00 | | 0.30 | 1.00 | | 0.53 |
| Lane Grp Cap(c), veh/h | 361 | 665 | 682 | 152 | 456 | 414 | 75 | 463 | 458 | 451 | 620 | 591 |
| V/C Ratio(X) | 0.90 | 0.47 | 0.47 | 0.80 | 0.79 | 0.80 | 0.78 | 0.66 | 0.66 | 0.81 | 0.33 | 0.34 |
| Avail Cap(c_a), veh/h | 517 | 677 | 694 | 323 | 484 | 439 | 129 | 597 | 591 | 784 | 871 | 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) | 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 | 42.6 | 26.0 | 26.0 | 49.3 | 37.9 | 38.0 | 52.0 | 36.1 | 36.2 | 46.3 | 26.2 | 26.3 |
| Incr Delay (d2), s/veh | 14.1 | 0.5 | 0.5 | 9.5 | 8.1 | 9.5 | 15.6 | 1.7 | 1.8 | 3.5 | 0.3 | 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 | 11.0 | 7.3 | 7.5 | 4.0 | 11.2 | 10.4 | 2.1 | 8.4 | 8.4 | 5.6 | 4.6 | 4.6 |
| LnGrp Delay(d),s/veh | 56.7 | 26.5 | 26.5 | 58.8 | 46.1 | 47.6 | 67.7 | 37.8 | 38.0 | 49.9 | 26.5 | 26.6 |
| LnGrp LOS | E | C | C | E | D | D | E | D | D | D | C | C |
| Approach Vol, veh/h | | 961 | | | 812 | | | 665 | | | 774 | |
| Approach Delay, s/veh | | 36.7 | | | 48.6 | | | 40.5 | | | 37.6 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 18.4 | 32.7 | 13.4 | 45.3 | 8.6 | 42.5 | 26.3 | 32.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 13.3 | 19.0 | 9.4 | 16.8 | 5.6 | 11.7 | 21.6 | 23.1 |
| Green Ext Time (p_c), s | 1.0 | 6.4 | 0.2 | 10.2 | 0.0 | 8.2 | 0.8 | 4.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 40.7 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 17.2 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 190 | 70 | 110 | 237 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 190 | 70 | 110 | 237 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 211 | 78 | 122 | 263 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 16.2 | 14.7 | 16.5 | 20.6 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 17% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 48% | 0% |
| Vol Thru, % | 83% | 58% | 0% | 100% | 81% | 0% | 100% | 44% | 52% | 80% |
| Vol Right, % | 0% | 42% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 20% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 115 | 165 | 90 | 167 | 103 | 80 | 93 | 107 | 229 | 149 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 95 | 95 | 0 | 167 | 83 | 0 | 93 | 47 | 119 | 119 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 128 | 183 | 100 | 185 | 115 | 89 | 104 | 119 | 254 | 165 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.311 | 0.427 | 0.254 | 0.443 | 0.27 | 0.232 | 0.256 | 0.279 | 0.606 | 0.376 |
| Departure Headway (Hd) | 8.767 | 8.377 | 9.127 | 8.61 | 8.47 | 9.401 | 8.882 | 8.474 | 8.589 | 8.202 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 410 | 429 | 394 | 419 | 425 | 382 | 404 | 424 | 421 | 439 |
| Service Time | 6.518 | 6.128 | 6.877 | 6.36 | 6.219 | 7.153 | 6.634 | 6.226 | 6.336 | 5.949 |
| HCM Lane V/C Ratio | 0.312 | 0.427 | 0.254 | 0.442 | 0.271 | 0.233 | 0.257 | 0.281 | 0.603 | 0.376 |
| HCM Control Delay | 15.4 | 17.3 | 15 | 18.1 | 14.3 | 15 | 14.7 | 14.5 | 23.7 | 15.8 |
| HCM Lane LOS | C | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.3 | 2.1 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.9 | 1.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 627 | 40 | 160 | 613 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 627 | 40 | 160 | 613 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 660 | 0 | 168 | 645 | 86 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 104 | 390 | 325 | 44 | 327 | 278 | 145 | 859 | 730 | 209 | 1000 | 845 |
| Arrive On Green | 0.06 | 0.21 | 0.21 | 0.02 | 0.18 | 0.00 | 0.04 | 0.46 | 0.00 | 0.12 | 0.54 | 0.54 |
| Sat Flow, veh/h | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Grp Volume(v), veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 660 | 0 | 168 | 645 | 86 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Q Serve(g_s), s | 5.0 | 12.7 | 0.4 | 1.5 | 8.0 | 0.0 | 2.0 | 25.3 | 0.0 | 7.9 | 21.0 | 2.3 |
| Cycle Q Clear(g_c), s | 5.0 | 12.7 | 0.4 | 1.5 | 8.0 | 0.0 | 2.0 | 25.3 | 0.0 | 7.9 | 21.0 | 2.3 |
| 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 | 104 | 390 | 325 | 44 | 327 | 278 | 145 | 859 | 730 | 209 | 1000 | 845 |
| V/C Ratio(X) | 1.42 | 0.76 | 0.02 | 0.72 | 0.58 | 0.00 | 0.58 | 0.77 | 0.00 | 0.81 | 0.65 | 0.10 |
| Avail Cap(c_a), veh/h | 104 | 871 | 726 | 124 | 893 | 759 | 523 | 2047 | 1740 | 498 | 2287 | 1934 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 40.3 | 31.8 | 26.9 | 41.4 | 32.3 | 0.0 | 40.2 | 19.2 | 0.0 | 36.8 | 14.0 | 9.7 |
| Incr Delay (d2), s/veh | 234.9 | 3.0 | 0.0 | 19.9 | 1.6 | 0.0 | 3.6 | 1.5 | 0.0 | 7.1 | 0.7 | 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 | 9.2 | 6.9 | 0.2 | 1.0 | 4.2 | 0.0 | 1.1 | 13.2 | 0.0 | 4.3 | 10.9 | 1.0 |
| LnGrp Delay(d),s/veh | 275.2 | 34.8 | 26.9 | 61.3 | 34.0 | 0.0 | 43.8 | 20.7 | 0.0 | 43.9 | 14.7 | 9.8 |
| LnGrp LOS | F | C | C | E | C | | D | C | | D | B | A |
| Approach Vol, veh/h | | 450 | | | 221 | | | 744 | | | 899 | |
| Approach Delay, s/veh | | 113.2 | | | 37.9 | | | 23.3 | | | 19.7 | |
| Approach LOS | | F | | | D | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.1 | 43.4 | 6.1 | 21.9 | 7.6 | 49.9 | 9.0 | 19.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 9.9 | 27.3 | 3.5 | 14.7 | 4.0 | 23.0 | 7.0 | 10.0 |
| Green Ext Time (p_c), s | 0.3 | 12.2 | 0.0 | 3.2 | 0.1 | 12.3 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 40.8 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 532 | 40 | 268 | 343 | 473 | 70 | 1210 | 595 | 482 | 320 | 300 |
| Future Volume (veh/h) | 220 | 532 | 40 | 268 | 343 | 473 | 70 | 1210 | 595 | 482 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 572 | 0 | 288 | 369 | 0 | 75 | 1301 | 0 | 518 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1202 | 358 | 323 | 963 | 300 | 71 | 1487 | 0 | 546 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.25 | 0.00 | 0.10 | 0.20 | 0.00 | 0.04 | 0.41 | 0.00 | 0.17 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 572 | 0 | 288 | 369 | 0 | 75 | 1301 | 0 | 518 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 26.2 | 0.0 | 22.7 | 17.2 | 0.0 | 11.0 | 84.0 | 0.0 | 40.9 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 26.2 | 0.0 | 22.7 | 17.2 | 0.0 | 11.0 | 84.0 | 0.0 | 40.9 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1202 | 358 | 323 | 963 | 300 | 71 | 1487 | 0 | 546 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.48 | 0.00 | 0.89 | 0.38 | 0.00 | 1.06 | 0.87 | 0.00 | 0.95 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1202 | 358 | 802 | 963 | 300 | 71 | 1487 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 80.5 | 0.0 | 113.1 | 87.5 | 0.0 | 121.9 | 69.1 | 0.0 | 104.5 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.4 | 0.0 | 8.4 | 1.2 | 0.0 | 122.9 | 7.5 | 0.0 | 24.7 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 11.5 | 0.0 | 10.4 | 7.6 | 0.0 | 7.4 | 29.1 | 0.0 | 19.9 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 81.8 | 0.0 | 121.5 | 88.7 | 0.0 | 246.1 | 76.6 | 0.0 | 129.2 | 29.7 | 0.0 |
| LnGrp LOS | F | F | | F | F | | F | E | | F | C | |
| Approach Vol, veh/h | | 809 | | | 657 | | | 1376 | | | 862 | |
| Approach Delay, s/veh | | 100.2 | | | 103.0 | | | 85.8 | | | 89.5 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 47.6 | 108.4 | 29.8 | 68.9 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 42.9 | 86.0 | 24.7 | 28.2 | 13.0 | 12.3 | 38.4 | 19.2 |
| Green Ext Time (p_c), s | 0.7 | 10.6 | 1.1 | 2.2 | 0.0 | 23.3 | 0.3 | 8.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 92.9 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 289 | 140 | 380 | 40 | 304 | 255 | 139 | 90 | 248 | 200 |
| Future Volume (veh/h) | 310 | 700 | 289 | 140 | 380 | 40 | 304 | 255 | 139 | 90 | 248 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.98 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 246 | 147 | 400 | 34 | 320 | 268 | 95 | 95 | 261 | 102 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 424 | 1210 | 398 | 177 | 1426 | 119 | 357 | 945 | 326 | 88 | 543 | 206 |
| Arrive On Green | 0.12 | 0.32 | 0.32 | 0.10 | 0.30 | 0.30 | 0.20 | 0.37 | 0.37 | 0.05 | 0.22 | 0.22 |
| Sat Flow, veh/h | 3442 | 3755 | 1236 | 1774 | 4775 | 400 | 1774 | 2563 | 884 | 1774 | 2494 | 947 |
| Grp Volume(v), veh/h | 326 | 664 | 319 | 147 | 282 | 152 | 320 | 183 | 180 | 95 | 183 | 180 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1601 | 1774 | 1695 | 1785 | 1774 | 1770 | 1678 | 1774 | 1770 | 1672 |
| Q Serve(g_s), s | 9.2 | 16.6 | 16.9 | 8.2 | 6.4 | 6.5 | 17.6 | 7.3 | 7.6 | 5.0 | 9.1 | 9.5 |
| Cycle Q Clear(g_c), s | 9.2 | 16.6 | 16.9 | 8.2 | 6.4 | 6.5 | 17.6 | 7.3 | 7.6 | 5.0 | 9.1 | 9.5 |
| Prop In Lane | 1.00 | | 0.77 | 1.00 | | 0.22 | 1.00 | | 0.53 | 1.00 | | 0.57 |
| Lane Grp Cap(c), veh/h | 424 | 1092 | 516 | 177 | 1013 | 533 | 357 | 653 | 619 | 88 | 385 | 364 |
| V/C Ratio(X) | 0.77 | 0.61 | 0.62 | 0.83 | 0.28 | 0.28 | 0.90 | 0.28 | 0.29 | 1.08 | 0.48 | 0.50 |
| Avail Cap(c_a), veh/h | 1234 | 1554 | 734 | 194 | 1216 | 640 | 459 | 1022 | 970 | 88 | 723 | 683 |
| 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 | 42.6 | 28.7 | 28.8 | 44.3 | 26.9 | 27.0 | 39.1 | 22.3 | 22.4 | 47.7 | 34.3 | 34.4 |
| Incr Delay (d2), s/veh | 3.0 | 0.6 | 1.2 | 23.4 | 0.1 | 0.3 | 16.9 | 0.2 | 0.3 | 117.6 | 0.9 | 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 | 0.6 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 4.6 | 7.8 | 7.6 | 5.2 | 3.0 | 3.2 | 10.3 | 3.6 | 3.5 | 5.3 | 4.5 | 4.5 |
| LnGrp Delay(d),s/veh | 45.6 | 29.2 | 30.0 | 67.8 | 27.1 | 27.3 | 56.0 | 22.5 | 22.7 | 165.9 | 35.2 | 35.5 |
| LnGrp LOS | D | C | C | E | C | C | E | C | C | F | D | D |
| Approach Vol, veh/h | | 1309 | | | 581 | | | 683 | | | 458 | |
| Approach Delay, s/veh | | 33.5 | | | 37.4 | | | 38.2 | | | 62.4 | |
| Approach LOS | | C | | | D | | | D | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 41.0 | 14.0 | 36.3 | 24.2 | 25.8 | 16.4 | 34.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 7.0 | 9.6 | 10.2 | 18.9 | 19.6 | 11.5 | 11.2 | 8.5 |
| Green Ext Time (p_c), s | 0.0 | 5.1 | 0.0 | 11.9 | 0.5 | 4.9 | 1.2 | 12.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 39.7 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 8.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 48 | 871 | 456 | 172 | 233 | 44 |
| Future Vol, veh/h | 48 | 871 | 456 | 172 | 233 | 44 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 52 | 937 | 490 | 185 | 251 | 47 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 491 | 0 | - | 0 | 970 | 247 |
| Stage 1 | - | - | - | - | 491 | - |
| Stage 2 | - | - | - | - | 479 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 684 | - | - | - | 321 | 642 |
| Stage 1 | - | - | - | - | 489 | - |
| Stage 2 | - | - | - | - | 538 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 683 | - | - | - | 296 | 641 |
| Mov Cap-2 Maneuver | - | - | - | - | 296 | - |
| Stage 1 | - | - | - | - | 489 | - |
| Stage 2 | - | - | - | - | 497 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.6 | 0 | 51.3 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 683 | - | - | - | 296 | 641 |
| HCM Lane V/C Ratio | 0.076 | - | - | - | 0.846 | 0.074 |
| HCM Control Delay (s) | 10.7 | - | - | - | 58.9 | 11.1 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 7.3 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 158 | 901 | 195 | 96 | 569 | 200 | 133 | 419 | 97 | 200 | 339 | 184 |
| Future Volume (veh/h) | 158 | 901 | 195 | 96 | 569 | 200 | 133 | 419 | 97 | 200 | 339 | 184 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 178 | 1012 | 130 | 108 | 639 | 0 | 149 | 471 | 0 | 225 | 381 | 195 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 107 | 644 | 328 | 104 | 648 | 330 | 72 | 658 | 559 | 244 | 523 | 268 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 515 | 3091 | 1576 | 498 | 3109 | 1583 | 1774 | 1863 | 1583 | 1774 | 1162 | 595 |
| Grp Volume(v), veh/h | 635 | 555 | 130 | 398 | 349 | 0 | 149 | 471 | 0 | 225 | 0 | 576 |
| Grp Sat Flow(s),veh/h/ln | 1837 | 1770 | 1576 | 1838 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1757 |
| Q Serve(g_s), s | 36.0 | 36.0 | 12.3 | 36.0 | 33.6 | 0.0 | 7.0 | 37.8 | 0.0 | 21.6 | 0.0 | 46.3 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 12.3 | 36.0 | 33.6 | 0.0 | 7.0 | 37.8 | 0.0 | 21.6 | 0.0 | 46.3 |
| Prop In Lane | 0.28 | | 1.00 | 0.27 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.34 |
| Lane Grp Cap(c), veh/h | 383 | 369 | 328 | 383 | 369 | 330 | 72 | 658 | 559 | 244 | 0 | 791 |
| V/C Ratio(X) | 1.66 | 1.51 | 0.40 | 1.04 | 0.95 | 0.00 | 2.07 | 0.72 | 0.00 | 0.92 | 0.00 | 0.73 |
| Avail Cap(c_a), veh/h | 383 | 369 | 328 | 383 | 369 | 330 | 72 | 658 | 559 | 267 | 0 | 791 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.4 | 68.4 | 59.0 | 68.4 | 67.4 | 0.0 | 82.9 | 48.4 | 0.0 | 73.6 | 0.0 | 38.8 |
| Incr Delay (d2), s/veh | 307.6 | 241.5 | 0.8 | 56.8 | 33.1 | 0.0 | 527.3 | 6.6 | 0.0 | 33.4 | 0.0 | 5.8 |
| 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 | 50.9 | 42.3 | 5.4 | 24.2 | 19.9 | 0.0 | 13.9 | 20.7 | 0.0 | 12.9 | 0.0 | 23.7 |
| LnGrp Delay(d),s/veh | 376.0 | 309.9 | 59.8 | 125.2 | 100.5 | 0.0 | 610.2 | 55.0 | 0.0 | 107.0 | 0.0 | 44.7 |
| LnGrp LOS | F | F | E | F | F | | F | D | | F | | D |
| Approach Vol, veh/h | | 1320 | | | 747 | | | 620 | | | 801 | |
| Approach Delay, s/veh | | 317.1 | | | 113.7 | | | 188.4 | | | 62.2 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.8 | 65.0 | | 40.0 | 11.0 | 81.8 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 39.8 | | 38.0 | 9.0 | 48.3 | | 38.0 |
| Green Ext Time (p_c), s | 0.2 | 7.4 | | 0.0 | 0.0 | 5.7 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 192.1 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 66.3 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 356 | 204 | 1 | 617 | 223 |
| Future Vol, veh/h | 12 | 356 | 204 | 1 | 617 | 223 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 379 | 217 | 1 | 656 | 237 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 18 | 13.4 | 100.3 |
| HCM LOS | C | B | F |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 3% | 100% | 0% |
| Vol Thru, % | 100% | 0% | 0% | 100% |
| Vol Right, % | 0% | 97% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 205 | 368 | 617 | 223 |
| LT Vol | 0 | 12 | 617 | 0 |
| Through Vol | 204 | 0 | 0 | 223 |
| RT Vol | 1 | 356 | 0 | 0 |
| Lane Flow Rate | 218 | 391 | 656 | 237 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.379 | 0.613 | 1.207 | 0.403 |
| Departure Headway (Hd) | 6.481 | 5.977 | 6.621 | 6.113 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 558 | 607 | 551 | 591 |
| Service Time | 4.481 | 3.977 | 4.332 | 3.824 |
| HCM Lane V/C Ratio | 0.391 | 0.644 | 1.191 | 0.401 |
| HCM Control Delay | 13.4 | 18 | 131.9 | 12.9 |
| HCM Lane LOS | B | C | F | B |
| HCM 95th-tile Q | 1.8 | 4.2 | 24.2 | 1.9 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 557 | 72 | 62 | 312 | 46 | 41 |
| Future Vol, veh/h | 557 | 72 | 62 | 312 | 46 | 41 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 599 | 77 | 67 | 335 | 49 | 44 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 682 | 0 | 1119 | 650 |
| Stage 1 | - | - | - | - | 644 | - |
| Stage 2 | - | - | - | - | 475 | - |
| 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 | - | - | 911 | - | 229 | 469 |
| Stage 1 | - | - | - | - | 523 | - |
| Stage 2 | - | - | - | - | 626 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 906 | - | 206 | 464 |
| Mov Cap-2 Maneuver | - | - | - | - | 206 | - |
| Stage 1 | - | - | - | - | 520 | - |
| Stage 2 | - | - | - | - | 566 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 1.5 | 24.3 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 279 | - | - | 906 | - |
| HCM Lane V/C Ratio | 0.335 | - | - | 0.074 | - |
| HCM Control Delay (s) | 24.3 | - | - | 9.3 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 1.4 | - | - | 0.2 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.5 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 544 | 20 | 20 | 404 | 10 | 10 |
| Future Vol, veh/h | 544 | 20 | 20 | 404 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 573 | 21 | 21 | 425 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 599 | 0 | 1060 | 593 |
| Stage 1 | - | - | - | - | 588 | - |
| Stage 2 | - | - | - | - | 472 | - |
| 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 | - | - | 978 | - | 248 | 506 |
| Stage 1 | - | - | - | - | 555 | - |
| Stage 2 | - | - | - | - | 628 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 974 | - | 239 | 502 |
| Mov Cap-2 Maneuver | - | - | - | - | 239 | - |
| Stage 1 | - | - | - | - | 553 | - |
| Stage 2 | - | - | - | - | 608 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.4 | 16.9 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 324 | - | - | 974 | - |
| HCM Lane V/C Ratio | 0.065 | - | - | 0.022 | - |
| HCM Control Delay (s) | 16.9 | - | - | 8.8 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 117.5 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 149 | 416 | 10 | 30 | 283 | 200 | 10 | 230 | 80 | 310 | 130 | 180 |
| Future Vol, veh/h | 149 | 416 | 10 | 30 | 283 | 200 | 10 | 230 | 80 | 310 | 130 | 180 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 152 | 424 | 10 | 31 | 289 | 204 | 10 | 235 | 82 | 316 | 133 | 184 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 118.3 | 214.3 | 22.6 | 85.8 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 12% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 83% | 0% |
| Vol Thru, % | 88% | 100% | 0% | 0% | 100% | 0% | 0% | 59% | 17% | 27% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 41% | 0% | 73% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 87 | 153 | 80 | 149 | 416 | 10 | 30 | 483 | 375 | 245 |
| LT Vol | 10 | 0 | 0 | 149 | 0 | 0 | 30 | 0 | 310 | 0 |
| Through Vol | 77 | 153 | 0 | 0 | 416 | 0 | 0 | 283 | 65 | 65 |
| RT Vol | 0 | 0 | 80 | 0 | 0 | 10 | 0 | 200 | 0 | 180 |
| Lane Flow Rate | 88 | 156 | 82 | 152 | 424 | 10 | 31 | 493 | 383 | 250 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.271 | 0.477 | 0.233 | 0.455 | 1.213 | 0.027 | 0.094 | 1.402 | 1.114 | 0.664 |
| Departure Headway (Hd) | 12.734 | 12.672 | 11.926 | 11.967 | 11.44 | 10.702 | 11.677 | 10.853 | 11.707 | 10.733 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 284 | 286 | 303 | 303 | 323 | 337 | 309 | 340 | 314 | 340 |
| Service Time | 10.434 | 10.372 | 9.626 | 9.667 | 9.14 | 8.402 | 9.377 | 8.553 | 9.407 | 8.433 |
| HCM Lane V/C Ratio | 0.31 | 0.545 | 0.271 | 0.502 | 1.313 | 0.03 | 0.1 | 1.45 | 1.22 | 0.735 |
| HCM Control Delay | 20.1 | 26.4 | 18.2 | 24.3 | 154.5 | 13.7 | 15.6 | 226.6 | 120.8 | 32.3 |
| HCM Lane LOS | C | D | C | C | F | B | C | F | F | D |
| HCM 95th-tile Q | 1.1 | 2.4 | 0.9 | 2.3 | 16.9 | 0.1 | 0.3 | 23.9 | 13.7 | 4.5 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 284 | 133 | 93 | 361 | 240 | 208 | 546 | 108 | 320 | 756 | 690 |
| Future Volume (veh/h) | 320 | 284 | 133 | 93 | 361 | 240 | 208 | 546 | 108 | 320 | 756 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 309 | 0 | 101 | 392 | 0 | 226 | 593 | 0 | 348 | 885 | 432 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 450 | 1026 | 459 | 131 | 824 | 1007 | 323 | 1118 | 500 | 456 | 1307 | 541 |
| Arrive On Green | 0.13 | 0.29 | 0.00 | 0.07 | 0.23 | 0.00 | 0.09 | 0.32 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 309 | 0 | 101 | 392 | 0 | 226 | 593 | 0 | 348 | 885 | 432 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.2 | 5.7 | 0.0 | 4.7 | 8.0 | 0.0 | 5.3 | 11.5 | 0.0 | 7.9 | 16.9 | 21.1 |
| Cycle Q Clear(g_c), s | 8.2 | 5.7 | 0.0 | 4.7 | 8.0 | 0.0 | 5.3 | 11.5 | 0.0 | 7.9 | 16.9 | 21.1 |
| 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 | 450 | 1026 | 459 | 131 | 824 | 1007 | 323 | 1118 | 500 | 456 | 1307 | 541 |
| V/C Ratio(X) | 0.77 | 0.30 | 0.00 | 0.77 | 0.48 | 0.00 | 0.70 | 0.53 | 0.00 | 0.76 | 0.68 | 0.80 |
| Avail Cap(c_a), veh/h | 743 | 1527 | 683 | 383 | 1527 | 1561 | 784 | 1315 | 588 | 808 | 1384 | 573 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 35.1 | 23.1 | 0.0 | 37.9 | 27.6 | 0.0 | 36.7 | 23.4 | 0.0 | 35.1 | 23.1 | 24.4 |
| Incr Delay (d2), s/veh | 2.9 | 0.2 | 0.0 | 9.2 | 0.4 | 0.0 | 2.8 | 0.4 | 0.0 | 2.7 | 1.2 | 7.5 |
| 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 | 4.0 | 2.8 | 0.0 | 2.6 | 3.9 | 0.0 | 2.6 | 5.7 | 0.0 | 4.0 | 8.8 | 10.0 |
| LnGrp Delay(d),s/veh | 37.9 | 23.2 | 0.0 | 47.1 | 28.0 | 0.0 | 39.4 | 23.8 | 0.0 | 37.8 | 24.3 | 31.9 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 657 | | | 493 | | | 819 | | | 1665 | |
| Approach Delay, s/veh | | 31.0 | | | 31.9 | | | 28.1 | | | 29.1 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.7 | 30.4 | 10.2 | 28.2 | 11.8 | 33.3 | 14.9 | 23.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 9.9 | 13.5 | 6.7 | 7.7 | 7.3 | 23.1 | 10.2 | 10.0 |
| Green Ext Time (p_c), s | 0.8 | 10.7 | 0.2 | 4.9 | 0.5 | 5.9 | 0.8 | 4.8 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 29.6 |
| HCM 2010 LOS | | C |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 148 | 287 | 45 | 124 | 458 | 190 | 12 | 330 | 101 | 300 | 420 | 262 |
| Future Volume (veh/h) | 148 | 287 | 45 | 124 | 458 | 190 | 12 | 330 | 101 | 300 | 420 | 262 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 172 | 334 | 39 | 144 | 533 | 174 | 14 | 384 | 93 | 349 | 488 | 235 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 210 | 1042 | 121 | 180 | 811 | 264 | 29 | 753 | 180 | 422 | 862 | 413 |
| Arrive On Green | 0.12 | 0.33 | 0.33 | 0.10 | 0.31 | 0.31 | 0.02 | 0.27 | 0.27 | 0.12 | 0.37 | 0.37 |
| Sat Flow, veh/h | 1774 | 3188 | 369 | 1774 | 2618 | 851 | 1774 | 2825 | 676 | 3442 | 2314 | 1108 |
| Grp Volume(v), veh/h | 172 | 184 | 189 | 144 | 360 | 347 | 14 | 239 | 238 | 349 | 373 | 350 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1788 | 1774 | 1770 | 1699 | 1774 | 1770 | 1732 | 1721 | 1770 | 1652 |
| Q Serve(g_s), s | 8.3 | 6.8 | 7.0 | 6.9 | 15.4 | 15.5 | 0.7 | 10.0 | 10.2 | 8.7 | 14.6 | 14.8 |
| Cycle Q Clear(g_c), s | 8.3 | 6.8 | 7.0 | 6.9 | 15.4 | 15.5 | 0.7 | 10.0 | 10.2 | 8.7 | 14.6 | 14.8 |
| Prop In Lane | 1.00 | | 0.21 | 1.00 | | 0.50 | 1.00 | | 0.39 | 1.00 | | 0.67 |
| Lane Grp Cap(c), veh/h | 210 | 578 | 584 | 180 | 548 | 526 | 29 | 472 | 461 | 422 | 659 | 615 |
| V/C Ratio(X) | 0.82 | 0.32 | 0.32 | 0.80 | 0.66 | 0.66 | 0.48 | 0.51 | 0.52 | 0.83 | 0.57 | 0.57 |
| Avail Cap(c_a), veh/h | 325 | 1235 | 1247 | 325 | 1235 | 1185 | 223 | 729 | 713 | 433 | 729 | 680 |
| 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 | 37.6 | 22.1 | 22.2 | 38.4 | 26.1 | 26.2 | 42.6 | 27.2 | 27.3 | 37.5 | 21.8 | 21.9 |
| Incr Delay (d2), s/veh | 9.2 | 0.3 | 0.3 | 8.0 | 1.3 | 1.4 | 11.6 | 0.8 | 0.9 | 12.3 | 0.8 | 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 | 4.6 | 3.4 | 3.5 | 3.8 | 7.7 | 7.4 | 0.4 | 5.0 | 5.0 | 4.8 | 7.3 | 6.9 |
| LnGrp Delay(d),s/veh | 46.9 | 22.4 | 22.5 | 46.4 | 27.5 | 27.6 | 54.3 | 28.0 | 28.2 | 49.8 | 22.6 | 22.8 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 545 | | | 851 | | | 491 | | | 1072 | |
| Approach Delay, s/veh | | 30.2 | | | 30.7 | | | 28.8 | | | 31.5 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.7 | 27.3 | 12.9 | 32.6 | 5.4 | 36.6 | 14.3 | 31.1 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 10.7 | 12.2 | 8.9 | 9.0 | 2.7 | 16.8 | 10.3 | 17.5 |
| Green Ext Time (p_c), s | 0.1 | 8.9 | 0.2 | 9.2 | 0.0 | 8.0 | 0.2 | 9.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 30.6 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.9 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 239 | 30 | 80 | 216 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 239 | 30 | 80 | 216 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 303 | 38 | 101 | 273 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.4 | 21.2 | 18.9 | 21.5 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 14% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 43% | 0% |
| Vol Thru, % | 86% | 80% | 0% | 100% | 57% | 0% | 100% | 39% | 57% | 73% |
| Vol Right, % | 0% | 20% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 27% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 140 | 150 | 80 | 53 | 47 | 50 | 167 | 213 | 188 | 148 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 120 | 120 | 0 | 53 | 27 | 0 | 167 | 83 | 108 | 108 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 177 | 189 | 101 | 68 | 59 | 63 | 211 | 270 | 238 | 187 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.443 | 0.463 | 0.285 | 0.18 | 0.153 | 0.162 | 0.51 | 0.62 | 0.594 | 0.446 |
| Departure Headway (Hd) | 9.026 | 8.81 | 10.146 | 9.624 | 9.311 | 9.227 | 8.709 | 8.267 | 8.988 | 8.58 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 399 | 409 | 354 | 373 | 385 | 389 | 414 | 437 | 402 | 420 |
| Service Time | 6.781 | 6.565 | 7.91 | 7.388 | 7.075 | 6.979 | 6.461 | 6.019 | 6.743 | 6.335 |
| HCM Lane V/C Ratio | 0.444 | 0.462 | 0.285 | 0.182 | 0.153 | 0.162 | 0.51 | 0.618 | 0.592 | 0.445 |
| HCM Control Delay | 18.8 | 19 | 16.9 | 14.5 | 13.8 | 13.8 | 20.2 | 23.7 | 24.1 | 18.1 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 2.2 | 2.4 | 1.2 | 0.6 | 0.5 | 0.6 | 2.8 | 4.1 | 3.7 | 2.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 683 | 40 | 110 | 751 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 683 | 40 | 110 | 751 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 785 | 0 | 126 | 863 | 86 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 279 | 817 | 694 | 159 | 832 | 703 |
| Arrive On Green | 0.05 | 0.23 | 0.23 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 785 | 0 | 126 | 863 | 86 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.6 | 0.0 | 4.5 | 33.2 | 0.0 | 5.6 | 36.3 | 2.6 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.6 | 0.0 | 4.5 | 33.2 | 0.0 | 5.6 | 36.3 | 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 | 89 | 438 | 370 | 71 | 419 | 356 | 279 | 817 | 694 | 159 | 832 | 703 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.96 | 0.00 | 0.79 | 1.04 | 0.12 |
| Avail Cap(c_a), veh/h | 175 | 918 | 776 | 175 | 918 | 781 | 424 | 827 | 703 | 219 | 832 | 703 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 38.1 | 25.5 | 23.8 | 38.4 | 29.2 | 0.0 | 36.3 | 22.1 | 0.0 | 36.2 | 22.4 | 13.1 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 22.1 | 0.0 | 12.9 | 41.1 | 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 | 1.9 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.3 | 22.0 | 0.0 | 3.3 | 28.0 | 1.1 |
| LnGrp Delay(d),s/veh | 51.5 | 25.8 | 23.8 | 48.1 | 31.8 | 0.0 | 39.4 | 44.2 | 0.0 | 49.1 | 63.6 | 13.2 |
| LnGrp LOS | D | C | C | D | C | | D | D | | D | F | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 980 | | | 1075 | |
| Approach Delay, s/veh | | 34.6 | | | 33.9 | | | 43.3 | | | 57.8 | |
| Approach LOS | | C | | | C | | | D | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.3 | 39.6 | 7.2 | 23.1 | 10.6 | 40.3 | 8.1 | 22.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 35.2 | 4.1 | 6.5 | 6.5 | 38.3 | 5.1 | 14.6 |
| Green Ext Time (p_c), s | 0.1 | 0.4 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 47.3 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 100 | 40 | 602 | 211 | 391 | 20 | 470 | 259 | 640 | 990 | 180 |
| Future Volume (veh/h) | 50 | 100 | 40 | 602 | 211 | 391 | 20 | 470 | 259 | 640 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 103 | 0 | 621 | 218 | 0 | 21 | 485 | 0 | 660 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 66 | 445 | 138 | 743 | 1352 | 421 | 37 | 877 | 0 | 774 | 2234 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.23 | 0.29 | 0.00 | 0.02 | 0.25 | 0.00 | 0.24 | 0.47 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 103 | 0 | 621 | 218 | 0 | 21 | 485 | 0 | 660 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.8 | 1.8 | 0.0 | 16.8 | 3.1 | 0.0 | 1.2 | 11.0 | 0.0 | 17.9 | 13.2 | 0.0 |
| Cycle Q Clear(g_c), s | 2.8 | 1.8 | 0.0 | 16.8 | 3.1 | 0.0 | 1.2 | 11.0 | 0.0 | 17.9 | 13.2 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 66 | 445 | 138 | 743 | 1352 | 421 | 37 | 877 | 0 | 774 | 2234 | 0 |
| V/C Ratio(X) | 0.78 | 0.23 | 0.00 | 0.84 | 0.16 | 0.00 | 0.57 | 0.55 | 0.00 | 0.85 | 0.46 | 0.00 |
| Avail Cap(c_a), veh/h | 563 | 1874 | 583 | 1268 | 1874 | 583 | 553 | 1564 | 0 | 1092 | 2234 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 43.1 | 38.0 | 0.0 | 33.1 | 24.2 | 0.0 | 43.8 | 29.3 | 0.0 | 32.8 | 16.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.0 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.4 | 0.5 | 0.0 | 4.8 | 0.1 | 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 | 1.6 | 0.8 | 0.0 | 7.7 | 1.4 | 0.0 | 0.7 | 3.5 | 0.0 | 8.4 | 5.7 | 0.0 |
| LnGrp Delay(d),s/veh | 61.1 | 38.2 | 0.0 | 35.7 | 24.2 | 0.0 | 57.2 | 29.9 | 0.0 | 37.5 | 16.2 | 0.0 |
| LnGrp LOS | E | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 155 | | | 839 | | | 506 | | | 1681 | |
| Approach Delay, s/veh | | 45.9 | | | 32.7 | | | 31.0 | | | 24.5 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 26.0 | 27.0 | 25.1 | 12.5 | 6.1 | 46.9 | 7.6 | 30.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 19.9 | 13.0 | 18.8 | 3.8 | 3.2 | 15.2 | 4.8 | 5.1 |
| Green Ext Time (p_c), s | 2.1 | 9.6 | 2.3 | 2.4 | 0.0 | 13.2 | 0.1 | 2.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.8 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 388 | 105 | 440 | 30 | 443 | 313 | 79 | 50 | 185 | 160 |
| Future Volume (veh/h) | 180 | 260 | 388 | 105 | 440 | 30 | 443 | 313 | 79 | 50 | 185 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 147 | 114 | 478 | 24 | 482 | 340 | 65 | 54 | 201 | 27 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 312 | 979 | 443 | 149 | 1398 | 70 | 307 | 966 | 182 | 86 | 632 | 84 |
| Arrive On Green | 0.09 | 0.29 | 0.29 | 0.08 | 0.28 | 0.28 | 0.17 | 0.33 | 0.33 | 0.05 | 0.20 | 0.20 |
| Sat Flow, veh/h | 3442 | 3390 | 1536 | 1774 | 4952 | 246 | 1774 | 2954 | 557 | 1774 | 3127 | 413 |
| Grp Volume(v), veh/h | 196 | 283 | 147 | 114 | 326 | 176 | 482 | 202 | 203 | 54 | 112 | 116 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1536 | 1774 | 1695 | 1808 | 1774 | 1770 | 1742 | 1774 | 1770 | 1771 |
| Q Serve(g_s), s | 3.5 | 4.1 | 4.8 | 4.0 | 4.8 | 4.9 | 11.0 | 5.5 | 5.6 | 1.9 | 3.4 | 3.5 |
| Cycle Q Clear(g_c), s | 3.5 | 4.1 | 4.8 | 4.0 | 4.8 | 4.9 | 11.0 | 5.5 | 5.6 | 1.9 | 3.4 | 3.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.32 | 1.00 | | 0.23 |
| Lane Grp Cap(c), veh/h | 312 | 979 | 443 | 149 | 957 | 510 | 307 | 578 | 569 | 86 | 358 | 358 |
| V/C Ratio(X) | 0.63 | 0.29 | 0.33 | 0.76 | 0.34 | 0.34 | 1.57 | 0.35 | 0.36 | 0.63 | 0.31 | 0.32 |
| Avail Cap(c_a), veh/h | 867 | 1921 | 870 | 447 | 1921 | 1025 | 307 | 1003 | 987 | 307 | 1003 | 1004 |
| 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 | 27.9 | 17.5 | 17.8 | 28.5 | 18.1 | 18.1 | 26.3 | 16.2 | 16.3 | 29.7 | 21.6 | 21.6 |
| Incr Delay (d2), s/veh | 2.1 | 0.2 | 0.4 | 7.8 | 0.2 | 0.4 | 271.4 | 0.4 | 0.4 | 7.4 | 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 | 1.8 | 1.9 | 2.1 | 2.3 | 2.3 | 2.5 | 28.4 | 2.7 | 2.8 | 1.1 | 1.7 | 1.8 |
| LnGrp Delay(d),s/veh | 29.9 | 17.7 | 18.2 | 36.3 | 18.3 | 18.5 | 297.6 | 16.6 | 16.7 | 37.0 | 22.1 | 22.2 |
| LnGrp LOS | C | B | B | D | B | B | F | B | B | D | C | C |
| Approach Vol, veh/h | | 626 | | | 616 | | | 887 | | | 282 | |
| Approach Delay, s/veh | | 21.6 | | | 21.7 | | | 169.3 | | | 25.0 | |
| Approach LOS | | C | | | C | | | F | | | C | |
| **Timer** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | | | | |
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 7.1 | 24.8 | 9.3 | 22.3 | 15.0 | 16.8 | 9.8 | 21.9 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | | | |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 3.9 | 7.6 | 6.0 | 6.8 | 13.0 | 5.5 | 5.5 | 6.9 | | | | |
| Green Ext Time (p_c), s | 0.0 | 4.1 | 0.2 | 7.3 | 0.0 | 4.1 | 0.5 | 7.3 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2010 Ctrl Delay | | | 76.4 |
| HCM 2010 LOS | | | E |

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 33 | 346 | 561 | 216 | 212 | 34 |
| Future Vol, veh/h | 33 | 346 | 561 | 216 | 212 | 34 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 40 | 417 | 676 | 260 | 255 | 41 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 686 | 0 | - | 0 | 934 | 358 |
| Stage 1 | - | - | - | - | 686 | - |
| Stage 2 | - | - | - | - | 248 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 553 | - | - | - | 335 | 545 |
| Stage 1 | - | - | - | - | 374 | - |
| Stage 2 | - | - | - | - | 707 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 548 | - | - | - | 305 | 536 |
| Mov Cap-2 Maneuver | - | - | - | - | 305 | - |
| Stage 1 | - | - | - | - | 371 | - |
| Stage 2 | - | - | - | - | 650 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.1 | 0 | 50.2 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 548 | - | - | - | 305 | 536 |
| HCM Lane V/C Ratio | 0.073 | - | - | - | 0.837 | 0.076 |
| HCM Control Delay (s) | 12.1 | - | - | - | 56.3 | 12.3 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 7.2 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 203 | 93 | 686 | 300 | 179 | 378 | 153 | 270 | 476 | 94 |
| Future Volume (veh/h) | 164 | 579 | 203 | 93 | 686 | 300 | 179 | 378 | 153 | 270 | 476 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.80 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 706 | 109 | 113 | 837 | 0 | 218 | 461 | 0 | 329 | 580 | 110 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 119 | 446 | 199 | 120 | 936 | 463 | 179 | 565 | 480 | 279 | 547 | 104 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.29 | 0.29 | 0.00 | 0.10 | 0.30 | 0.00 | 0.16 | 0.36 | 0.36 |
| Sat Flow, veh/h | 758 | 2836 | 1263 | 411 | 3201 | 1583 | 1774 | 1863 | 1583 | 1774 | 1522 | 289 |
| Grp Volume(v), veh/h | 481 | 425 | 109 | 507 | 443 | 0 | 218 | 461 | 0 | 329 | 0 | 690 |
| Grp Sat Flow(s),veh/h/ln | 1825 | 1770 | 1263 | 1842 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1811 |
| Q Serve(g_s), s | 28.0 | 28.0 | 14.2 | 47.8 | 42.1 | 0.0 | 18.0 | 40.8 | 0.0 | 28.0 | 0.0 | 64.0 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 14.2 | 47.8 | 42.1 | 0.0 | 18.0 | 40.8 | 0.0 | 28.0 | 0.0 | 64.0 |
| Prop In Lane | 0.42 | | 1.00 | 0.22 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 287 | 278 | 199 | 539 | 517 | 463 | 179 | 565 | 480 | 279 | 0 | 651 |
| V/C Ratio(X) | 1.68 | 1.53 | 0.55 | 0.94 | 0.86 | 0.00 | 1.22 | 0.82 | 0.00 | 1.18 | 0.00 | 1.06 |
| Avail Cap(c_a), veh/h | 287 | 278 | 199 | 559 | 537 | 480 | 179 | 565 | 480 | 279 | 0 | 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 75.0 | 75.0 | 69.2 | 61.5 | 59.5 | 0.0 | 80.0 | 57.4 | 0.0 | 75.0 | 0.0 | 57.0 |
| Incr Delay (d2), s/veh | 319.6 | 254.3 | 3.2 | 24.0 | 12.6 | 0.0 | 137.1 | 12.3 | 0.0 | 111.4 | 0.0 | 52.3 |
| 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 | 39.6 | 33.3 | 5.1 | 27.9 | 22.4 | 0.0 | 15.6 | 22.9 | 0.0 | 22.4 | 0.0 | 41.5 |
| LnGrp Delay(d),s/veh | 394.6 | 329.3 | 72.4 | 85.5 | 72.1 | 0.0 | 217.1 | 69.7 | 0.0 | 186.5 | 0.0 | 109.4 |
| LnGrp LOS | F | F | E | F | E | | F | E | | F | | F |
| Approach Vol, veh/h | | 1015 | | | 950 | | | 679 | | | 1019 | |
| Approach Delay, s/veh | | 332.7 | | | 79.2 | | | 117.1 | | | 134.3 | |
| Approach LOS | | F | | | E | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 58.0 | | 32.0 | 22.0 | 68.0 | | 56.1 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 30.0 | 42.8 | | 30.0 | 20.0 | 66.0 | | 49.8 |
| Green Ext Time (p_c), s | 0.0 | 5.8 | | 0.0 | 0.0 | 0.0 | | 2.2 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 171.8 |
| HCM 2010 LOS | | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 72.9 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 11 | 611 | 281 | 2 | 331 | 169 |
| Future Vol, veh/h | 11 | 611 | 281 | 2 | 331 | 169 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 719 | 331 | 2 | 389 | 199 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 128.6 | 23.4 | 31.6 |
| HCM LOS | F | C | D |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 2% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 98% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 283 | 622 | 331 | 169 |
| LT Vol | 0 | 11 | 331 | 0 |
| Through Vol | 281 | 0 | 0 | 169 |
| RT Vol | 2 | 611 | 0 | 0 |
| Lane Flow Rate | 333 | 732 | 389 | 199 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.643 | 1.206 | 0.824 | 0.392 |
| Departure Headway (Hd) | 7.644 | 5.935 | 8.355 | 7.839 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 476 | 615 | 436 | 461 |
| Service Time | 5.644 | 3.935 | 6.055 | 5.539 |
| HCM Lane V/C Ratio | 0.7 | 1.19 | 0.892 | 0.432 |
| HCM Control Delay | 23.4 | 128.6 | 39.8 | 15.5 |
| HCM Lane LOS | C | F | E | C |
| HCM 95th-tile Q | 4.5 | 26.1 | 7.7 | 1.8 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 6.9 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 274 | 59 | 46 | 503 | 108 | 112 |
| Future Vol, veh/h | 274 | 59 | 46 | 503 | 108 | 112 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 304 | 66 | 51 | 559 | 120 | 124 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 377 | 0 | 1012 | 351 |
| Stage 1 | - | - | - | - | 344 | - |
| Stage 2 | - | - | - | - | 668 | - |
| 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 | - | - | 1181 | - | 265 | 692 |
| Stage 1 | - | - | - | - | 718 | - |
| Stage 2 | - | - | - | - | 510 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1174 | - | 245 | 684 |
| Mov Cap-2 Maneuver | - | - | - | - | 245 | - |
| Stage 1 | - | - | - | - | 714 | - |
| Stage 2 | - | - | - | - | 475 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.7 | 32.9 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 364 | - | - | 1174 | - |
| HCM Lane V/C Ratio | 0.672 | - | - | 0.044 | - |
| HCM Control Delay (s) | 32.9 | - | - | 8.2 | 0 |
| HCM Lane LOS | D | - | - | A | A |
| HCM 95th %tile Q(veh) | 4.7 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 420 | 10 | 10 | 509 | 20 | 20 |
| Future Vol, veh/h | 420 | 10 | 10 | 509 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 477 | 11 | 11 | 578 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 496 | 0 | 1098 | 497 |
| Stage 1 | - | - | - | - | 490 | - |
| Stage 2 | - | - | - | - | 608 | - |
| 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 | - | - | 1068 | - | 235 | 573 |
| Stage 1 | - | - | - | - | 616 | - |
| Stage 2 | - | - | - | - | 543 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1062 | - | 229 | 566 |
| Mov Cap-2 Maneuver | - | - | - | - | 229 | - |
| Stage 1 | - | - | - | - | 612 | - |
| Stage 2 | - | - | - | - | 532 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 17.8 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 326 | - | - | 1062 | - |
| HCM Lane V/C Ratio | 0.139 | - | - | 0.011 | - |
| HCM Control Delay (s) | 17.8 | - | - | 8.4 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.5 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 135.3 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 282 | 206 | 10 | 12 | 318 | 220 | 30 | 159 | 25 | 270 | 203 | 190 |
| Future Vol, veh/h | 282 | 206 | 10 | 12 | 318 | 220 | 30 | 159 | 25 | 270 | 203 | 190 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 310 | 226 | 11 | 13 | 349 | 242 | 33 | 175 | 27 | 297 | 223 | 209 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 50.7 | 311.8 | 21.1 | 89.3 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 36% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 73% | 0% |
| Vol Thru, % | 64% | 100% | 0% | 0% | 100% | 0% | 0% | 59% | 27% | 35% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 41% | 0% | 65% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 83 | 106 | 25 | 282 | 206 | 10 | 12 | 538 | 372 | 292 |
| LT Vol | 30 | 0 | 0 | 282 | 0 | 0 | 12 | 0 | 270 | 0 |
| Through Vol | 53 | 106 | 0 | 0 | 206 | 0 | 0 | 318 | 102 | 102 |
| RT Vol | 0 | 0 | 25 | 0 | 0 | 10 | 0 | 220 | 0 | 190 |
| Lane Flow Rate | 91 | 116 | 27 | 310 | 226 | 11 | 13 | 591 | 408 | 320 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.285 | 0.358 | 0.079 | 0.901 | 0.627 | 0.028 | 0.039 | 1.624 | 1.126 | 0.812 |
| Departure Headway (Hd) | 13.007 | 12.814 | 12.066 | 12.066 | 11.538 | 10.799 | 11.086 | 10.272 | 11.355 | 10.496 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 278 | 283 | 299 | 304 | 315 | 334 | 325 | 361 | 323 | 349 |
| Service Time | 10.707 | 10.514 | 9.766 | 9.766 | 9.238 | 8.499 | 8.786 | 7.972 | 9.055 | 8.196 |
| HCM Lane V/C Ratio | 0.327 | 0.41 | 0.09 | 1.02 | 0.717 | 0.033 | 0.04 | 1.637 | 1.263 | 0.917 |
| HCM Control Delay | 20.8 | 22.5 | 15.8 | 65.9 | 31.8 | 13.8 | 14.2 | 318.4 | 123.4 | 45.9 |
| HCM Lane LOS | C | C | C | F | D | B | B | F | F | E |
| HCM 95th-tile Q | 1.1 | 1.6 | 0.3 | 8.4 | 4 | 0.1 | 0.1 | 33.7 | 14.3 | 7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 563 | 268 | 98 | 404 | 350 | 155 | 617 | 125 | 280 | 704 | 430 |
| Future Volume (veh/h) | 700 | 563 | 268 | 98 | 404 | 350 | 155 | 617 | 125 | 280 | 704 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 593 | 0 | 103 | 425 | 0 | 163 | 649 | 0 | 295 | 741 | 250 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 853 | 1374 | 615 | 130 | 758 | 892 | 230 | 1039 | 465 | 377 | 1240 | 508 |
| Arrive On Green | 0.25 | 0.39 | 0.00 | 0.07 | 0.21 | 0.00 | 0.07 | 0.29 | 0.00 | 0.11 | 0.33 | 0.33 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1526 |
| Grp Volume(v), veh/h | 737 | 593 | 0 | 103 | 425 | 0 | 163 | 649 | 0 | 295 | 741 | 250 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1526 |
| Q Serve(g_s), s | 23.7 | 14.2 | 0.0 | 6.6 | 12.4 | 0.0 | 5.4 | 18.3 | 0.0 | 9.4 | 19.2 | 15.1 |
| Cycle Q Clear(g_c), s | 23.7 | 14.2 | 0.0 | 6.6 | 12.4 | 0.0 | 5.4 | 18.3 | 0.0 | 9.4 | 19.2 | 15.1 |
| 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 | 853 | 1374 | 615 | 130 | 758 | 892 | 230 | 1039 | 465 | 377 | 1240 | 508 |
| V/C Ratio(X) | 0.86 | 0.43 | 0.00 | 0.79 | 0.56 | 0.00 | 0.71 | 0.62 | 0.00 | 0.78 | 0.60 | 0.49 |
| Avail Cap(c_a), veh/h | 3065 | 3519 | 1574 | 445 | 1255 | 1284 | 684 | 1867 | 835 | 890 | 2158 | 884 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 41.6 | 26.0 | 0.0 | 52.7 | 40.6 | 0.0 | 52.8 | 35.3 | 0.0 | 50.4 | 32.1 | 30.8 |
| Incr Delay (d2), s/veh | 2.8 | 0.2 | 0.0 | 10.1 | 0.7 | 0.0 | 4.0 | 0.6 | 0.0 | 3.6 | 0.5 | 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 | 7.0 | 0.0 | 3.6 | 6.1 | 0.0 | 2.7 | 9.0 | 0.0 | 4.8 | 10.0 | 6.4 |
| LnGrp Delay(d),s/veh | 44.4 | 26.2 | 0.0 | 62.8 | 41.2 | 0.0 | 56.8 | 36.0 | 0.0 | 54.0 | 32.6 | 31.5 |
| LnGrp LOS | D | C | | E | D | | E | D | | D | C | C |
| Approach Vol, veh/h | | 1330 | | | 528 | | | 812 | | | 1286 | |
| Approach Delay, s/veh | | 36.3 | | | 45.4 | | | 40.1 | | | 37.3 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 16.3 | 38.0 | 12.5 | 48.9 | 11.7 | 42.5 | 32.7 | 28.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 11.4 | 20.3 | 8.6 | 16.2 | 7.4 | 21.2 | 25.7 | 14.4 |
| Green Ext Time (p_c), s | 0.9 | 13.6 | 0.2 | 8.5 | 0.4 | 14.0 | 3.0 | 7.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.6 |
| HCM 2010 LOS | D |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 302 | 556 | 43 | 113 | 427 | 310 | 55 | 480 | 97 | 340 | 280 | 181 |
| Future Volume (veh/h) | 302 | 556 | 43 | 113 | 427 | 310 | 55 | 480 | 97 | 340 | 280 | 181 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 325 | 598 | 42 | 122 | 459 | 237 | 59 | 516 | 91 | 366 | 301 | 107 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 361 | 1261 | 88 | 152 | 577 | 295 | 76 | 783 | 137 | 451 | 896 | 312 |
| Arrive On Green | 0.20 | 0.38 | 0.38 | 0.09 | 0.26 | 0.26 | 0.04 | 0.26 | 0.26 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 1774 | 3348 | 235 | 1774 | 2232 | 1142 | 1774 | 2996 | 526 | 3442 | 2564 | 891 |
| Grp Volume(v), veh/h | 325 | 316 | 324 | 122 | 363 | 333 | 59 | 304 | 303 | 366 | 206 | 202 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1813 | 1774 | 1770 | 1605 | 1774 | 1770 | 1752 | 1721 | 1770 | 1686 |
| Q Serve(g_s), s | 19.6 | 14.9 | 14.9 | 7.4 | 21.0 | 21.3 | 3.6 | 16.8 | 17.0 | 11.4 | 9.4 | 9.7 |
| Cycle Q Clear(g_c), s | 19.6 | 14.9 | 14.9 | 7.4 | 21.0 | 21.3 | 3.6 | 16.8 | 17.0 | 11.4 | 9.4 | 9.7 |
| Prop In Lane | 1.00 | | 0.13 | 1.00 | | 0.71 | 1.00 | | 0.30 | 1.00 | | 0.53 |
| Lane Grp Cap(c), veh/h | 361 | 666 | 683 | 152 | 457 | 415 | 76 | 462 | 458 | 451 | 619 | 589 |
| V/C Ratio(X) | 0.90 | 0.47 | 0.48 | 0.80 | 0.79 | 0.80 | 0.78 | 0.66 | 0.66 | 0.81 | 0.33 | 0.34 |
| Avail Cap(c_a), veh/h | 517 | 676 | 693 | 323 | 483 | 438 | 129 | 596 | 590 | 783 | 870 | 829 |
| 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 | 42.7 | 26.0 | 26.0 | 49.3 | 38.0 | 38.1 | 52.1 | 36.2 | 36.3 | 46.4 | 26.3 | 26.4 |
| Incr Delay (d2), s/veh | 14.2 | 0.5 | 0.5 | 9.5 | 8.5 | 9.9 | 15.4 | 1.7 | 1.8 | 3.5 | 0.3 | 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 | 11.1 | 7.4 | 7.6 | 4.0 | 11.4 | 10.6 | 2.1 | 8.4 | 8.4 | 5.6 | 4.6 | 4.6 |
| LnGrp Delay(d),s/veh | 56.9 | 26.5 | 26.5 | 58.9 | 46.5 | 48.1 | 67.5 | 37.9 | 38.1 | 50.0 | 26.6 | 26.8 |
| LnGrp LOS | E | C | C | E | D | D | E | D | D | D | C | C |
| Approach Vol, veh/h | | 965 | | | 818 | | | 666 | | | 774 | |
| Approach Delay, s/veh | | 36.7 | | | 49.0 | | | 40.6 | | | 37.7 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 18.4 | 32.7 | 13.4 | 45.4 | 8.7 | 42.4 | 26.4 | 32.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 13.4 | 19.0 | 9.4 | 16.9 | 5.6 | 11.7 | 21.6 | 23.3 |
| Green Ext Time (p_c), s | 1.0 | 6.4 | 0.2 | 10.2 | 0.0 | 8.2 | 0.8 | 4.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 40.9 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 17.3 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 192 | 70 | 110 | 240 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 192 | 70 | 110 | 240 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 213 | 78 | 122 | 267 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 16.3 | 14.7 | 16.6 | 20.8 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 17% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 48% | 0% |
| Vol Thru, % | 83% | 58% | 0% | 100% | 81% | 0% | 100% | 44% | 52% | 80% |
| Vol Right, % | 0% | 42% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 20% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 116 | 166 | 90 | 167 | 103 | 80 | 93 | 107 | 230 | 150 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 96 | 96 | 0 | 167 | 83 | 0 | 93 | 47 | 120 | 120 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 129 | 184 | 100 | 185 | 115 | 89 | 104 | 119 | 256 | 167 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.315 | 0.43 | 0.254 | 0.444 | 0.271 | 0.233 | 0.257 | 0.28 | 0.611 | 0.381 |
| Departure Headway (Hd) | 8.788 | 8.401 | 9.158 | 8.641 | 8.5 | 9.432 | 8.913 | 8.505 | 8.607 | 8.223 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 410 | 428 | 393 | 417 | 423 | 381 | 403 | 423 | 419 | 438 |
| Service Time | 6.538 | 6.15 | 6.906 | 6.389 | 6.248 | 7.181 | 6.662 | 6.254 | 6.352 | 5.967 |
| HCM Lane V/C Ratio | 0.315 | 0.43 | 0.254 | 0.444 | 0.272 | 0.234 | 0.258 | 0.281 | 0.611 | 0.381 |
| HCM Control Delay | 15.5 | 17.4 | 15 | 18.1 | 14.4 | 15 | 14.7 | 14.5 | 24 | 16 |
| HCM Lane LOS | C | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.3 | 2.1 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.9 | 1.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 666 | 40 | 160 | 679 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 666 | 40 | 160 | 679 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 701 | 0 | 168 | 715 | 95 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 95 | 381 | 318 | 43 | 326 | 277 | 142 | 902 | 767 | 206 | 1041 | 881 |
| Arrive On Green | 0.05 | 0.20 | 0.20 | 0.02 | 0.18 | 0.00 | 0.04 | 0.48 | 0.00 | 0.12 | 0.56 | 0.56 |
| Sat Flow, veh/h | 1774 | 1863 | 1552 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1576 |
| Grp Volume(v), veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 701 | 0 | 168 | 715 | 95 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1552 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1576 |
| Q Serve(g_s), s | 5.0 | 14.0 | 0.4 | 1.7 | 8.7 | 0.0 | 2.2 | 29.1 | 0.0 | 8.7 | 25.7 | 2.6 |
| Cycle Q Clear(g_c), s | 5.0 | 14.0 | 0.4 | 1.7 | 8.7 | 0.0 | 2.2 | 29.1 | 0.0 | 8.7 | 25.7 | 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 | 95 | 381 | 318 | 43 | 326 | 277 | 142 | 902 | 767 | 206 | 1041 | 881 |
| V/C Ratio(X) | 1.55 | 0.77 | 0.03 | 0.75 | 0.58 | 0.00 | 0.59 | 0.78 | 0.00 | 0.82 | 0.69 | 0.11 |
| Avail Cap(c_a), veh/h | 95 | 796 | 664 | 114 | 816 | 694 | 478 | 1871 | 1591 | 455 | 2090 | 1768 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 44.3 | 35.2 | 29.8 | 45.4 | 35.4 | 0.0 | 44.1 | 19.9 | 0.0 | 40.4 | 14.8 | 9.7 |
| Incr Delay (d2), s/veh | 293.0 | 3.4 | 0.0 | 22.4 | 1.6 | 0.0 | 3.9 | 1.5 | 0.0 | 7.7 | 0.8 | 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 | 10.1 | 7.6 | 0.2 | 1.1 | 4.6 | 0.0 | 1.1 | 15.2 | 0.0 | 4.7 | 13.3 | 1.2 |
| LnGrp Delay(d),s/veh | 337.3 | 38.6 | 29.8 | 67.8 | 37.0 | 0.0 | 47.9 | 21.4 | 0.0 | 48.1 | 15.6 | 9.7 |
| LnGrp LOS | F | D | C | E | D | | D | C | | D | B | A |
| Approach Vol, veh/h | | 450 | | | 221 | | | 785 | | | 978 | |
| Approach Delay, s/veh | | 136.0 | | | 41.5 | | | 24.3 | | | 20.6 | |
| Approach LOS | | F | | | D | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.9 | 49.3 | 6.3 | 23.1 | 7.9 | 56.3 | 9.0 | 20.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 10.7 | 31.1 | 3.7 | 16.0 | 4.2 | 27.7 | 7.0 | 10.7 |
| Green Ext Time (p_c), s | 0.3 | 14.2 | 0.0 | 3.1 | 0.1 | 14.4 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 45.0 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 541 | 40 | 284 | 348 | 478 | 70 | 1210 | 623 | 491 | 320 | 300 |
| Future Volume (veh/h) | 220 | 541 | 40 | 284 | 348 | 478 | 70 | 1210 | 623 | 491 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 582 | 0 | 305 | 374 | 0 | 75 | 1301 | 0 | 528 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1176 | 350 | 341 | 963 | 300 | 71 | 1477 | 0 | 554 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.25 | 0.00 | 0.11 | 0.20 | 0.00 | 0.04 | 0.41 | 0.00 | 0.17 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 582 | 0 | 305 | 374 | 0 | 75 | 1301 | 0 | 528 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 26.9 | 0.0 | 24.0 | 17.5 | 0.0 | 11.0 | 84.4 | 0.0 | 41.7 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 26.9 | 0.0 | 24.0 | 17.5 | 0.0 | 11.0 | 84.4 | 0.0 | 41.7 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1176 | 350 | 341 | 963 | 300 | 71 | 1477 | 0 | 554 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.50 | 0.00 | 0.89 | 0.39 | 0.00 | 1.06 | 0.88 | 0.00 | 0.95 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1176 | 350 | 802 | 963 | 300 | 71 | 1477 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 81.9 | 0.0 | 112.3 | 87.6 | 0.0 | 121.9 | 69.8 | 0.0 | 104.2 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.5 | 0.0 | 8.3 | 1.2 | 0.0 | 122.9 | 7.8 | 0.0 | 25.6 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 11.9 | 0.0 | 11.0 | 7.7 | 0.0 | 7.4 | 29.3 | 0.0 | 20.5 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 83.4 | 0.0 | 120.6 | 88.8 | 0.0 | 246.1 | 77.6 | 0.0 | 129.8 | 29.7 | 0.0 |
| LnGrp LOS | F | F | | F | F | | F | E | | F | C | |
| Approach Vol, veh/h | | 819 | | | 679 | | | 1376 | | | 872 | |
| Approach Delay, s/veh | | 101.0 | | | 103.1 | | | 86.8 | | | 90.3 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 48.3 | 107.7 | 31.2 | 67.5 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 43.7 | 86.4 | 26.0 | 28.9 | 13.0 | 12.3 | 38.4 | 19.5 |
| Green Ext Time (p_c), s | 0.5 | 10.4 | 1.2 | 1.8 | 0.0 | 23.3 | 0.3 | 8.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 93.7 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 334 | 140 | 380 | 40 | 331 | 266 | 140 | 90 | 267 | 200 |
| Future Volume (veh/h) | 310 | 700 | 334 | 140 | 380 | 40 | 331 | 266 | 140 | 90 | 267 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.98 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 286 | 147 | 400 | 34 | 348 | 280 | 100 | 95 | 281 | 110 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 419 | 1138 | 436 | 176 | 1406 | 118 | 380 | 988 | 344 | 83 | 546 | 208 |
| Arrive On Green | 0.12 | 0.32 | 0.32 | 0.10 | 0.29 | 0.29 | 0.21 | 0.39 | 0.39 | 0.05 | 0.22 | 0.22 |
| Sat Flow, veh/h | 3442 | 3588 | 1374 | 1774 | 4775 | 400 | 1774 | 2557 | 890 | 1774 | 2491 | 950 |
| Grp Volume(v), veh/h | 326 | 696 | 327 | 147 | 282 | 152 | 348 | 191 | 189 | 95 | 197 | 194 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1572 | 1774 | 1695 | 1785 | 1774 | 1770 | 1678 | 1774 | 1770 | 1671 |
| Q Serve(g_s), s | 9.8 | 18.8 | 19.1 | 8.7 | 6.8 | 7.0 | 20.4 | 7.9 | 8.3 | 5.0 | 10.4 | 10.9 |
| Cycle Q Clear(g_c), s | 9.8 | 18.8 | 19.1 | 8.7 | 6.8 | 7.0 | 20.4 | 7.9 | 8.3 | 5.0 | 10.4 | 10.9 |
| Prop In Lane | 1.00 | | 0.87 | 1.00 | | 0.22 | 1.00 | | 0.53 | 1.00 | | 0.57 |
| Lane Grp Cap(c), veh/h | 419 | 1075 | 498 | 176 | 998 | 526 | 380 | 684 | 648 | 83 | 388 | 366 |
| V/C Ratio(X) | 0.78 | 0.65 | 0.66 | 0.84 | 0.28 | 0.29 | 0.92 | 0.28 | 0.29 | 1.14 | 0.51 | 0.53 |
| Avail Cap(c_a), veh/h | 1165 | 1466 | 680 | 183 | 1147 | 604 | 434 | 965 | 915 | 83 | 682 | 644 |
| 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 | 45.3 | 31.2 | 31.3 | 47.1 | 28.9 | 28.9 | 40.9 | 22.5 | 22.6 | 50.7 | 36.5 | 36.7 |
| Incr Delay (d2), s/veh | 3.2 | 0.7 | 1.5 | 26.6 | 0.2 | 0.3 | 22.3 | 0.2 | 0.2 | 141.1 | 1.0 | 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 | 4.8 | 8.9 | 8.5 | 5.5 | 3.2 | 3.5 | 12.3 | 3.9 | 3.9 | 5.7 | 5.2 | 5.1 |
| LnGrp Delay(d),s/veh | 48.5 | 31.9 | 32.8 | 73.6 | 29.0 | 29.2 | 63.2 | 22.7 | 22.8 | 191.8 | 37.5 | 37.9 |
| LnGrp LOS | D | C | C | E | C | C | E | C | C | F | D | D |
| Approach Vol, veh/h | | 1349 | | | 581 | | | 728 | | | 486 | |
| Approach Delay, s/veh | | 36.1 | | | 40.4 | | | 42.1 | | | 67.8 | |
| Approach LOS | | D | | | D | | | D | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 45.1 | 14.5 | 37.7 | 26.8 | 27.3 | 16.9 | 35.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 7.0 | 10.3 | 10.7 | 21.1 | 22.4 | 12.9 | 11.8 | 9.0 |
| Green Ext Time (p_c), s | 0.0 | 5.5 | 0.0 | 11.9 | 0.4 | 5.2 | 1.2 | 12.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 43.2 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 8.4 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 48 | 871 | 456 | 173 | 236 | 44 |
| Future Vol, veh/h | 48 | 871 | 456 | 173 | 236 | 44 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 52 | 937 | 490 | 186 | 254 | 47 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 491 | 0 | - | 0 | 970 | 247 |
| Stage 1 | - | - | - | - | 491 | - |
| Stage 2 | - | - | - | - | 479 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 684 | - | - | - | 321 | 642 |
| Stage 1 | - | - | - | - | 489 | - |
| Stage 2 | - | - | - | - | 538 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 683 | - | - | - | 296 | 641 |
| Mov Cap-2 Maneuver | - | - | - | - | 296 | - |
| Stage 1 | - | - | - | - | 489 | - |
| Stage 2 | - | - | - | - | 497 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.6 | 0 | 52.9 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 683 | - | - | - | 296 | 641 |
| HCM Lane V/C Ratio | 0.076 | - | - | - | 0.857 | 0.074 |
| HCM Control Delay (s) | 10.7 | - | - | - | 60.7 | 11.1 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 7.5 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 158 | 901 | 199 | 124 | 569 | 200 | 135 | 458 | 113 | 200 | 405 | 184 |
| Future Volume (veh/h) | 158 | 901 | 199 | 124 | 569 | 200 | 135 | 458 | 113 | 200 | 405 | 184 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 178 | 1012 | 133 | 139 | 639 | 0 | 152 | 515 | 0 | 225 | 455 | 197 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 107 | 644 | 328 | 128 | 622 | 330 | 72 | 658 | 559 | 244 | 555 | 241 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 515 | 3091 | 1576 | 615 | 2987 | 1583 | 1774 | 1863 | 1583 | 1774 | 1234 | 534 |
| Grp Volume(v), veh/h | 635 | 555 | 133 | 414 | 364 | 0 | 152 | 515 | 0 | 225 | 0 | 652 |
| Grp Sat Flow(s),veh/h/ln | 1837 | 1770 | 1576 | 1832 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1768 |
| Q Serve(g_s), s | 36.0 | 36.0 | 12.6 | 36.0 | 35.4 | 0.0 | 7.0 | 42.7 | 0.0 | 21.6 | 0.0 | 55.5 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 12.6 | 36.0 | 35.4 | 0.0 | 7.0 | 42.7 | 0.0 | 21.6 | 0.0 | 55.5 |
| Prop In Lane | 0.28 | | 1.00 | 0.34 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.30 |
| Lane Grp Cap(c), veh/h | 383 | 369 | 328 | 382 | 369 | 330 | 72 | 658 | 559 | 244 | 0 | 796 |
| V/C Ratio(X) | 1.66 | 1.51 | 0.41 | 1.09 | 0.99 | 0.00 | 2.11 | 0.78 | 0.00 | 0.92 | 0.00 | 0.82 |
| Avail Cap(c_a), veh/h | 383 | 369 | 328 | 382 | 369 | 330 | 72 | 658 | 559 | 267 | 0 | 796 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.4 | 68.4 | 59.1 | 68.4 | 68.2 | 0.0 | 82.9 | 50.0 | 0.0 | 73.6 | 0.0 | 41.4 |
| Incr Delay (d2), s/veh | 307.6 | 241.5 | 0.8 | 70.8 | 43.2 | 0.0 | 545.4 | 9.0 | 0.0 | 33.4 | 0.0 | 9.2 |
| 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 | 50.9 | 42.2 | 5.6 | 25.6 | 21.7 | 0.0 | 14.3 | 23.7 | 0.0 | 12.9 | 0.0 | 29.0 |
| LnGrp Delay(d),s/veh | 376.0 | 309.9 | 59.9 | 139.2 | 111.4 | 0.0 | 628.3 | 59.0 | 0.0 | 107.0 | 0.0 | 50.6 |
| LnGrp LOS | F | F | E | F | F | | F | E | | F | | D |
| Approach Vol, veh/h | | 1323 | | | 778 | | | 667 | | | 877 | |
| Approach Delay, s/veh | | 316.5 | | | 126.2 | | | 188.8 | | | 65.0 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.8 | 65.0 | | 40.0 | 11.0 | 81.8 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 44.7 | | 38.0 | 9.0 | 57.5 | | 38.0 |
| Green Ext Time (p_c), s | 0.2 | 7.4 | | 0.0 | 0.0 | 2.3 | | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 192.0 |
| HCM 2010 LOS | | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 90.6 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 387 | 214 | 1 | 668 | 239 |
| Future Vol, veh/h | 12 | 387 | 214 | 1 | 668 | 239 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 412 | 228 | 1 | 711 | 254 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 20.5 | 14.2 | 139.5 |
| HCM LOS | C | B | F |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 3% | 100% | 0% |
| Vol Thru, % | 100% | 0% | 0% | 100% |
| Vol Right, % | 0% | 97% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 215 | 399 | 668 | 239 |
| LT Vol | 0 | 12 | 668 | 0 |
| Through Vol | 214 | 0 | 0 | 239 |
| RT Vol | 1 | 387 | 0 | 0 |
| Lane Flow Rate | 229 | 424 | 711 | 254 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.405 | 0.668 | 1.337 | 0.442 |
| Departure Headway (Hd) | 6.69 | 6.114 | 6.772 | 6.263 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 542 | 594 | 540 | 577 |
| Service Time | 4.69 | 4.114 | 4.484 | 3.975 |
| HCM Lane V/C Ratio | 0.423 | 0.714 | 1.317 | 0.44 |
| HCM Control Delay | 14.2 | 20.5 | 184.5 | 13.9 |
| HCM Lane LOS | B | C | F | B |
| HCM 95th-tile Q | 1.9 | 5 | 31 | 2.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.6 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 608 | 72 | 62 | 342 | 46 | 41 |
| Future Vol, veh/h | 608 | 72 | 62 | 342 | 46 | 41 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 654 | 77 | 67 | 368 | 49 | 44 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 737 | 0 | 1205 | 704 |
| Stage 1 | - | - | - | - | 698 | - |
| Stage 2 | - | - | - | - | 507 | - |
| 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 | - | - | 869 | - | 203 | 437 |
| Stage 1 | - | - | - | - | 494 | - |
| Stage 2 | - | - | - | - | 605 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 865 | - | 181 | 433 |
| Mov Cap-2 Maneuver | - | - | - | - | 181 | - |
| Stage 1 | - | - | - | - | 492 | - |
| Stage 2 | - | - | - | - | 544 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 1.5 | 27.9 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 249 | - | - | 865 | - |
| HCM Lane V/C Ratio | 0.376 | - | - | 0.077 | - |
| HCM Control Delay (s) | 27.9 | - | - | 9.5 | 0 |
| HCM Lane LOS | D | - | - | A | A |
| HCM 95th %tile Q(veh) | 1.7 | - | - | 0.2 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 595 | 20 | 20 | 434 | 10 | 10 |
| Future Vol, veh/h | 595 | 20 | 20 | 434 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 626 | 21 | 21 | 457 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 652 | 0 | 1146 | 647 |
| Stage 1 | - | - | - | - | 642 | - |
| Stage 2 | - | - | - | - | 504 | - |
| 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 | - | - | 935 | - | 220 | 471 |
| Stage 1 | - | - | - | - | 524 | - |
| Stage 2 | - | - | - | - | 607 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 931 | - | 212 | 467 |
| Mov Cap-2 Maneuver | - | - | - | - | 212 | - |
| Stage 1 | - | - | - | - | 522 | - |
| Stage 2 | - | - | - | - | 586 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.4 | 18.3 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 292 | - | - | 931 | - |
| HCM Lane V/C Ratio | 0.072 | - | - | 0.023 | - |
| HCM Control Delay (s) | 18.3 | - | - | 9 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 136.3 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 202 | 424 | 10 | 35 | 297 | 200 | 10 | 235 | 83 | 310 | 138 | 270 |
| Future Vol, veh/h | 202 | 424 | 10 | 35 | 297 | 200 | 10 | 235 | 83 | 310 | 138 | 270 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 206 | 433 | 10 | 36 | 303 | 204 | 10 | 240 | 85 | 316 | 141 | 276 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 130.9 | 255.3 | 24.2 | 104.2 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 11% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 82% | 0% |
| Vol Thru, % | 89% | 100% | 0% | 0% | 100% | 0% | 0% | 60% | 18% | 20% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 40% | 0% | 80% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 88 | 157 | 83 | 202 | 424 | 10 | 35 | 497 | 379 | 339 |
| LT Vol | 10 | 0 | 0 | 202 | 0 | 0 | 35 | 0 | 310 | 0 |
| Through Vol | 78 | 157 | 0 | 0 | 424 | 0 | 0 | 297 | 69 | 69 |
| RT Vol | 0 | 0 | 83 | 0 | 0 | 10 | 0 | 200 | 0 | 270 |
| Lane Flow Rate | 90 | 160 | 85 | 206 | 433 | 10 | 36 | 507 | 387 | 346 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.287 | 0.507 | 0.252 | 0.635 | 1.274 | 0.028 | 0.114 | 1.507 | 1.15 | 0.937 |
| Departure Headway (Hd) | 13.177 | 13.117 | 12.369 | 12.49 | 11.962 | 11.222 | 12.185 | 11.369 | 12.19 | 11.172 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 275 | 277 | 292 | 291 | 307 | 321 | 296 | 325 | 302 | 329 |
| Service Time | 10.877 | 10.817 | 10.069 | 10.19 | 9.662 | 8.922 | 9.885 | 9.069 | 9.89 | 8.872 |
| HCM Lane V/C Ratio | 0.327 | 0.578 | 0.291 | 0.708 | 1.41 | 0.031 | 0.122 | 1.56 | 1.281 | 1.052 |
| HCM Control Delay | 21.1 | 28.6 | 19.2 | 34.6 | 179.6 | 14.2 | 16.4 | 272.1 | 134.9 | 69.8 |
| HCM Lane LOS | C | D | C | D | F | B | C | F | F | F |
| HCM 95th-tile Q | 1.2 | 2.7 | 1 | 4 | 18.2 | 0.1 | 0.4 | 26.8 | 14.4 | 9.4 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 287 | 130 | 100 | 376 | 240 | 200 | 459 | 105 | 320 | 764 | 690 |
| Future Volume (veh/h) | 320 | 287 | 130 | 100 | 376 | 240 | 200 | 459 | 105 | 320 | 764 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 312 | 0 | 109 | 409 | 0 | 217 | 499 | 0 | 348 | 890 | 435 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 450 | 1020 | 456 | 141 | 838 | 1018 | 313 | 1105 | 494 | 456 | 1304 | 539 |
| Arrive On Green | 0.13 | 0.29 | 0.00 | 0.08 | 0.24 | 0.00 | 0.09 | 0.31 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 312 | 0 | 109 | 409 | 0 | 217 | 499 | 0 | 348 | 890 | 435 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.2 | 5.7 | 0.0 | 5.0 | 8.3 | 0.0 | 5.1 | 9.4 | 0.0 | 7.9 | 17.0 | 21.3 |
| Cycle Q Clear(g_c), s | 8.2 | 5.7 | 0.0 | 5.0 | 8.3 | 0.0 | 5.1 | 9.4 | 0.0 | 7.9 | 17.0 | 21.3 |
| 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 | 450 | 1020 | 456 | 141 | 838 | 1018 | 313 | 1105 | 494 | 456 | 1304 | 539 |
| V/C Ratio(X) | 0.77 | 0.31 | 0.00 | 0.77 | 0.49 | 0.00 | 0.69 | 0.45 | 0.00 | 0.76 | 0.68 | 0.81 |
| Avail Cap(c_a), veh/h | 742 | 1526 | 683 | 383 | 1526 | 1560 | 783 | 1314 | 588 | 808 | 1383 | 572 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 35.1 | 23.2 | 0.0 | 37.7 | 27.5 | 0.0 | 36.8 | 23.0 | 0.0 | 35.1 | 23.2 | 24.6 |
| Incr Delay (d2), s/veh | 2.9 | 0.2 | 0.0 | 8.7 | 0.4 | 0.0 | 2.8 | 0.3 | 0.0 | 2.7 | 1.3 | 8.0 |
| 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 | 4.0 | 2.8 | 0.0 | 2.8 | 4.1 | 0.0 | 2.5 | 4.6 | 0.0 | 4.0 | 9.0 | 10.2 |
| LnGrp Delay(d),s/veh | 37.9 | 23.4 | 0.0 | 46.4 | 27.9 | 0.0 | 39.6 | 23.3 | 0.0 | 37.8 | 24.5 | 32.5 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 660 | | | 518 | | | 716 | | | 1673 | |
| Approach Delay, s/veh | | 31.0 | | | 31.8 | | | 28.2 | | | 29.3 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.7 | 30.1 | 10.6 | 28.1 | 11.6 | 33.2 | 14.9 | 23.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 9.9 | 11.4 | 7.0 | 7.7 | 7.1 | 23.3 | 10.2 | 10.3 |
| Green Ext Time (p_c), s | 0.8 | 10.9 | 0.2 | 5.0 | 0.5 | 5.5 | 0.8 | 4.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.8 |
| HCM 2010 LOS | C |

| Notes |
|---|

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 124 | 279 | 43 | 120 | 471 | 190 | 13 | 330 | 90 | 300 | 420 | 306 |
| Future Volume (veh/h) | 124 | 279 | 43 | 120 | 471 | 190 | 13 | 330 | 90 | 300 | 420 | 306 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 144 | 324 | 38 | 140 | 548 | 177 | 15 | 384 | 84 | 349 | 488 | 262 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 180 | 1020 | 119 | 176 | 834 | 268 | 31 | 779 | 169 | 424 | 834 | 446 |
| Arrive On Green | 0.10 | 0.32 | 0.32 | 0.10 | 0.32 | 0.32 | 0.02 | 0.27 | 0.27 | 0.12 | 0.38 | 0.38 |
| Sat Flow, veh/h | 1774 | 3186 | 370 | 1774 | 2625 | 845 | 1774 | 2887 | 625 | 3442 | 2221 | 1186 |
| Grp Volume(v), veh/h | 144 | 179 | 183 | 140 | 369 | 356 | 15 | 234 | 234 | 349 | 388 | 362 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1787 | 1774 | 1770 | 1700 | 1774 | 1770 | 1742 | 1721 | 1770 | 1638 |
| Q Serve(g_s), s | 6.8 | 6.5 | 6.6 | 6.6 | 15.3 | 15.4 | 0.7 | 9.5 | 9.7 | 8.4 | 15.0 | 15.1 |
| Cycle Q Clear(g_c), s | 6.8 | 6.5 | 6.6 | 6.6 | 15.3 | 15.4 | 0.7 | 9.5 | 9.7 | 8.4 | 15.0 | 15.1 |
| Prop In Lane | 1.00 | | 0.21 | 1.00 | | 0.50 | 1.00 | | 0.36 | 1.00 | | 0.72 |
| Lane Grp Cap(c), veh/h | 180 | 567 | 572 | 176 | 562 | 540 | 31 | 477 | 470 | 424 | 665 | 615 |
| V/C Ratio(X) | 0.80 | 0.32 | 0.32 | 0.80 | 0.66 | 0.66 | 0.48 | 0.49 | 0.50 | 0.82 | 0.58 | 0.59 |
| Avail Cap(c_a), veh/h | 333 | 1266 | 1278 | 333 | 1266 | 1216 | 229 | 747 | 735 | 444 | 747 | 691 |
| 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 | 37.5 | 21.9 | 22.0 | 37.6 | 25.1 | 25.1 | 41.5 | 26.2 | 26.3 | 36.5 | 21.3 | 21.3 |
| Incr Delay (d2), s/veh | 7.9 | 0.3 | 0.3 | 7.9 | 1.3 | 1.4 | 11.1 | 0.8 | 0.8 | 11.4 | 0.9 | 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 | 3.7 | 3.2 | 3.3 | 3.6 | 7.7 | 7.4 | 0.4 | 4.7 | 4.7 | 4.7 | 7.5 | 7.0 |
| LnGrp Delay(d),s/veh | 45.3 | 22.2 | 22.3 | 45.5 | 26.4 | 26.5 | 52.6 | 27.0 | 27.1 | 47.9 | 22.2 | 22.4 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 506 | | | 865 | | | 483 | | | 1099 | |
| Approach Delay, s/veh | | 28.8 | | | 29.5 | | | 27.8 | | | 30.4 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.5 | 27.0 | 12.5 | 31.3 | 5.5 | 36.0 | 12.7 | 31.1 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 10.4 | 11.7 | 8.6 | 8.6 | 2.7 | 17.1 | 8.8 | 17.4 |
| Green Ext Time (p_c), s | 0.1 | 9.1 | 0.2 | 9.3 | 0.0 | 8.1 | 0.2 | 9.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.5 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.2 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 222 | 30 | 80 | 212 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 222 | 30 | 80 | 212 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 281 | 38 | 101 | 268 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.1 | 20.6 | 18 | 20.7 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 15% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 43% | 0% |
| Vol Thru, % | 85% | 79% | 0% | 100% | 57% | 0% | 100% | 39% | 57% | 73% |
| Vol Right, % | 0% | 21% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 27% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 131 | 141 | 80 | 53 | 47 | 50 | 167 | 213 | 186 | 146 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 111 | 111 | 0 | 53 | 27 | 0 | 167 | 83 | 106 | 106 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 166 | 178 | 101 | 68 | 59 | 63 | 211 | 270 | 235 | 185 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.413 | 0.433 | 0.281 | 0.178 | 0.15 | 0.16 | 0.503 | 0.61 | 0.58 | 0.434 |
| Departure Headway (Hd) | 8.962 | 8.733 | 9.995 | 9.474 | 9.162 | 9.096 | 8.579 | 8.137 | 8.876 | 8.463 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 401 | 412 | 359 | 379 | 391 | 394 | 420 | 443 | 407 | 425 |
| Service Time | 6.714 | 6.485 | 7.754 | 7.233 | 6.92 | 6.845 | 6.327 | 5.886 | 6.627 | 6.214 |
| HCM Lane V/C Ratio | 0.414 | 0.432 | 0.281 | 0.179 | 0.151 | 0.16 | 0.502 | 0.609 | 0.577 | 0.435 |
| HCM Control Delay | 17.9 | 18 | 16.6 | 14.3 | 13.5 | 13.6 | 19.7 | 22.9 | 23.2 | 17.6 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 2 | 2.1 | 1.1 | 0.6 | 0.5 | 0.6 | 2.7 | 4 | 3.5 | 2.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 584 | 40 | 110 | 765 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 584 | 40 | 110 | 765 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 671 | 0 | 126 | 879 | 87 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| Arrive On Green | 0.05 | 0.24 | 0.24 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 671 | 0 | 126 | 879 | 87 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 25.6 | 0.0 | 5.6 | 36.0 | 2.6 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 25.6 | 0.0 | 5.6 | 36.0 | 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 | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.82 | 0.00 | 0.79 | 1.06 | 0.12 |
| Avail Cap(c_a), veh/h | 176 | 922 | 779 | 176 | 922 | 784 | 426 | 830 | 706 | 220 | 830 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 37.9 | 25.3 | 23.7 | 38.2 | 29.1 | 0.0 | 36.1 | 20.0 | 0.0 | 36.0 | 22.4 | 13.1 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 6.7 | 0.0 | 12.7 | 48.0 | 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 | 1.8 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.2 | 14.6 | 0.0 | 3.3 | 29.3 | 1.1 |
| LnGrp Delay(d),s/veh | 51.4 | 25.7 | 23.7 | 47.9 | 31.7 | 0.0 | 39.3 | 26.6 | 0.0 | 48.8 | 70.4 | 13.2 |
| LnGrp LOS | D | C | C | D | C | | D | C | | D | F | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 866 | | | 1092 | |
| Approach Delay, s/veh | | 34.5 | | | 33.8 | | | 29.5 | | | 63.4 | |
| Approach LOS | | C | | | C | | | C | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.2 | 39.3 | 7.2 | 23.0 | 10.6 | 40.0 | 8.0 | 22.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 27.6 | 4.1 | 6.5 | 6.5 | 38.0 | 5.1 | 14.5 |
| Green Ext Time (p_c), s | 0.1 | 5.9 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 45.2 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 93 | 40 | 534 | 188 | 389 | 20 | 470 | 239 | 686 | 990 | 180 |
| Future Volume (veh/h) | 50 | 93 | 40 | 534 | 188 | 389 | 20 | 470 | 239 | 686 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 96 | 0 | 551 | 194 | 0 | 21 | 485 | 0 | 707 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 67 | 430 | 134 | 673 | 1232 | 384 | 37 | 884 | 0 | 827 | 2320 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.21 | 0.26 | 0.00 | 0.02 | 0.26 | 0.00 | 0.26 | 0.49 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 96 | 0 | 551 | 194 | 0 | 21 | 485 | 0 | 707 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.7 | 1.7 | 0.0 | 14.4 | 2.8 | 0.0 | 1.1 | 10.6 | 0.0 | 18.4 | 12.3 | 0.0 |
| Cycle Q Clear(g_c), s | 2.7 | 1.7 | 0.0 | 14.4 | 2.8 | 0.0 | 1.1 | 10.6 | 0.0 | 18.4 | 12.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 67 | 430 | 134 | 673 | 1232 | 384 | 37 | 884 | 0 | 827 | 2320 | 0 |
| V/C Ratio(X) | 0.77 | 0.22 | 0.00 | 0.82 | 0.16 | 0.00 | 0.57 | 0.55 | 0.00 | 0.86 | 0.44 | 0.00 |
| Avail Cap(c_a), veh/h | 583 | 1940 | 604 | 1313 | 1940 | 604 | 572 | 1619 | 0 | 1131 | 2320 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 41.5 | 36.9 | 0.0 | 32.9 | 24.9 | 0.0 | 42.3 | 28.2 | 0.0 | 30.9 | 14.4 | 0.0 |
| Incr Delay (d2), s/veh | 16.7 | 0.3 | 0.0 | 2.5 | 0.1 | 0.0 | 13.0 | 0.5 | 0.0 | 4.9 | 0.1 | 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 | 1.6 | 0.7 | 0.0 | 6.6 | 1.2 | 0.0 | 0.6 | 3.4 | 0.0 | 8.7 | 5.3 | 0.0 |
| LnGrp Delay(d),s/veh | 58.2 | 37.1 | 0.0 | 35.4 | 25.0 | 0.0 | 55.4 | 28.7 | 0.0 | 35.8 | 14.5 | 0.0 |
| LnGrp LOS | E | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 148 | | | 745 | | | 506 | | | 1728 | |
| Approach Delay, s/veh | | 44.6 | | | 32.7 | | | 29.8 | | | 23.2 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 36.7 | 26.4 | 22.5 | 12.0 | 6.0 | 47.0 | 7.6 | 26.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 20.4 | 12.6 | 16.4 | 3.7 | 3.1 | 14.3 | 4.7 | 4.8 |
| Green Ext Time (p_c), s | 2.2 | 9.4 | 2.1 | 2.2 | 0.0 | 13.4 | 0.1 | 2.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 27.6 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 408 | 197 | 440 | 30 | 351 | 248 | 94 | 50 | 236 | 160 |
| Future Volume (veh/h) | 180 | 260 | 408 | 197 | 440 | 30 | 351 | 248 | 94 | 50 | 236 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 135 | 214 | 478 | 25 | 382 | 270 | 65 | 54 | 257 | 48 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 303 | 865 | 376 | 262 | 1537 | 80 | 281 | 915 | 216 | 83 | 631 | 116 |
| Arrive On Green | 0.09 | 0.25 | 0.25 | 0.15 | 0.31 | 0.31 | 0.16 | 0.32 | 0.32 | 0.05 | 0.21 | 0.21 |
| Sat Flow, veh/h | 3442 | 3434 | 1495 | 1774 | 4941 | 256 | 1774 | 2823 | 665 | 1774 | 2968 | 544 |
| Grp Volume(v), veh/h | 196 | 279 | 139 | 214 | 327 | 176 | 382 | 167 | 168 | 54 | 151 | 154 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1539 | 1774 | 1695 | 1807 | 1774 | 1770 | 1718 | 1774 | 1770 | 1743 |
| Q Serve(g_s), s | 3.8 | 4.7 | 5.2 | 8.1 | 5.1 | 5.2 | 11.0 | 4.9 | 5.1 | 2.1 | 5.1 | 5.3 |
| Cycle Q Clear(g_c), s | 3.8 | 4.7 | 5.2 | 8.1 | 5.1 | 5.2 | 11.0 | 4.9 | 5.1 | 2.1 | 5.1 | 5.3 |
| Prop In Lane | 1.00 | | 0.97 | 1.00 | | 0.14 | 1.00 | | 0.39 | 1.00 | | 0.31 |
| Lane Grp Cap(c), veh/h | 303 | 853 | 388 | 262 | 1055 | 562 | 281 | 573 | 557 | 83 | 376 | 370 |
| V/C Ratio(X) | 0.65 | 0.33 | 0.36 | 0.82 | 0.31 | 0.31 | 1.36 | 0.29 | 0.30 | 0.65 | 0.40 | 0.41 |
| Avail Cap(c_a), veh/h | 792 | 1754 | 797 | 408 | 1754 | 935 | 281 | 916 | 889 | 281 | 916 | 902 |
| 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 | 30.7 | 21.2 | 21.4 | 28.7 | 18.3 | 18.3 | 29.3 | 17.5 | 17.6 | 32.6 | 23.6 | 23.7 |
| Incr Delay (d2), s/veh | 2.3 | 0.2 | 0.6 | 7.2 | 0.2 | 0.3 | 184.1 | 0.3 | 0.3 | 8.4 | 0.7 | 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 | 1.9 | 2.2 | 2.3 | 4.5 | 2.4 | 2.6 | 19.6 | 2.4 | 2.5 | 1.2 | 2.6 | 2.6 |
| LnGrp Delay(d),s/veh | 33.0 | 21.4 | 22.0 | 35.9 | 18.4 | 18.6 | 213.4 | 17.8 | 17.9 | 41.0 | 24.3 | 24.4 |
| LnGrp LOS | C | C | C | D | B | B | F | B | B | D | C | C |
| Approach Vol, veh/h | | 614 | | | 717 | | | 717 | | | 359 | |
| Approach Delay, s/veh | | 25.2 | | | 23.7 | | | 122.0 | | | 26.9 | |
| Approach LOS | | C | | | C | | | F | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.2 | 26.5 | 14.3 | 21.5 | 15.0 | 18.8 | 10.1 | 25.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 4.1 | 7.1 | 10.1 | 7.2 | 13.0 | 7.3 | 5.8 | 7.2 |
| Green Ext Time (p_c), s | 0.0 | 4.1 | 0.3 | 7.2 | 0.0 | 4.1 | 0.4 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 53.9 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 10.7 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 22 | 372 | 655 | 210 | 210 | 32 |
| Future Vol, veh/h | 22 | 372 | 655 | 210 | 210 | 32 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 27 | 448 | 789 | 253 | 253 | 39 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 799 | 0 | - | 0 | 1033 | 415 |
| Stage 1 | - | - | - | - | 799 | - |
| Stage 2 | - | - | - | - | 234 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 489 | - | - | - | 299 | 501 |
| Stage 1 | - | - | - | - | 320 | - |
| Stage 2 | - | - | - | - | 719 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 485 | - | - | - | 278 | 493 |
| Mov Cap-2 Maneuver | - | - | - | - | 278 | - |
| Stage 1 | - | - | - | - | 317 | - |
| Stage 2 | - | - | - | - | 673 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 65.3 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 485 | - | - | - | 278 | 493 |
| HCM Lane V/C Ratio | 0.055 | - | - | - | 0.91 | 0.078 |
| HCM Control Delay (s) | 12.9 | - | - | - | 73.3 | 12.9 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 8.3 | 0.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 168 | 595 | 200 | 110 | 740 | 300 | 170 | 276 | 103 | 270 | 465 | 120 |
| Future Volume (veh/h) | 168 | 595 | 200 | 110 | 740 | 300 | 170 | 276 | 103 | 270 | 465 | 120 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.80 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 205 | 726 | 110 | 134 | 902 | 0 | 207 | 337 | 0 | 329 | 567 | 140 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 118 | 441 | 196 | 134 | 949 | 475 | 177 | 559 | 475 | 276 | 513 | 127 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.30 | 0.30 | 0.00 | 0.10 | 0.30 | 0.00 | 0.16 | 0.36 | 0.36 |
| Sat Flow, veh/h | 756 | 2838 | 1260 | 446 | 3164 | 1583 | 1774 | 1863 | 1583 | 1774 | 1442 | 356 |
| Grp Volume(v), veh/h | 495 | 436 | 110 | 553 | 483 | 0 | 207 | 337 | 0 | 329 | 0 | 707 |
| Grp Sat Flow(s),veh/h/ln | 1825 | 1770 | 1260 | 1840 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1798 |
| Q Serve(g_s), s | 28.0 | 28.0 | 14.5 | 54.0 | 47.4 | 0.0 | 18.0 | 27.8 | 0.0 | 28.0 | 0.0 | 64.0 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 14.5 | 54.0 | 47.4 | 0.0 | 18.0 | 27.8 | 0.0 | 28.0 | 0.0 | 64.0 |
| Prop In Lane | 0.41 | | 1.00 | 0.24 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.20 |
| Lane Grp Cap(c), veh/h | 284 | 275 | 196 | 552 | 531 | 475 | 177 | 559 | 475 | 276 | 0 | 639 |
| V/C Ratio(X) | 1.74 | 1.59 | 0.56 | 1.00 | 0.91 | 0.00 | 1.17 | 0.60 | 0.00 | 1.19 | 0.00 | 1.11 |
| Avail Cap(c_a), veh/h | 284 | 275 | 196 | 552 | 531 | 475 | 177 | 559 | 475 | 276 | 0 | 639 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 76.0 | 76.0 | 70.3 | 63.0 | 60.7 | 0.0 | 81.0 | 53.8 | 0.0 | 76.0 | 0.0 | 58.0 |
| Incr Delay (d2), s/veh | 348.3 | 280.1 | 3.6 | 38.5 | 19.9 | 0.0 | 119.6 | 4.8 | 0.0 | 116.5 | 0.0 | 68.1 |
| 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 | 41.6 | 35.1 | 5.3 | 33.4 | 26.0 | 0.0 | 14.7 | 15.1 | 0.0 | 22.7 | 0.0 | 43.9 |
| LnGrp Delay(d),s/veh | 424.3 | 356.1 | 73.9 | 101.5 | 80.6 | 0.0 | 200.6 | 58.6 | 0.0 | 192.5 | 0.0 | 126.1 |
| LnGrp LOS | F | F | E | F | F | | F | E | | F | | F |
| Approach Vol, veh/h | | 1041 | | | 1036 | | | 544 | | | 1036 | |
| Approach Delay, s/veh | | 358.7 | | | 91.7 | | | 112.6 | | | 147.2 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 58.0 | | 32.0 | 22.0 | 68.0 | | 58.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 30.0 | 29.8 | | 30.0 | 20.0 | 66.0 | | 56.0 |
| Green Ext Time (p_c), s | 0.0 | 8.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 186.5 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 35.8 |
| Intersection LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 14 | 449 | 296 | 3 | 300 | 363 |
| Future Vol, veh/h | 14 | 449 | 296 | 3 | 300 | 363 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 16 | 528 | 348 | 4 | 353 | 427 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 45.2 | 24 | 34.6 |
| HCM LOS | E | C | D |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 3% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 97% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 299 | 463 | 300 | 363 |
| LT Vol | 0 | 14 | 300 | 0 |
| Through Vol | 296 | 0 | 0 | 363 |
| RT Vol | 3 | 449 | 0 | 0 |
| Lane Flow Rate | 352 | 545 | 353 | 427 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.685 | 0.924 | 0.751 | 0.848 |
| Departure Headway (Hd) | 7.008 | 6.105 | 7.659 | 7.146 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 517 | 599 | 473 | 508 |
| Service Time | 5.054 | 4.105 | 5.411 | 4.898 |
| HCM Lane V/C Ratio | 0.681 | 0.91 | 0.746 | 0.841 |
| HCM Control Delay | 24 | 45.2 | 30.2 | 38.3 |
| HCM Lane LOS | C | E | D | E |
| HCM 95th-tile Q | 5.2 | 11.8 | 6.3 | 8.7 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 233 | 70 | 127 | 374 | 79 | 127 |
| Future Vol, veh/h | 233 | 70 | 127 | 374 | 79 | 127 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 259 | 78 | 141 | 416 | 88 | 141 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 344 | 0 | 1010 | 312 |
| Stage 1 | - | - | - | - | 305 | - |
| Stage 2 | - | - | - | - | 705 | - |
| 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 | - | - | 1215 | - | 266 | 728 |
| Stage 1 | - | - | - | - | 748 | - |
| Stage 2 | - | - | - | - | 490 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1208 | - | 223 | 720 |
| Mov Cap-2 Maneuver | - | - | - | - | 223 | - |
| Stage 1 | - | - | - | - | 744 | - |
| Stage 2 | - | - | - | - | 413 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.1 | 26.8 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 388 | - | - | 1208 | - |
| HCM Lane V/C Ratio | 0.59 | - | - | 0.117 | - |
| HCM Control Delay (s) | 26.8 | - | - | 8.4 | 0 |
| HCM Lane LOS | D | - | - | A | A |
| HCM 95th %tile Q(veh) | 3.6 | - | - | 0.4 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 340 | 10 | 10 | 510 | 20 | 20 |
| Future Vol, veh/h | 340 | 10 | 10 | 510 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 386 | 11 | 11 | 580 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 405 | 0 | 1008 | 406 |
| Stage 1 | - | - | - | - | 399 | - |
| Stage 2 | - | - | - | - | 609 | - |
| 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 | - | - | 1154 | - | 267 | 645 |
| Stage 1 | - | - | - | - | 678 | - |
| Stage 2 | - | - | - | - | 543 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1147 | - | 260 | 637 |
| Mov Cap-2 Maneuver | - | - | - | - | 260 | - |
| Stage 1 | - | - | - | - | 674 | - |
| Stage 2 | - | - | - | - | 532 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 16.1 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 369 | - | - | 1147 | - |
| HCM Lane V/C Ratio | 0.123 | - | - | 0.01 | - |
| HCM Control Delay (s) | 16.1 | - | - | 8.2 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.4 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 119.9 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 129 | 180 | 10 | 10 | 335 | 220 | 30 | 150 | 20 | 270 | 200 | 195 |
| Future Vol, veh/h | 129 | 180 | 10 | 10 | 335 | 220 | 30 | 150 | 20 | 270 | 200 | 195 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 142 | 198 | 11 | 11 | 368 | 242 | 33 | 165 | 22 | 297 | 220 | 214 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 23.8 | 273.5 | 18.8 | 65.8 |
| HCM LOS | C | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 38% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 73% | 0% |
| Vol Thru, % | 62% | 100% | 0% | 0% | 100% | 0% | 0% | 60% | 27% | 34% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 40% | 0% | 66% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 80 | 100 | 20 | 129 | 180 | 10 | 10 | 555 | 370 | 295 |
| LT Vol | 30 | 0 | 0 | 129 | 0 | 0 | 10 | 0 | 270 | 0 |
| Through Vol | 50 | 100 | 0 | 0 | 180 | 0 | 0 | 335 | 100 | 100 |
| RT Vol | 0 | 0 | 20 | 0 | 0 | 10 | 0 | 220 | 0 | 195 |
| Lane Flow Rate | 88 | 110 | 22 | 142 | 198 | 11 | 11 | 610 | 407 | 324 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.256 | 0.314 | 0.059 | 0.404 | 0.536 | 0.028 | 0.03 | 1.538 | 1.032 | 0.749 |
| Departure Headway (Hd) | 11.951 | 11.753 | 11.012 | 11.56 | 11.034 | 10.297 | 10.07 | 9.27 | 10.348 | 9.489 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 302 | 308 | 327 | 313 | 328 | 350 | 358 | 396 | 354 | 386 |
| Service Time | 9.651 | 9.453 | 8.712 | 9.26 | 8.734 | 7.997 | 7.77 | 6.97 | 8.048 | 7.189 |
| HCM Lane V/C Ratio | 0.291 | 0.357 | 0.067 | 0.454 | 0.604 | 0.031 | 0.031 | 1.54 | 1.15 | 0.839 |
| HCM Control Delay | 18.7 | 19.7 | 14.4 | 21.9 | 25.8 | 13.3 | 13.1 | 278.2 | 89.9 | 35.6 |
| HCM Lane LOS | C | C | B | C | D | B | B | F | F | E |
| HCM 95th-tile Q | 1 | 1.3 | 0.2 | 1.9 | 3 | 0.1 | 0.1 | 32.9 | 12.3 | 6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 576 | 260 | 97 | 411 | 350 | 150 | 593 | 131 | 280 | 622 | 430 |
| Future Volume (veh/h) | 700 | 576 | 260 | 97 | 411 | 350 | 150 | 593 | 131 | 280 | 622 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 606 | 0 | 102 | 433 | 0 | 158 | 624 | 0 | 295 | 655 | 222 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 857 | 1403 | 628 | 130 | 781 | 913 | 227 | 991 | 443 | 380 | 1196 | 489 |
| Arrive On Green | 0.25 | 0.40 | 0.00 | 0.07 | 0.22 | 0.00 | 0.07 | 0.28 | 0.00 | 0.11 | 0.32 | 0.32 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1524 |
| Grp Volume(v), veh/h | 737 | 606 | 0 | 102 | 433 | 0 | 158 | 624 | 0 | 295 | 655 | 222 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1524 |
| Q Serve(g_s), s | 22.8 | 13.9 | 0.0 | 6.3 | 12.1 | 0.0 | 5.0 | 17.2 | 0.0 | 9.0 | 16.2 | 12.9 |
| Cycle Q Clear(g_c), s | 22.8 | 13.9 | 0.0 | 6.3 | 12.1 | 0.0 | 5.0 | 17.2 | 0.0 | 9.0 | 16.2 | 12.9 |
| 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 | 857 | 1403 | 628 | 130 | 781 | 913 | 227 | 991 | 443 | 380 | 1196 | 489 |
| V/C Ratio(X) | 0.86 | 0.43 | 0.00 | 0.79 | 0.55 | 0.00 | 0.70 | 0.63 | 0.00 | 0.78 | 0.55 | 0.45 |
| Avail Cap(c_a), veh/h | 3176 | 3646 | 1631 | 461 | 1300 | 1322 | 709 | 1934 | 865 | 922 | 2236 | 915 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 40.1 | 24.5 | 0.0 | 50.9 | 38.6 | 0.0 | 51.0 | 35.1 | 0.0 | 48.5 | 31.2 | 30.1 |
| Incr Delay (d2), s/veh | 2.7 | 0.2 | 0.0 | 9.9 | 0.6 | 0.0 | 3.8 | 0.7 | 0.0 | 3.5 | 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 | 11.2 | 6.9 | 0.0 | 3.4 | 6.0 | 0.0 | 2.5 | 8.5 | 0.0 | 4.6 | 8.3 | 5.5 |
| LnGrp Delay(d),s/veh | 42.7 | 24.7 | 0.0 | 60.8 | 39.2 | 0.0 | 54.8 | 35.8 | 0.0 | 52.0 | 31.6 | 30.8 |
| LnGrp LOS | D | C | | E | D | | D | D | | D | C | C |
| Approach Vol, veh/h | | 1343 | | | 535 | | | 782 | | | 1172 | |
| Approach Delay, s/veh | | 34.6 | | | 43.4 | | | 39.6 | | | 36.6 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 15.9 | 35.3 | 12.2 | 48.3 | 11.4 | 39.8 | 31.8 | 28.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 11.0 | 19.2 | 8.3 | 15.9 | 7.0 | 18.2 | 24.8 | 14.1 |
| Green Ext Time (p_c), s | 0.9 | 12.0 | 0.2 | 8.8 | 0.4 | 12.4 | 3.0 | 7.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 37.5 |
| HCM 2010 LOS | D |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 324 | 565 | 44 | 100 | 424 | 310 | 54 | 480 | 90 | 340 | 280 | 158 |
| Future Volume (veh/h) | 324 | 565 | 44 | 100 | 424 | 310 | 54 | 480 | 90 | 340 | 280 | 158 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 348 | 608 | 43 | 108 | 456 | 236 | 58 | 516 | 85 | 366 | 301 | 105 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 384 | 1301 | 92 | 136 | 556 | 285 | 75 | 785 | 129 | 451 | 897 | 306 |
| Arrive On Green | 0.22 | 0.39 | 0.39 | 0.08 | 0.25 | 0.25 | 0.04 | 0.26 | 0.26 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 1774 | 3346 | 236 | 1774 | 2230 | 1143 | 1774 | 3031 | 497 | 3442 | 2578 | 880 |
| Grp Volume(v), veh/h | 348 | 321 | 330 | 108 | 361 | 331 | 58 | 300 | 301 | 366 | 204 | 202 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1813 | 1774 | 1770 | 1603 | 1774 | 1770 | 1758 | 1721 | 1770 | 1688 |
| Q Serve(g_s), s | 21.2 | 15.0 | 15.0 | 6.6 | 21.3 | 21.6 | 3.6 | 16.7 | 16.9 | 11.4 | 9.4 | 9.8 |
| Cycle Q Clear(g_c), s | 21.2 | 15.0 | 15.0 | 6.6 | 21.3 | 21.6 | 3.6 | 16.7 | 16.9 | 11.4 | 9.4 | 9.8 |
| Prop In Lane | 1.00 | | 0.13 | 1.00 | | 0.71 | 1.00 | | 0.28 | 1.00 | | 0.52 |
| Lane Grp Cap(c), veh/h | 384 | 688 | 705 | 136 | 441 | 400 | 75 | 458 | 455 | 451 | 615 | 587 |
| V/C Ratio(X) | 0.91 | 0.47 | 0.47 | 0.79 | 0.82 | 0.83 | 0.78 | 0.66 | 0.66 | 0.81 | 0.33 | 0.34 |
| Avail Cap(c_a), veh/h | 513 | 688 | 705 | 321 | 480 | 435 | 128 | 592 | 588 | 778 | 864 | 824 |
| 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 | 42.3 | 25.2 | 25.3 | 50.2 | 39.2 | 39.3 | 52.5 | 36.6 | 36.6 | 46.7 | 26.6 | 26.7 |
| Incr Delay (d2), s/veh | 16.3 | 0.5 | 0.5 | 9.9 | 10.0 | 11.8 | 15.6 | 1.7 | 1.8 | 3.6 | 0.3 | 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 | 12.1 | 7.4 | 7.6 | 3.6 | 11.7 | 10.9 | 2.1 | 8.4 | 8.4 | 5.7 | 4.7 | 4.6 |
| LnGrp Delay(d),s/veh | 58.6 | 25.7 | 25.7 | 60.1 | 49.2 | 51.1 | 68.1 | 38.2 | 38.4 | 50.3 | 26.9 | 27.1 |
| LnGrp LOS | E | C | C | E | D | D | E | D | D | D | C | C |
| Approach Vol, veh/h | | 999 | | | 800 | | | 659 | | | 772 | |
| Approach Delay, s/veh | | 37.2 | | | 51.4 | | | 40.9 | | | 38.0 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 18.5 | 32.6 | 12.5 | 47.0 | 8.7 | 42.5 | 27.9 | 31.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 13.4 | 18.9 | 8.6 | 17.0 | 5.6 | 11.8 | 23.2 | 23.6 |
| Green Ext Time (p_c), s | 1.0 | 6.4 | 0.2 | 10.3 | 0.0 | 8.1 | 0.8 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 41.7 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 16.7 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 183 | 70 | 110 | 223 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 183 | 70 | 110 | 223 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 203 | 78 | 122 | 248 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.9 | 14.5 | 16.1 | 19.8 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 18% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 50% | 0% |
| Vol Thru, % | 82% | 57% | 0% | 100% | 81% | 0% | 100% | 44% | 50% | 79% |
| Vol Right, % | 0% | 43% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 21% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 112 | 162 | 90 | 167 | 103 | 80 | 93 | 107 | 222 | 142 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 92 | 92 | 0 | 167 | 83 | 0 | 93 | 47 | 112 | 112 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 124 | 179 | 100 | 185 | 115 | 89 | 104 | 119 | 246 | 157 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.299 | 0.413 | 0.25 | 0.437 | 0.267 | 0.229 | 0.253 | 0.275 | 0.583 | 0.357 |
| Departure Headway (Hd) | 8.686 | 8.287 | 9.014 | 8.497 | 8.357 | 9.284 | 8.766 | 8.358 | 8.533 | 8.174 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 414 | 434 | 399 | 424 | 431 | 387 | 410 | 430 | 423 | 443 |
| Service Time | 6.434 | 6.035 | 6.762 | 6.245 | 6.105 | 7.032 | 6.514 | 6.106 | 6.276 | 5.874 |
| HCM Lane V/C Ratio | 0.3 | 0.412 | 0.251 | 0.436 | 0.267 | 0.23 | 0.254 | 0.277 | 0.582 | 0.354 |
| HCM Control Delay | 15.1 | 16.8 | 14.8 | 17.7 | 14.1 | 14.8 | 14.5 | 14.3 | 22.6 | 15.3 |
| HCM Lane LOS | C | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.2 | 2 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.6 | 1.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 643 | 40 | 160 | 589 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 643 | 40 | 160 | 589 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 677 | 0 | 168 | 620 | 88 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 102 | 388 | 323 | 44 | 327 | 278 | 144 | 868 | 738 | 208 | 1008 | 853 |
| Arrive On Green | 0.06 | 0.21 | 0.21 | 0.02 | 0.18 | 0.00 | 0.04 | 0.47 | 0.00 | 0.12 | 0.54 | 0.54 |
| Sat Flow, veh/h | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Grp Volume(v), veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 677 | 0 | 168 | 620 | 88 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1575 |
| Q Serve(g_s), s | 5.0 | 13.0 | 0.4 | 1.6 | 8.1 | 0.0 | 2.1 | 26.6 | 0.0 | 8.0 | 19.9 | 2.4 |
| Cycle Q Clear(g_c), s | 5.0 | 13.0 | 0.4 | 1.6 | 8.1 | 0.0 | 2.1 | 26.6 | 0.0 | 8.0 | 19.9 | 2.4 |
| 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 | 102 | 388 | 323 | 44 | 327 | 278 | 144 | 868 | 738 | 208 | 1008 | 853 |
| V/C Ratio(X) | 1.44 | 0.76 | 0.02 | 0.73 | 0.58 | 0.00 | 0.58 | 0.78 | 0.00 | 0.81 | 0.61 | 0.10 |
| Avail Cap(c_a), veh/h | 102 | 856 | 713 | 122 | 877 | 745 | 514 | 2011 | 1709 | 489 | 2246 | 1899 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 41.0 | 32.4 | 27.4 | 42.2 | 32.9 | 0.0 | 41.0 | 19.5 | 0.0 | 37.5 | 13.7 | 9.7 |
| Incr Delay (d2), s/veh | 246.1 | 3.1 | 0.0 | 20.4 | 1.6 | 0.0 | 3.7 | 1.6 | 0.0 | 7.2 | 0.6 | 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 | 9.4 | 7.0 | 0.2 | 1.0 | 4.3 | 0.0 | 1.1 | 13.9 | 0.0 | 4.3 | 10.3 | 1.0 |
| LnGrp Delay(d),s/veh | 287.1 | 35.5 | 27.5 | 62.6 | 34.5 | 0.0 | 44.6 | 21.1 | 0.0 | 44.7 | 14.3 | 9.8 |
| LnGrp LOS | F | D | C | E | C | | D | C | | D | B | A |
| Approach Vol, veh/h | | 450 | | | 221 | | | 761 | | | 876 | |
| Approach Delay, s/veh | | 117.6 | | | 38.6 | | | 23.7 | | | 19.7 | |
| Approach LOS | | F | | | D | | | C | | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.2 | 44.6 | 6.2 | 22.1 | 7.7 | 51.1 | 9.0 | 19.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 10.0 | 28.6 | 3.6 | 15.0 | 4.1 | 21.9 | 7.0 | 10.1 |
| Green Ext Time (p_c), s | 0.3 | 12.0 | 0.0 | 3.2 | 0.1 | 12.2 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 41.9 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 518 | 40 | 245 | 336 | 521 | 70 | 1210 | 554 | 505 | 320 | 300 |
| Future Volume (veh/h) | 220 | 518 | 40 | 245 | 336 | 521 | 70 | 1210 | 554 | 505 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 557 | 0 | 263 | 361 | 0 | 75 | 1301 | 0 | 543 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1240 | 369 | 297 | 963 | 300 | 71 | 1464 | 0 | 567 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.26 | 0.00 | 0.09 | 0.20 | 0.00 | 0.04 | 0.40 | 0.00 | 0.18 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 557 | 0 | 263 | 361 | 0 | 75 | 1301 | 0 | 543 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 25.1 | 0.0 | 20.7 | 16.8 | 0.0 | 11.0 | 85.0 | 0.0 | 42.9 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 25.1 | 0.0 | 20.7 | 16.8 | 0.0 | 11.0 | 85.0 | 0.0 | 42.9 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1240 | 369 | 297 | 963 | 300 | 71 | 1464 | 0 | 567 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.45 | 0.00 | 0.88 | 0.37 | 0.00 | 1.06 | 0.89 | 0.00 | 0.96 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1240 | 369 | 802 | 963 | 300 | 71 | 1464 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 78.5 | 0.0 | 114.1 | 87.3 | 0.0 | 121.9 | 70.6 | 0.0 | 103.8 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.2 | 0.0 | 8.6 | 1.1 | 0.0 | 122.9 | 8.4 | 0.0 | 27.1 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 11.1 | 0.0 | 9.5 | 7.4 | 0.0 | 7.4 | 29.6 | 0.0 | 21.1 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 79.6 | 0.0 | 122.7 | 88.5 | 0.0 | 246.1 | 79.1 | 0.0 | 130.9 | 29.7 | 0.0 |
| LnGrp LOS | F | E | | F | F | | F | E | | F | C | |
| Approach Vol, veh/h | | 794 | | | 624 | | | 1376 | | | 887 | |
| Approach Delay, s/veh | | 99.0 | | | 102.9 | | | 88.2 | | | 91.7 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 49.2 | 106.8 | 27.7 | 71.0 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 44.9 | 87.0 | 22.7 | 27.1 | 13.0 | 12.3 | 38.4 | 18.8 |
| Green Ext Time (p_c), s | 0.3 | 10.1 | 1.0 | 2.6 | 0.0 | 23.3 | 0.3 | 7.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 93.8 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 257 | 178 | 380 | 40 | 322 | 283 | 225 | 90 | 209 | 200 |
| Future Volume (veh/h) | 310 | 700 | 257 | 178 | 380 | 40 | 322 | 283 | 225 | 90 | 209 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 218 | 187 | 400 | 34 | 339 | 298 | 136 | 95 | 220 | 79 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 424 | 1226 | 358 | 193 | 1441 | 121 | 375 | 868 | 385 | 88 | 526 | 183 |
| Arrive On Green | 0.12 | 0.32 | 0.32 | 0.11 | 0.30 | 0.30 | 0.21 | 0.37 | 0.37 | 0.05 | 0.21 | 0.21 |
| Sat Flow, veh/h | 3442 | 3881 | 1132 | 1774 | 4775 | 400 | 1774 | 2364 | 1050 | 1774 | 2562 | 890 |
| Grp Volume(v), veh/h | 326 | 643 | 312 | 187 | 282 | 152 | 339 | 221 | 213 | 95 | 150 | 149 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1623 | 1774 | 1695 | 1785 | 1774 | 1770 | 1644 | 1774 | 1770 | 1682 |
| Q Serve(g_s), s | 9.3 | 16.2 | 16.5 | 10.6 | 6.4 | 6.6 | 18.8 | 9.1 | 9.5 | 5.0 | 7.4 | 7.8 |
| Cycle Q Clear(g_c), s | 9.3 | 16.2 | 16.5 | 10.6 | 6.4 | 6.6 | 18.8 | 9.1 | 9.5 | 5.0 | 7.4 | 7.8 |
| Prop In Lane | 1.00 | | 0.70 | 1.00 | | 0.22 | 1.00 | | 0.64 | 1.00 | | 0.53 |
| Lane Grp Cap(c), veh/h | 424 | 1071 | 513 | 193 | 1023 | 539 | 375 | 650 | 603 | 88 | 364 | 346 |
| V/C Ratio(X) | 0.77 | 0.60 | 0.61 | 0.97 | 0.28 | 0.28 | 0.90 | 0.34 | 0.35 | 1.08 | 0.41 | 0.43 |
| Avail Cap(c_a), veh/h | 1227 | 1544 | 739 | 193 | 1208 | 636 | 457 | 1016 | 944 | 88 | 718 | 683 |
| 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 | 42.9 | 29.2 | 29.3 | 44.8 | 26.9 | 26.9 | 38.9 | 23.1 | 23.2 | 48.0 | 34.8 | 35.0 |
| Incr Delay (d2), s/veh | 3.0 | 0.5 | 1.2 | 55.3 | 0.1 | 0.3 | 18.9 | 0.3 | 0.4 | 120.0 | 0.7 | 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 | 0.4 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 4.6 | 7.7 | 7.5 | 8.2 | 3.0 | 3.3 | 11.2 | 4.5 | 4.4 | 5.4 | 3.7 | 3.7 |
| LnGrp Delay(d),s/veh | 45.9 | 29.7 | 30.4 | 100.1 | 27.0 | 27.2 | 57.8 | 23.4 | 23.6 | 168.4 | 35.6 | 35.8 |
| LnGrp LOS | D | C | C | F | C | C | E | C | C | F | D | D |
| Approach Vol, veh/h | | 1281 | | | 621 | | | 773 | | | 394 | |
| Approach Delay, s/veh | | 34.0 | | | 49.1 | | | 38.5 | | | 67.7 | |
| Approach LOS | | C | | | D | | | D | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 41.1 | 15.0 | 35.9 | 25.3 | 24.8 | 16.4 | 34.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 7.0 | 11.5 | 12.6 | 18.5 | 20.8 | 9.8 | 11.3 | 8.6 |
| Green Ext Time (p_c), s | 0.0 | 5.2 | 0.0 | 11.7 | 0.5 | 5.0 | 1.2 | 11.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 42.5 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.2 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 43 | 962 | 505 | 170 | 230 | 33 |
| Future Vol, veh/h | 43 | 962 | 505 | 170 | 230 | 33 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 46 | 1034 | 543 | 183 | 247 | 35 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 544 | 0 | - | 0 | 1051 | 274 |
| Stage 1 | - | - | - | - | 544 | - |
| Stage 2 | - | - | - | - | 507 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 646 | - | - | - | 293 | 617 |
| Stage 1 | - | - | - | - | 455 | - |
| Stage 2 | - | - | - | - | 520 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 645 | - | - | - | 272 | 616 |
| Mov Cap-2 Maneuver | - | - | - | - | 272 | - |
| Stage 1 | - | - | - | - | 455 | - |
| Stage 2 | - | - | - | - | 483 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0 | 66.3 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 645 | - | - | - | 272 | 616 |
| HCM Lane V/C Ratio | 0.072 | - | - | - | 0.909 | 0.058 |
| HCM Control Delay (s) | 11 | - | - | - | 74.2 | 11.2 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 8.2 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 179 | 955 | 190 | 83 | 600 | 200 | 130 | 414 | 113 | 200 | 308 | 191 |
| Future Volume (veh/h) | 179 | 955 | 190 | 83 | 600 | 200 | 130 | 414 | 113 | 200 | 308 | 191 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 201 | 1073 | 133 | 93 | 674 | 0 | 146 | 465 | 0 | 225 | 346 | 200 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 113 | 638 | 328 | 87 | 665 | 330 | 72 | 658 | 559 | 244 | 499 | 288 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 543 | 3062 | 1576 | 418 | 3193 | 1583 | 1774 | 1863 | 1583 | 1774 | 1108 | 641 |
| Grp Volume(v), veh/h | 680 | 594 | 133 | 409 | 358 | 0 | 146 | 465 | 0 | 225 | 0 | 546 |
| Grp Sat Flow(s),veh/h/ln | 1836 | 1770 | 1576 | 1842 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1749 |
| Q Serve(g_s), s | 36.0 | 36.0 | 12.6 | 36.0 | 34.7 | 0.0 | 7.0 | 37.2 | 0.0 | 21.6 | 0.0 | 43.1 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 12.6 | 36.0 | 34.7 | 0.0 | 7.0 | 37.2 | 0.0 | 21.6 | 0.0 | 43.1 |
| Prop In Lane | 0.30 | | 1.00 | 0.23 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.37 |
| Lane Grp Cap(c), veh/h | 382 | 369 | 328 | 384 | 369 | 330 | 72 | 658 | 559 | 244 | 0 | 787 |
| V/C Ratio(X) | 1.78 | 1.61 | 0.41 | 1.07 | 0.97 | 0.00 | 2.03 | 0.71 | 0.00 | 0.92 | 0.00 | 0.69 |
| Avail Cap(c_a), veh/h | 382 | 369 | 328 | 384 | 369 | 330 | 72 | 658 | 559 | 267 | 0 | 787 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.4 | 68.4 | 59.1 | 68.4 | 67.9 | 0.0 | 82.9 | 48.2 | 0.0 | 73.6 | 0.0 | 38.0 |
| Incr Delay (d2), s/veh | 360.1 | 287.9 | 0.8 | 64.8 | 38.9 | 0.0 | 509.1 | 6.3 | 0.0 | 33.4 | 0.0 | 5.0 |
| 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 | 56.4 | 47.0 | 5.6 | 25.1 | 21.0 | 0.0 | 13.6 | 20.3 | 0.0 | 12.9 | 0.0 | 21.9 |
| LnGrp Delay(d),s/veh | 428.5 | 356.2 | 59.9 | 133.2 | 106.7 | 0.0 | 592.0 | 54.5 | 0.0 | 107.0 | 0.0 | 43.0 |
| LnGrp LOS | F | F | E | F | F | | F | D | | F | | D |
| Approach Vol, veh/h | | 1407 | | | 767 | | | 611 | | | 771 | |
| Approach Delay, s/veh | | 363.1 | | | 120.8 | | | 182.9 | | | 61.6 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.8 | 65.0 | | 40.0 | 11.0 | 81.8 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 39.2 | | 38.0 | 9.0 | 45.1 | | 38.0 |
| Green Ext Time (p_c), s | 0.2 | 7.1 | | 0.0 | 0.0 | 6.2 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 214.5 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 36.7 |
| Intersection LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 14 | 307 | 383 | 5 | 507 | 299 |
| Future Vol, veh/h | 14 | 307 | 383 | 5 | 507 | 299 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 327 | 407 | 5 | 539 | 318 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 17.6 | 23.3 | 50.8 |
| HCM LOS | C | C | F |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 4% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 96% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 388 | 321 | 507 | 299 |
| LT Vol | 0 | 14 | 507 | 0 |
| Through Vol | 383 | 0 | 0 | 299 |
| RT Vol | 5 | 307 | 0 | 0 |
| Lane Flow Rate | 413 | 341 | 539 | 318 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.713 | 0.584 | 1.021 | 0.557 |
| Departure Headway (Hd) | 6.216 | 6.158 | 6.818 | 6.309 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 578 | 584 | 529 | 569 |
| Service Time | 4.28 | 4.222 | 4.59 | 4.08 |
| HCM Lane V/C Ratio | 0.715 | 0.584 | 1.019 | 0.559 |
| HCM Control Delay | 23.3 | 17.6 | 70.8 | 16.8 |
| HCM Lane LOS | C | C | F | C |
| HCM 95th-tile Q | 5.8 | 3.7 | 14.8 | 3.4 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 475 | 47 | 101 | 264 | 47 | 119 |
| Future Vol, veh/h | 475 | 47 | 101 | 264 | 47 | 119 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 511 | 51 | 109 | 284 | 51 | 128 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 567 | 0 | 1049 | 548 |
| Stage 1 | - | - | - | - | 542 | - |
| Stage 2 | - | - | - | - | 507 | - |
| 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 | - | - | 1005 | - | 252 | 536 |
| Stage 1 | - | - | - | - | 583 | - |
| Stage 2 | - | - | - | - | 605 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1000 | - | 217 | 531 |
| Mov Cap-2 Maneuver | - | - | - | - | 217 | - |
| Stage 1 | - | - | - | - | 580 | - |
| Stage 2 | - | - | - | - | 524 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.5 | 22.8 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 377 | - | - | 1000 | - |
| HCM Lane V/C Ratio | 0.473 | - | - | 0.109 | - |
| HCM Control Delay (s) | 22.8 | - | - | 9 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 2.5 | - | - | 0.4 | - |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 0.5 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 574 | 20 | 20 | 355 | 10 | 10 |
| Future Vol, veh/h | 574 | 20 | 20 | 355 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 604 | 21 | 21 | 374 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 630 | 0 | 1041 | 625 |
| Stage 1 | - | - | - | - | 620 | - |
| Stage 2 | - | - | - | - | 421 | - |
| 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 | - | - | 952 | - | 255 | 485 |
| Stage 1 | - | - | - | - | 536 | - |
| Stage 2 | - | - | - | - | 662 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 948 | - | 246 | 481 |
| Mov Cap-2 Maneuver | - | - | - | - | 246 | - |
| Stage 1 | - | - | - | - | 534 | - |
| Stage 2 | - | - | - | - | 641 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.5 | 16.8 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 326 | - | - | 948 | - |
| HCM Lane V/C Ratio | 0.065 | - | - | 0.022 | - |
| HCM Control Delay (s) | 16.8 | - | - | 8.9 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.2 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 122.2 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 157 | 437 | 10 | 30 | 285 | 200 | 10 | 230 | 80 | 310 | 130 | 131 |
| Future Vol, veh/h | 157 | 437 | 10 | 30 | 285 | 200 | 10 | 230 | 80 | 310 | 130 | 131 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 160 | 446 | 10 | 31 | 291 | 204 | 10 | 235 | 82 | 316 | 133 | 134 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 131 | 211.6 | 22.6 | 88.2 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 12% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 83% | 0% |
| Vol Thru, % | 88% | 100% | 0% | 0% | 100% | 0% | 0% | 59% | 17% | 33% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 41% | 0% | 67% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 87 | 153 | 80 | 157 | 437 | 10 | 30 | 485 | 375 | 196 |
| LT Vol | 10 | 0 | 0 | 157 | 0 | 0 | 30 | 0 | 310 | 0 |
| Through Vol | 77 | 153 | 0 | 0 | 437 | 0 | 0 | 285 | 65 | 65 |
| RT Vol | 0 | 0 | 80 | 0 | 0 | 10 | 0 | 200 | 0 | 131 |
| Lane Flow Rate | 88 | 156 | 82 | 160 | 446 | 10 | 31 | 495 | 383 | 200 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.269 | 0.474 | 0.232 | 0.475 | 1.26 | 0.027 | 0.093 | 1.395 | 1.114 | 0.534 |
| Departure Headway (Hd) | 12.728 | 12.667 | 11.919 | 11.859 | 11.331 | 10.593 | 11.658 | 10.835 | 11.761 | 10.835 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 284 | 286 | 303 | 306 | 326 | 340 | 309 | 341 | 310 | 336 |
| Service Time | 10.428 | 10.367 | 9.619 | 9.559 | 9.031 | 8.293 | 9.358 | 8.535 | 9.461 | 8.535 |
| HCM Lane V/C Ratio | 0.31 | 0.545 | 0.271 | 0.523 | 1.368 | 0.029 | 0.1 | 1.452 | 1.235 | 0.595 |
| HCM Control Delay | 20 | 26.3 | 18.2 | 24.8 | 171.8 | 13.6 | 15.5 | 223.7 | 121.1 | 25.3 |
| HCM Lane LOS | C | D | C | C | F | B | C | F | F | D |
| HCM 95th-tile Q | 1.1 | 2.4 | 0.9 | 2.4 | 18.5 | 0.1 | 0.3 | 23.7 | 13.7 | 3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 290 | 130 | 105 | 378 | 240 | 200 | 481 | 109 | 320 | 773 | 690 |
| Future Volume (veh/h) | 320 | 290 | 130 | 105 | 378 | 240 | 200 | 481 | 109 | 320 | 773 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 315 | 0 | 114 | 411 | 0 | 217 | 523 | 0 | 348 | 896 | 439 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 450 | 1009 | 451 | 147 | 839 | 1018 | 312 | 1107 | 495 | 456 | 1306 | 540 |
| Arrive On Green | 0.13 | 0.29 | 0.00 | 0.08 | 0.24 | 0.00 | 0.09 | 0.31 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 315 | 0 | 114 | 411 | 0 | 217 | 523 | 0 | 348 | 896 | 439 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.2 | 5.8 | 0.0 | 5.3 | 8.4 | 0.0 | 5.1 | 10.0 | 0.0 | 7.9 | 17.2 | 21.7 |
| Cycle Q Clear(g_c), s | 8.2 | 5.8 | 0.0 | 5.3 | 8.4 | 0.0 | 5.1 | 10.0 | 0.0 | 7.9 | 17.2 | 21.7 |
| 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 | 450 | 1009 | 451 | 147 | 839 | 1018 | 312 | 1107 | 495 | 456 | 1306 | 540 |
| V/C Ratio(X) | 0.77 | 0.31 | 0.00 | 0.78 | 0.49 | 0.00 | 0.69 | 0.47 | 0.00 | 0.76 | 0.69 | 0.81 |
| Avail Cap(c_a), veh/h | 740 | 1521 | 681 | 381 | 1521 | 1556 | 781 | 1310 | 586 | 805 | 1379 | 571 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 35.2 | 23.5 | 0.0 | 37.6 | 27.6 | 0.0 | 36.9 | 23.2 | 0.0 | 35.3 | 23.3 | 24.7 |
| Incr Delay (d2), s/veh | 2.9 | 0.2 | 0.0 | 8.5 | 0.4 | 0.0 | 2.8 | 0.3 | 0.0 | 2.7 | 1.3 | 8.4 |
| 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 | 4.0 | 2.9 | 0.0 | 2.9 | 4.2 | 0.0 | 2.6 | 4.9 | 0.0 | 4.0 | 9.1 | 10.5 |
| LnGrp Delay(d),s/veh | 38.1 | 23.7 | 0.0 | 46.1 | 28.0 | 0.0 | 39.7 | 23.5 | 0.0 | 38.0 | 24.6 | 33.1 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 663 | | | 525 | | | 740 | | | 1683 | |
| Approach Delay, s/veh | | 31.2 | | | 32.0 | | | 28.3 | | | 29.6 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.8 | 30.2 | 10.9 | 27.9 | 11.6 | 33.3 | 14.9 | 23.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 9.9 | 12.0 | 7.3 | 7.8 | 7.1 | 23.7 | 10.2 | 10.4 |
| Green Ext Time (p_c), s | 0.8 | 10.9 | 0.2 | 5.1 | 0.5 | 5.4 | 0.8 | 4.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 30.0 |
| HCM 2010 LOS | C |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 145 | 284 | 44 | 124 | 475 | 190 | 14 | 330 | 98 | 300 | 420 | 315 |
| Future Volume (veh/h) | 145 | 284 | 44 | 124 | 475 | 190 | 14 | 330 | 98 | 300 | 420 | 315 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 169 | 330 | 39 | 144 | 552 | 177 | 16 | 384 | 91 | 349 | 488 | 268 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 206 | 1049 | 123 | 179 | 827 | 264 | 33 | 757 | 177 | 420 | 815 | 446 |
| Arrive On Green | 0.12 | 0.33 | 0.33 | 0.10 | 0.31 | 0.31 | 0.02 | 0.27 | 0.27 | 0.12 | 0.37 | 0.37 |
| Sat Flow, veh/h | 1774 | 3183 | 373 | 1774 | 2630 | 840 | 1774 | 2838 | 665 | 3442 | 2201 | 1203 |
| Grp Volume(v), veh/h | 169 | 182 | 187 | 144 | 371 | 358 | 16 | 238 | 237 | 349 | 392 | 364 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1787 | 1774 | 1770 | 1701 | 1774 | 1770 | 1734 | 1721 | 1770 | 1634 |
| Q Serve(g_s), s | 8.2 | 6.8 | 6.9 | 7.0 | 16.1 | 16.2 | 0.8 | 10.1 | 10.3 | 8.8 | 15.9 | 16.0 |
| Cycle Q Clear(g_c), s | 8.2 | 6.8 | 6.9 | 7.0 | 16.1 | 16.2 | 0.8 | 10.1 | 10.3 | 8.8 | 15.9 | 16.0 |
| Prop In Lane | 1.00 | | 0.21 | 1.00 | | 0.49 | 1.00 | | 0.38 | 1.00 | | 0.74 |
| Lane Grp Cap(c), veh/h | 206 | 583 | 589 | 179 | 556 | 535 | 33 | 472 | 463 | 420 | 656 | 605 |
| V/C Ratio(X) | 0.82 | 0.31 | 0.32 | 0.80 | 0.67 | 0.67 | 0.49 | 0.50 | 0.51 | 0.83 | 0.60 | 0.60 |
| Avail Cap(c_a), veh/h | 320 | 1218 | 1230 | 320 | 1218 | 1171 | 220 | 719 | 705 | 427 | 719 | 664 |
| 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 | 22.2 | 22.2 | 38.9 | 26.3 | 26.4 | 43.1 | 27.5 | 27.6 | 38.0 | 22.5 | 22.6 |
| Incr Delay (d2), s/veh | 9.2 | 0.3 | 0.3 | 8.1 | 1.4 | 1.5 | 11.0 | 0.8 | 0.9 | 12.9 | 1.2 | 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 | 4.6 | 3.4 | 3.5 | 3.8 | 8.0 | 7.8 | 0.5 | 5.0 | 5.1 | 4.9 | 7.9 | 7.4 |
| LnGrp Delay(d),s/veh | 47.5 | 22.5 | 22.6 | 47.0 | 27.7 | 27.8 | 54.1 | 28.3 | 28.5 | 50.9 | 23.7 | 23.9 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 538 | | | 873 | | | 491 | | | 1105 | |
| Approach Delay, s/veh | | 30.4 | | | 31.0 | | | 29.2 | | | 32.3 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.8 | 27.6 | 13.0 | 33.2 | 5.6 | 36.8 | 14.3 | 31.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 10.8 | 12.3 | 9.0 | 8.9 | 2.8 | 18.0 | 10.2 | 18.2 |
| Green Ext Time (p_c), s | 0.0 | 9.1 | 0.2 | 9.4 | 0.0 | 8.0 | 0.2 | 9.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 31.1 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.8 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 233 | 30 | 80 | 218 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 233 | 30 | 80 | 218 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 295 | 38 | 101 | 276 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.4 | 21 | 18.6 | 21.5 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 15% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 42% | 0% |
| Vol Thru, % | 85% | 80% | 0% | 100% | 57% | 0% | 100% | 39% | 58% | 73% |
| Vol Right, % | 0% | 20% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 27% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 137 | 147 | 80 | 53 | 47 | 50 | 167 | 213 | 189 | 149 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 117 | 117 | 0 | 53 | 27 | 0 | 167 | 83 | 109 | 109 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 173 | 185 | 101 | 68 | 59 | 63 | 211 | 270 | 239 | 189 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.433 | 0.453 | 0.285 | 0.18 | 0.152 | 0.162 | 0.509 | 0.618 | 0.595 | 0.448 |
| Departure Headway (Hd) | 9.023 | 8.803 | 10.117 | 9.595 | 9.282 | 9.201 | 8.683 | 8.241 | 8.956 | 8.551 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 399 | 410 | 355 | 374 | 386 | 390 | 416 | 437 | 404 | 421 |
| Service Time | 6.781 | 6.56 | 7.879 | 7.358 | 7.044 | 6.954 | 6.436 | 5.994 | 6.71 | 6.304 |
| HCM Lane V/C Ratio | 0.434 | 0.451 | 0.285 | 0.182 | 0.153 | 0.162 | 0.507 | 0.618 | 0.592 | 0.449 |
| HCM Control Delay | 18.5 | 18.7 | 16.9 | 14.5 | 13.7 | 13.7 | 20.1 | 23.5 | 24.1 | 18.1 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 2.1 | 2.3 | 1.2 | 0.6 | 0.5 | 0.6 | 2.8 | 4.1 | 3.7 | 2.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 609 | 40 | 110 | 777 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 609 | 40 | 110 | 777 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 700 | 0 | 126 | 893 | 90 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| Arrive On Green | 0.05 | 0.24 | 0.24 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 700 | 0 | 126 | 893 | 90 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 27.4 | 0.0 | 5.6 | 36.0 | 2.7 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 27.4 | 0.0 | 5.6 | 36.0 | 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 | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 830 | 701 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.86 | 0.00 | 0.79 | 1.08 | 0.13 |
| Avail Cap(c_a), veh/h | 176 | 922 | 779 | 176 | 922 | 784 | 426 | 830 | 706 | 220 | 830 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 37.9 | 25.3 | 23.7 | 38.2 | 29.1 | 0.0 | 36.1 | 20.5 | 0.0 | 36.0 | 22.4 | 13.2 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 8.9 | 0.0 | 12.7 | 53.7 | 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 | 1.8 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.2 | 16.0 | 0.0 | 3.3 | 30.6 | 1.2 |
| LnGrp Delay(d),s/veh | 51.4 | 25.7 | 23.7 | 47.9 | 31.7 | 0.0 | 39.3 | 29.4 | 0.0 | 48.8 | 76.1 | 13.2 |
| LnGrp LOS | D | C | C | D | C | | D | C | | D | F | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 895 | | | 1109 | |
| Approach Delay, s/veh | | 34.5 | | | 33.8 | | | 31.5 | | | 67.9 | |
| Approach LOS | | C | | | C | | | C | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 11.2 | 39.3 | 7.2 | 23.0 | 10.6 | 40.0 | 8.0 | 22.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | 7.6 | 29.4 | 4.1 | 6.5 | 6.5 | 38.0 | 5.1 | 14.5 |
| Green Ext Time (p_c), s | 0.1 | 5.0 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 47.8 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 96 | 40 | 554 | 195 | 407 | 20 | 470 | 247 | 706 | 990 | 180 |
| Future Volume (veh/h) | 50 | 96 | 40 | 554 | 195 | 407 | 20 | 470 | 247 | 706 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 99 | 0 | 571 | 201 | 0 | 21 | 485 | 0 | 728 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 67 | 435 | 136 | 693 | 1267 | 394 | 37 | 851 | 0 | 844 | 2301 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.22 | 0.27 | 0.00 | 0.02 | 0.25 | 0.00 | 0.26 | 0.49 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 99 | 0 | 571 | 201 | 0 | 21 | 485 | 0 | 728 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.8 | 1.7 | 0.0 | 15.2 | 2.9 | 0.0 | 1.1 | 10.9 | 0.0 | 19.3 | 12.6 | 0.0 |
| Cycle Q Clear(g_c), s | 2.8 | 1.7 | 0.0 | 15.2 | 2.9 | 0.0 | 1.1 | 10.9 | 0.0 | 19.3 | 12.6 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 67 | 435 | 136 | 693 | 1267 | 394 | 37 | 851 | 0 | 844 | 2301 | 0 |
| V/C Ratio(X) | 0.78 | 0.23 | 0.00 | 0.82 | 0.16 | 0.00 | 0.57 | 0.57 | 0.00 | 0.86 | 0.44 | 0.00 |
| Avail Cap(c_a), veh/h | 574 | 1909 | 595 | 1292 | 1909 | 595 | 563 | 1593 | 0 | 1113 | 2301 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.2 | 37.4 | 0.0 | 33.2 | 24.8 | 0.0 | 43.0 | 29.4 | 0.0 | 31.2 | 14.9 | 0.0 |
| Incr Delay (d2), s/veh | 17.3 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.2 | 0.6 | 0.0 | 5.6 | 0.1 | 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 | 1.6 | 0.8 | 0.0 | 6.9 | 1.3 | 0.0 | 0.6 | 3.5 | 0.0 | 9.2 | 5.4 | 0.0 |
| LnGrp Delay(d),s/veh | 59.5 | 37.7 | 0.0 | 35.7 | 24.9 | 0.0 | 56.2 | 30.0 | 0.0 | 36.8 | 15.0 | 0.0 |
| LnGrp LOS | E | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 151 | | | 772 | | | 506 | | | 1749 | |
| Approach Delay, s/veh | | 45.2 | | | 32.9 | | | 31.1 | | | 24.1 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 27.5 | 25.9 | 23.3 | 12.2 | 6.0 | 47.4 | 7.6 | 27.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 21.3 | 12.9 | 17.2 | 3.7 | 3.1 | 14.6 | 4.8 | 4.9 |
| Green Ext Time (p_c), s | 2.2 | 8.6 | 2.1 | 2.3 | 0.0 | 13.3 | 0.1 | 2.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.3 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 439 | 202 | 440 | 30 | 396 | 286 | 103 | 50 | 255 | 160 |
| Future Volume (veh/h) | 180 | 260 | 439 | 202 | 440 | 30 | 396 | 286 | 103 | 50 | 255 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 145 | 220 | 478 | 25 | 430 | 311 | 78 | 54 | 277 | 69 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 300 | 849 | 383 | 266 | 1548 | 80 | 270 | 930 | 229 | 81 | 634 | 155 |
| Arrive On Green | 0.09 | 0.25 | 0.25 | 0.15 | 0.31 | 0.31 | 0.15 | 0.33 | 0.33 | 0.05 | 0.23 | 0.23 |
| Sat Flow, veh/h | 3442 | 3390 | 1531 | 1774 | 4941 | 256 | 1774 | 2795 | 688 | 1774 | 2800 | 683 |
| Grp Volume(v), veh/h | 196 | 283 | 145 | 220 | 327 | 176 | 430 | 195 | 194 | 54 | 173 | 173 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1531 | 1774 | 1695 | 1807 | 1774 | 1770 | 1714 | 1774 | 1770 | 1714 |
| Q Serve(g_s), s | 4.0 | 4.9 | 5.7 | 8.7 | 5.3 | 5.4 | 11.0 | 6.0 | 6.2 | 2.2 | 6.1 | 6.3 |
| Cycle Q Clear(g_c), s | 4.0 | 4.9 | 5.7 | 8.7 | 5.3 | 5.4 | 11.0 | 6.0 | 6.2 | 2.2 | 6.1 | 6.3 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.40 | 1.00 | | 0.40 |
| Lane Grp Cap(c), veh/h | 300 | 849 | 383 | 266 | 1062 | 566 | 270 | 589 | 570 | 81 | 401 | 388 |
| V/C Ratio(X) | 0.65 | 0.33 | 0.38 | 0.83 | 0.31 | 0.31 | 1.59 | 0.33 | 0.34 | 0.67 | 0.43 | 0.45 |
| Avail Cap(c_a), veh/h | 761 | 1687 | 762 | 392 | 1687 | 899 | 270 | 881 | 853 | 270 | 881 | 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) | 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 | 32.0 | 22.2 | 22.5 | 29.8 | 18.9 | 18.9 | 30.7 | 18.1 | 18.2 | 34.0 | 24.0 | 24.1 |
| Incr Delay (d2), s/veh | 2.4 | 0.2 | 0.6 | 9.0 | 0.2 | 0.3 | 284.3 | 0.3 | 0.4 | 9.0 | 0.7 | 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 | 2.0 | 2.3 | 2.4 | 4.9 | 2.5 | 2.7 | 26.6 | 3.0 | 3.0 | 1.3 | 3.0 | 3.1 |
| LnGrp Delay(d),s/veh | 34.4 | 22.4 | 23.1 | 38.8 | 19.0 | 19.2 | 314.9 | 18.4 | 18.5 | 43.0 | 24.7 | 24.9 |
| LnGrp LOS | C | C | C | D | B | B | F | B | B | D | C | C |
| Approach Vol, veh/h | | 624 | | | 723 | | | 819 | | | 400 | |
| Approach Delay, s/veh | | 26.3 | | | 25.1 | | | 174.1 | | | 27.3 | |
| Approach LOS | | C | | | C | | | F | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.3 | 28.1 | 14.9 | 22.1 | 15.0 | 20.4 | 10.3 | 26.7 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 4.2 | 8.2 | 10.7 | 7.7 | 13.0 | 8.3 | 6.0 | 7.4 |
| Green Ext Time (p_c), s | 0.0 | 4.8 | 0.3 | 7.2 | 0.0 | 4.8 | 0.4 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 73.3 |
| HCM 2010 LOS | E |

| Intersection | |
|---|---|
| Int Delay, s/veh | 12.8 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 31 | 373 | 655 | 212 | 211 | 37 |
| Future Vol, veh/h | 31 | 373 | 655 | 212 | 211 | 37 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 37 | 449 | 789 | 255 | 254 | 45 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 799 | 0 | - | 0 | 1055 | 415 |
| Stage 1 | - | - | - | - | 799 | - |
| Stage 2 | - | - | - | - | 256 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 489 | - | - | - | 291 | 501 |
| Stage 1 | - | - | - | - | 320 | - |
| Stage 2 | - | - | - | - | 700 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 485 | - | - | - | 264 | 493 |
| Mov Cap-2 Maneuver | - | - | - | - | 264 | - |
| Stage 1 | - | - | - | - | 317 | - |
| Stage 2 | - | - | - | - | 641 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1 | 0 | 76.5 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 485 | - | - | - | 264 | 493 |
| HCM Lane V/C Ratio | 0.077 | - | - | - | 0.963 | 0.09 |
| HCM Control Delay (s) | 13 | - | - | - | 87.6 | 13 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 9.2 | 0.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 168 | 595 | 207 | 143 | 740 | 300 | 177 | 301 | 139 | 270 | 479 | 118 |
| Future Volume (veh/h) | 168 | 595 | 207 | 143 | 740 | 300 | 177 | 301 | 139 | 270 | 479 | 118 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.80 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 205 | 726 | 114 | 174 | 902 | 0 | 216 | 367 | 0 | 329 | 584 | 138 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 118 | 441 | 196 | 167 | 914 | 475 | 177 | 559 | 475 | 276 | 518 | 122 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.30 | 0.30 | 0.00 | 0.10 | 0.30 | 0.00 | 0.16 | 0.36 | 0.36 |
| Sat Flow, veh/h | 756 | 2838 | 1260 | 557 | 3047 | 1583 | 1774 | 1863 | 1583 | 1774 | 1456 | 344 |
| Grp Volume(v), veh/h | 495 | 436 | 114 | 573 | 503 | 0 | 216 | 367 | 0 | 329 | 0 | 722 |
| Grp Sat Flow(s),veh/h/ln | 1825 | 1770 | 1260 | 1835 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1801 |
| Q Serve(g_s), s | 28.0 | 28.0 | 15.1 | 54.0 | 50.0 | 0.0 | 18.0 | 30.9 | 0.0 | 28.0 | 0.0 | 64.0 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 15.1 | 54.0 | 50.0 | 0.0 | 18.0 | 30.9 | 0.0 | 28.0 | 0.0 | 64.0 |
| Prop In Lane | 0.41 | | 1.00 | 0.30 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.19 |
| Lane Grp Cap(c), veh/h | 284 | 275 | 196 | 550 | 531 | 475 | 177 | 559 | 475 | 276 | 0 | 640 |
| V/C Ratio(X) | 1.74 | 1.59 | 0.58 | 1.04 | 0.95 | 0.00 | 1.22 | 0.66 | 0.00 | 1.19 | 0.00 | 1.13 |
| Avail Cap(c_a), veh/h | 284 | 275 | 196 | 550 | 531 | 475 | 177 | 559 | 475 | 276 | 0 | 640 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 76.0 | 76.0 | 70.6 | 63.0 | 61.6 | 0.0 | 81.0 | 54.9 | 0.0 | 76.0 | 0.0 | 58.0 |
| Incr Delay (d2), s/veh | 348.3 | 280.1 | 4.3 | 49.5 | 26.4 | 0.0 | 138.1 | 5.9 | 0.0 | 116.5 | 0.0 | 76.2 |
| 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 | 41.6 | 35.1 | 5.5 | 34.9 | 28.3 | 0.0 | 15.6 | 16.8 | 0.0 | 22.7 | 0.0 | 45.4 |
| LnGrp Delay(d),s/veh | 424.3 | 356.1 | 74.9 | 112.5 | 88.0 | 0.0 | 219.1 | 60.9 | 0.0 | 192.5 | 0.0 | 134.2 |
| LnGrp LOS | F | F | E | F | F | | F | E | | F | | F |
| Approach Vol, veh/h | | 1045 | | | 1076 | | | 583 | | | 1051 | |
| Approach Delay, s/veh | | 357.7 | | | 101.1 | | | 119.5 | | | 152.5 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 58.0 | | 32.0 | 22.0 | 68.0 | | 58.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 30.0 | 32.9 | | 30.0 | 20.0 | 66.0 | | 56.0 |
| Green Ext Time (p_c), s | 0.0 | 7.9 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 189.7 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 58.2 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 14 | 535 | 304 | 3 | 346 | 370 |
| Future Vol, veh/h | 14 | 535 | 304 | 3 | 346 | 370 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 16 | 629 | 358 | 4 | 407 | 435 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 92 | 27 | 45.6 |
| HCM LOS | F | D | E |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 3% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 97% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 307 | 549 | 346 | 370 |
| LT Vol | 0 | 14 | 346 | 0 |
| Through Vol | 304 | 0 | 0 | 370 |
| RT Vol | 3 | 535 | 0 | 0 |
| Lane Flow Rate | 361 | 646 | 407 | 435 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.712 | 1.102 | 0.878 | 0.879 |
| Departure Headway (Hd) | 7.515 | 6.14 | 8.192 | 7.676 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 484 | 594 | 444 | 474 |
| Service Time | 5.515 | 4.17 | 5.892 | 5.376 |
| HCM Lane V/C Ratio | 0.746 | 1.088 | 0.917 | 0.918 |
| HCM Control Delay | 27 | 92 | 46.6 | 44.6 |
| HCM Lane LOS | D | F | E | E |
| HCM 95th-tile Q | 5.6 | 19.7 | 9.1 | 9.4 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 13.6 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 266 | 83 | 137 | 435 | 104 | 136 |
| Future Vol, veh/h | 266 | 83 | 137 | 435 | 104 | 136 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 296 | 92 | 152 | 483 | 116 | 151 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 395 | 0 | 1144 | 356 |
| Stage 1 | - | - | - | - | 349 | - |
| Stage 2 | - | - | - | - | 795 | - |
| 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 | - | - | 1164 | - | 221 | 688 |
| Stage 1 | - | - | - | - | 714 | - |
| Stage 2 | - | - | - | - | 445 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1157 | - | 179 | 680 |
| Mov Cap-2 Maneuver | - | - | - | - | 179 | - |
| Stage 1 | - | - | - | - | 710 | - |
| Stage 2 | - | - | - | - | 363 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.1 | 61 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 307 | - | - | 1157 | - |
| HCM Lane V/C Ratio | 0.869 | - | - | 0.132 | - |
| HCM Control Delay (s) | 61 | - | - | 8.6 | 0 |
| HCM Lane LOS | F | - | - | A | A |
| HCM 95th %tile Q(veh) | 7.8 | - | - | 0.5 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 431 | 10 | 10 | 587 | 20 | 20 |
| Future Vol, veh/h | 431 | 10 | 10 | 587 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 490 | 11 | 11 | 667 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 508 | 0 | 1199 | 509 |
| Stage 1 | - | - | - | - | 502 | - |
| Stage 2 | - | - | - | - | 697 | - |
| 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 | - | - | 1057 | - | 205 | 564 |
| Stage 1 | - | - | - | - | 608 | - |
| Stage 2 | - | - | - | - | 494 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1051 | - | 199 | 557 |
| Mov Cap-2 Maneuver | - | - | - | - | 199 | - |
| Stage 1 | - | - | - | - | 604 | - |
| Stage 2 | - | - | - | - | 483 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 19.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 293 | - | - | 1051 | - |
| HCM Lane V/C Ratio | 0.155 | - | - | 0.011 | - |
| HCM Control Delay (s) | 19.5 | - | - | 8.5 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.5 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 144 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 197 | 204 | 10 | 10 | 357 | 220 | 30 | 150 | 20 | 270 | 200 | 249 |
| Future Vol, veh/h | 197 | 204 | 10 | 10 | 357 | 220 | 30 | 150 | 20 | 270 | 200 | 249 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 216 | 224 | 11 | 11 | 392 | 242 | 33 | 165 | 22 | 297 | 220 | 274 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 31.8 | 336.6 | 20.3 | 85.3 |
| HCM LOS | D | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 38% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 73% | 0% |
| Vol Thru, % | 62% | 100% | 0% | 0% | 100% | 0% | 0% | 62% | 27% | 29% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 38% | 0% | 71% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 80 | 100 | 20 | 197 | 204 | 10 | 10 | 577 | 370 | 349 |
| LT Vol | 30 | 0 | 0 | 197 | 0 | 0 | 10 | 0 | 270 | 0 |
| Through Vol | 50 | 100 | 0 | 0 | 204 | 0 | 0 | 357 | 100 | 100 |
| RT Vol | 0 | 0 | 20 | 0 | 0 | 10 | 0 | 220 | 0 | 249 |
| Lane Flow Rate | 88 | 110 | 22 | 216 | 224 | 11 | 11 | 634 | 407 | 384 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.269 | 0.33 | 0.062 | 0.629 | 0.62 | 0.028 | 0.032 | 1.682 | 1.077 | 0.925 |
| Departure Headway (Hd) | 12.833 | 12.633 | 11.887 | 12.088 | 11.559 | 10.82 | 10.676 | 9.885 | 11.034 | 10.131 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 282 | 287 | 303 | 301 | 314 | 333 | 337 | 374 | 333 | 361 |
| Service Time | 10.533 | 10.333 | 9.587 | 9.788 | 9.259 | 8.52 | 8.376 | 7.585 | 8.734 | 7.831 |
| HCM Lane V/C Ratio | 0.312 | 0.383 | 0.073 | 0.718 | 0.713 | 0.033 | 0.033 | 1.695 | 1.222 | 1.064 |
| HCM Control Delay | 20.2 | 21.4 | 15.4 | 33.2 | 31.4 | 13.8 | 13.7 | 342.2 | 106.2 | 63.1 |
| HCM Lane LOS | C | C | C | D | D | B | B | F | F | F |
| HCM 95th-tile Q | 1.1 | 1.4 | 0.2 | 4 | 3.9 | 0.1 | 0.1 | 37.2 | 13.2 | 9.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 579 | 260 | 102 | 414 | 350 | 150 | 606 | 135 | 280 | 642 | 430 |
| Future Volume (veh/h) | 700 | 579 | 260 | 102 | 414 | 350 | 150 | 606 | 135 | 280 | 642 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 609 | 0 | 107 | 436 | 0 | 158 | 638 | 0 | 295 | 676 | 229 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 855 | 1385 | 620 | 135 | 776 | 908 | 226 | 1008 | 451 | 378 | 1214 | 497 |
| Arrive On Green | 0.25 | 0.39 | 0.00 | 0.08 | 0.22 | 0.00 | 0.07 | 0.28 | 0.00 | 0.11 | 0.33 | 0.33 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1525 |
| Grp Volume(v), veh/h | 737 | 609 | 0 | 107 | 436 | 0 | 158 | 638 | 0 | 295 | 676 | 229 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1525 |
| Q Serve(g_s), s | 23.3 | 14.4 | 0.0 | 6.7 | 12.5 | 0.0 | 5.1 | 17.9 | 0.0 | 9.2 | 17.0 | 13.5 |
| Cycle Q Clear(g_c), s | 23.3 | 14.4 | 0.0 | 6.7 | 12.5 | 0.0 | 5.1 | 17.9 | 0.0 | 9.2 | 17.0 | 13.5 |
| 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 | 855 | 1385 | 620 | 135 | 776 | 908 | 226 | 1008 | 451 | 378 | 1214 | 497 |
| V/C Ratio(X) | 0.86 | 0.44 | 0.00 | 0.79 | 0.56 | 0.00 | 0.70 | 0.63 | 0.00 | 0.78 | 0.56 | 0.46 |
| Avail Cap(c_a), veh/h | 3121 | 3583 | 1603 | 453 | 1277 | 1303 | 697 | 1901 | 850 | 906 | 2197 | 899 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 40.8 | 25.4 | 0.0 | 51.6 | 39.5 | 0.0 | 52.0 | 35.4 | 0.0 | 49.4 | 31.5 | 30.4 |
| Incr Delay (d2), s/veh | 2.7 | 0.2 | 0.0 | 9.8 | 0.6 | 0.0 | 3.9 | 0.7 | 0.0 | 3.5 | 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 | 11.4 | 7.1 | 0.0 | 3.7 | 6.2 | 0.0 | 2.6 | 8.8 | 0.0 | 4.7 | 8.8 | 5.8 |
| LnGrp Delay(d),s/veh | 43.5 | 25.6 | 0.0 | 61.4 | 40.1 | 0.0 | 55.9 | 36.1 | 0.0 | 53.0 | 31.9 | 31.0 |
| LnGrp LOS | D | C | | E | D | | E | D | | D | C | C |
| Approach Vol, veh/h | | 1346 | | | 543 | | | 796 | | | 1200 | |
| Approach Delay, s/veh | | 35.4 | | | 44.3 | | | 40.0 | | | 36.9 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 16.1 | 36.4 | 12.7 | 48.5 | 11.5 | 41.0 | 32.2 | 28.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 11.2 | 19.9 | 8.7 | 16.4 | 7.1 | 19.0 | 25.3 | 14.5 |
| Green Ext Time (p_c), s | 0.9 | 12.5 | 0.2 | 8.8 | 0.4 | 12.9 | 3.0 | 7.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.1 |
| HCM 2010 LOS | D |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 337 | 569 | 45 | 108 | 429 | 310 | 55 | 480 | 96 | 340 | 280 | 178 |
| Future Volume (veh/h) | 337 | 569 | 45 | 108 | 429 | 310 | 55 | 480 | 96 | 340 | 280 | 178 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 362 | 612 | 44 | 116 | 461 | 237 | 59 | 516 | 90 | 366 | 301 | 107 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 396 | 1292 | 93 | 145 | 547 | 279 | 76 | 776 | 135 | 449 | 888 | 309 |
| Arrive On Green | 0.22 | 0.39 | 0.39 | 0.08 | 0.24 | 0.24 | 0.04 | 0.26 | 0.26 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 1774 | 3342 | 240 | 1774 | 2235 | 1139 | 1774 | 3002 | 521 | 3442 | 2564 | 891 |
| Grp Volume(v), veh/h | 362 | 324 | 332 | 116 | 364 | 334 | 59 | 303 | 303 | 366 | 206 | 202 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1812 | 1774 | 1770 | 1604 | 1774 | 1770 | 1753 | 1721 | 1770 | 1686 |
| Q Serve(g_s), s | 22.3 | 15.4 | 15.4 | 7.2 | 21.9 | 22.3 | 3.7 | 17.2 | 17.4 | 11.6 | 9.6 | 10.0 |
| Cycle Q Clear(g_c), s | 22.3 | 15.4 | 15.4 | 7.2 | 21.9 | 22.3 | 3.7 | 17.2 | 17.4 | 11.6 | 9.6 | 10.0 |
| Prop In Lane | 1.00 | | 0.13 | 1.00 | | 0.71 | 1.00 | | 0.30 | 1.00 | | 0.53 |
| Lane Grp Cap(c), veh/h | 396 | 684 | 701 | 145 | 433 | 393 | 76 | 457 | 453 | 449 | 613 | 584 |
| V/C Ratio(X) | 0.91 | 0.47 | 0.47 | 0.80 | 0.84 | 0.85 | 0.78 | 0.66 | 0.67 | 0.81 | 0.34 | 0.35 |
| Avail Cap(c_a), veh/h | 506 | 684 | 701 | 317 | 474 | 429 | 127 | 584 | 579 | 768 | 852 | 812 |
| 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 | 42.5 | 25.8 | 25.8 | 50.6 | 40.3 | 40.4 | 53.1 | 37.2 | 37.3 | 47.4 | 27.1 | 27.2 |
| Incr Delay (d2), s/veh | 18.1 | 0.5 | 0.5 | 9.8 | 12.0 | 14.0 | 15.4 | 1.9 | 2.0 | 3.6 | 0.3 | 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 | 12.9 | 7.6 | 7.9 | 3.9 | 12.2 | 11.4 | 2.1 | 8.7 | 8.7 | 5.7 | 4.7 | 4.7 |
| LnGrp Delay(d),s/veh | 60.5 | 26.3 | 26.3 | 60.4 | 52.2 | 54.4 | 68.5 | 39.1 | 39.3 | 51.1 | 27.4 | 27.6 |
| LnGrp LOS | E | C | C | E | D | D | E | D | D | D | C | C |
| Approach Vol, veh/h | | 1018 | | | 814 | | | 665 | | | 774 | |
| Approach Delay, s/veh | | 38.5 | | | 54.3 | | | 41.8 | | | 38.6 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 18.6 | 33.0 | 13.1 | 47.4 | 8.8 | 42.8 | 29.1 | 31.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 13.6 | 19.4 | 9.2 | 17.4 | 5.7 | 12.0 | 24.3 | 24.3 |
| Green Ext Time (p_c), s | 1.0 | 6.3 | 0.2 | 10.3 | 0.0 | 8.2 | 0.7 | 2.6 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 43.1 |
| HCM 2010 LOS | | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 17.2 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 190 | 70 | 110 | 234 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 190 | 70 | 110 | 234 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 211 | 78 | 122 | 260 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 16.2 | 14.7 | 16.5 | 20.5 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 17% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 48% | 0% |
| Vol Thru, % | 83% | 58% | 0% | 100% | 81% | 0% | 100% | 44% | 52% | 80% |
| Vol Right, % | 0% | 42% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 20% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 115 | 165 | 90 | 167 | 103 | 80 | 93 | 107 | 227 | 147 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 95 | 95 | 0 | 167 | 83 | 0 | 93 | 47 | 117 | 117 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 128 | 183 | 100 | 185 | 115 | 89 | 104 | 119 | 252 | 163 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.311 | 0.426 | 0.253 | 0.442 | 0.27 | 0.232 | 0.255 | 0.278 | 0.602 | 0.372 |
| Departure Headway (Hd) | 8.756 | 8.366 | 9.114 | 8.597 | 8.457 | 9.386 | 8.867 | 8.459 | 8.588 | 8.198 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 411 | 431 | 394 | 419 | 425 | 383 | 405 | 424 | 421 | 439 |
| Service Time | 6.502 | 6.112 | 6.862 | 6.344 | 6.204 | 7.137 | 6.618 | 6.21 | 6.331 | 5.941 |
| HCM Lane V/C Ratio | 0.311 | 0.425 | 0.254 | 0.442 | 0.271 | 0.232 | 0.257 | 0.281 | 0.599 | 0.371 |
| HCM Control Delay | 15.4 | 17.2 | 14.9 | 18 | 14.3 | 15 | 14.6 | 14.5 | 23.6 | 15.7 |
| HCM Lane LOS | C | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.3 | 2.1 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.8 | 1.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 661 | 40 | 160 | 615 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 661 | 40 | 160 | 615 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 696 | 0 | 168 | 647 | 90 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 98 | 384 | 320 | 43 | 327 | 278 | 143 | 887 | 754 | 207 | 1027 | 868 |
| Arrive On Green | 0.06 | 0.21 | 0.21 | 0.02 | 0.18 | 0.00 | 0.04 | 0.48 | 0.00 | 0.12 | 0.55 | 0.55 |
| Sat Flow, veh/h | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1576 |
| Grp Volume(v), veh/h | 147 | 295 | 8 | 32 | 189 | 0 | 84 | 696 | 0 | 168 | 647 | 90 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1553 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1576 |
| Q Serve(g_s), s | 5.0 | 13.5 | 0.4 | 1.6 | 8.4 | 0.0 | 2.2 | 28.3 | 0.0 | 8.4 | 21.6 | 2.5 |
| Cycle Q Clear(g_c), s | 5.0 | 13.5 | 0.4 | 1.6 | 8.4 | 0.0 | 2.2 | 28.3 | 0.0 | 8.4 | 21.6 | 2.5 |
| 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 | 98 | 384 | 320 | 43 | 327 | 278 | 143 | 887 | 754 | 207 | 1027 | 868 |
| V/C Ratio(X) | 1.50 | 0.77 | 0.02 | 0.74 | 0.58 | 0.00 | 0.59 | 0.78 | 0.00 | 0.81 | 0.63 | 0.10 |
| Avail Cap(c_a), veh/h | 98 | 823 | 686 | 118 | 843 | 717 | 494 | 1933 | 1643 | 470 | 2159 | 1827 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 42.8 | 33.9 | 28.7 | 43.9 | 34.3 | 0.0 | 42.6 | 19.8 | 0.0 | 39.0 | 14.0 | 9.7 |
| Incr Delay (d2), s/veh | 271.2 | 3.3 | 0.0 | 21.5 | 1.6 | 0.0 | 3.8 | 1.6 | 0.0 | 7.5 | 0.6 | 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 | 9.8 | 7.3 | 0.2 | 1.0 | 4.5 | 0.0 | 1.1 | 14.9 | 0.0 | 4.5 | 11.1 | 1.1 |
| LnGrp Delay(d),s/veh | 314.0 | 37.2 | 28.7 | 65.3 | 35.9 | 0.0 | 46.4 | 21.4 | 0.0 | 46.5 | 14.6 | 9.7 |
| LnGrp LOS | F | D | C | E | D | | D | C | | D | B | A |
| Approach Vol, veh/h | | 450 | | | 221 | | | 780 | | | 905 | |
| Approach Delay, s/veh | | 127.4 | | | 40.2 | | | 24.1 | | | 20.1 | |
| Approach LOS | | F | | | D | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.6 | 47.1 | 6.2 | 22.7 | 7.8 | 53.9 | 9.0 | 19.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 10.4 | 30.3 | 3.6 | 15.5 | 4.2 | 23.6 | 7.0 | 10.4 |
| Green Ext Time (p_c), s | 0.3 | 12.8 | 0.0 | 3.2 | 0.1 | 13.0 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 43.8 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 525 | 40 | 258 | 340 | 543 | 70 | 1210 | 574 | 528 | 320 | 300 |
| Future Volume (veh/h) | 220 | 525 | 40 | 258 | 340 | 543 | 70 | 1210 | 574 | 528 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 565 | 0 | 277 | 366 | 0 | 75 | 1301 | 0 | 568 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1218 | 363 | 312 | 963 | 300 | 71 | 1453 | 0 | 576 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.26 | 0.00 | 0.10 | 0.20 | 0.00 | 0.04 | 0.40 | 0.00 | 0.18 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 565 | 0 | 277 | 366 | 0 | 75 | 1301 | 0 | 568 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 25.7 | 0.0 | 21.8 | 17.1 | 0.0 | 11.0 | 85.4 | 0.0 | 45.2 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 25.7 | 0.0 | 21.8 | 17.1 | 0.0 | 11.0 | 85.4 | 0.0 | 45.2 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1218 | 363 | 312 | 963 | 300 | 71 | 1453 | 0 | 576 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.46 | 0.00 | 0.89 | 0.38 | 0.00 | 1.06 | 0.90 | 0.00 | 0.99 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1218 | 363 | 802 | 963 | 300 | 71 | 1453 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 79.6 | 0.0 | 113.5 | 87.4 | 0.0 | 121.9 | 71.4 | 0.0 | 104.0 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.3 | 0.0 | 8.5 | 1.1 | 0.0 | 122.9 | 8.9 | 0.0 | 33.7 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 11.3 | 0.0 | 10.0 | 7.5 | 0.0 | 7.4 | 29.8 | 0.0 | 22.7 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 80.8 | 0.0 | 122.0 | 88.6 | 0.0 | 246.1 | 80.3 | 0.0 | 137.7 | 29.7 | 0.0 |
| LnGrp LOS | F | F | | F | F | | F | F | | F | C | |
| Approach Vol, veh/h | | 802 | | | 643 | | | 1376 | | | 912 | |
| Approach Delay, s/veh | | 99.6 | | | 103.0 | | | 89.3 | | | 97.0 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 50.0 | 106.0 | 28.9 | 69.8 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 47.2 | 87.4 | 23.8 | 27.7 | 13.0 | 12.3 | 38.4 | 19.1 |
| Green Ext Time (p_c), s | 0.0 | 9.9 | 1.0 | 2.4 | 0.0 | 23.3 | 0.3 | 8.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 95.8 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 308 | 188 | 380 | 40 | 361 | 309 | 231 | 90 | 247 | 200 |
| Future Volume (veh/h) | 310 | 700 | 308 | 188 | 380 | 40 | 361 | 309 | 231 | 90 | 247 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.98 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 263 | 198 | 400 | 34 | 380 | 325 | 149 | 95 | 260 | 102 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 416 | 1135 | 400 | 179 | 1376 | 115 | 408 | 940 | 421 | 81 | 535 | 204 |
| Arrive On Green | 0.12 | 0.31 | 0.31 | 0.10 | 0.29 | 0.29 | 0.23 | 0.40 | 0.40 | 0.05 | 0.21 | 0.21 |
| Sat Flow, veh/h | 3442 | 3682 | 1296 | 1774 | 4775 | 400 | 1774 | 2358 | 1056 | 1774 | 2491 | 949 |
| Grp Volume(v), veh/h | 326 | 678 | 322 | 198 | 282 | 152 | 380 | 242 | 232 | 95 | 182 | 180 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1587 | 1774 | 1695 | 1785 | 1774 | 1770 | 1644 | 1774 | 1770 | 1671 |
| Q Serve(g_s), s | 10.0 | 18.9 | 19.2 | 11.0 | 7.1 | 7.2 | 22.9 | 10.4 | 10.8 | 5.0 | 9.9 | 10.3 |
| Cycle Q Clear(g_c), s | 10.0 | 18.9 | 19.2 | 11.0 | 7.1 | 7.2 | 22.9 | 10.4 | 10.8 | 5.0 | 9.9 | 10.3 |
| Prop In Lane | 1.00 | | 0.82 | 1.00 | | 0.22 | 1.00 | | 0.64 | 1.00 | | 0.57 |
| Lane Grp Cap(c), veh/h | 416 | 1045 | 489 | 179 | 977 | 514 | 408 | 705 | 655 | 81 | 380 | 359 |
| V/C Ratio(X) | 0.78 | 0.65 | 0.66 | 1.11 | 0.29 | 0.30 | 0.93 | 0.34 | 0.35 | 1.17 | 0.48 | 0.50 |
| Avail Cap(c_a), veh/h | 1135 | 1428 | 669 | 179 | 1118 | 588 | 422 | 940 | 873 | 81 | 664 | 627 |
| 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 | 46.6 | 32.7 | 32.8 | 49.1 | 30.2 | 30.2 | 41.2 | 22.9 | 23.0 | 52.1 | 37.5 | 37.7 |
| Incr Delay (d2), s/veh | 3.3 | 0.7 | 1.5 | 99.2 | 0.2 | 0.3 | 27.1 | 0.3 | 0.3 | 152.7 | 0.9 | 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 | 4.9 | 8.9 | 8.6 | 10.3 | 3.3 | 3.6 | 14.3 | 5.1 | 5.0 | 5.9 | 4.9 | 4.9 |
| LnGrp Delay(d),s/veh | 49.9 | 33.3 | 34.3 | 148.3 | 30.3 | 30.6 | 68.4 | 23.2 | 23.3 | 204.8 | 38.5 | 38.8 |
| LnGrp LOS | D | C | C | F | C | C | E | C | C | F | D | D |
| Approach Vol, veh/h | | 1326 | | | 632 | | | 854 | | | 457 | |
| Approach Delay, s/veh | | 37.6 | | | 67.4 | | | 43.3 | | | 73.2 | |
| Approach LOS | | D | | | E | | | D | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 47.5 | 15.0 | 37.7 | 29.1 | 27.4 | 17.2 | 35.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 7.0 | 12.8 | 13.0 | 21.2 | 24.9 | 12.3 | 12.0 | 9.2 |
| Green Ext Time (p_c), s | 0.0 | 6.1 | 0.0 | 11.6 | 0.2 | 5.8 | 1.2 | 12.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 49.8 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Int Delay, s/veh | 10.4 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 49 | 962 | 506 | 171 | 232 | 42 |
| Future Vol, veh/h | 49 | 962 | 506 | 171 | 232 | 42 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 53 | 1034 | 544 | 184 | 249 | 45 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 545 | 0 | - | 0 | 1065 | 274 |
| Stage 1 | - | - | - | - | 545 | - |
| Stage 2 | - | - | - | - | 520 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 645 | - | - | - | 288 | 617 |
| Stage 1 | - | - | - | - | 454 | - |
| Stage 2 | - | - | - | - | 512 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 644 | - | - | - | 264 | 616 |
| Mov Cap-2 Maneuver | - | - | - | - | 264 | - |
| Stage 1 | - | - | - | - | 454 | - |
| Stage 2 | - | - | - | - | 469 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0 | 72.3 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 644 | - | - | - | 264 | 616 |
| HCM Lane V/C Ratio | 0.082 | - | - | - | 0.945 | 0.073 |
| HCM Control Delay (s) | 11.1 | - | - | - | 83.4 | 11.3 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.3 | - | - | - | 8.8 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 178 | 955 | 199 | 127 | 600 | 200 | 138 | 434 | 152 | 200 | 334 | 191 |
| Future Volume (veh/h) | 178 | 955 | 199 | 127 | 600 | 200 | 138 | 434 | 152 | 200 | 334 | 191 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 1073 | 140 | 143 | 674 | 0 | 155 | 488 | 0 | 225 | 375 | 202 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 113 | 639 | 328 | 126 | 625 | 330 | 72 | 658 | 559 | 244 | 513 | 276 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 541 | 3065 | 1576 | 603 | 3000 | 1583 | 1774 | 1863 | 1583 | 1774 | 1140 | 614 |
| Grp Volume(v), veh/h | 679 | 594 | 140 | 435 | 382 | 0 | 155 | 488 | 0 | 225 | 0 | 577 |
| Grp Sat Flow(s),veh/h/ln | 1836 | 1770 | 1576 | 1833 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1754 |
| Q Serve(g_s), s | 36.0 | 36.0 | 13.3 | 36.0 | 36.0 | 0.0 | 7.0 | 39.7 | 0.0 | 21.6 | 0.0 | 46.6 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 13.3 | 36.0 | 36.0 | 0.0 | 7.0 | 39.7 | 0.0 | 21.6 | 0.0 | 46.6 |
| Prop In Lane | 0.29 | | 1.00 | 0.33 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.35 |
| Lane Grp Cap(c), veh/h | 382 | 369 | 328 | 382 | 369 | 330 | 72 | 658 | 559 | 244 | 0 | 790 |
| V/C Ratio(X) | 1.78 | 1.61 | 0.43 | 1.14 | 1.04 | 0.00 | 2.16 | 0.74 | 0.00 | 0.92 | 0.00 | 0.73 |
| Avail Cap(c_a), veh/h | 382 | 369 | 328 | 382 | 369 | 330 | 72 | 658 | 559 | 267 | 0 | 790 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.4 | 68.4 | 59.4 | 68.4 | 68.4 | 0.0 | 82.9 | 49.0 | 0.0 | 73.6 | 0.0 | 38.9 |
| Incr Delay (d2), s/veh | 359.5 | 287.2 | 0.9 | 89.6 | 56.6 | 0.0 | 563.6 | 7.4 | 0.0 | 33.4 | 0.0 | 5.9 |
| 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 | 56.4 | 46.9 | 5.9 | 27.6 | 23.3 | 0.0 | 14.7 | 21.8 | 0.0 | 12.9 | 0.0 | 23.9 |
| LnGrp Delay(d),s/veh | 427.9 | 355.6 | 60.3 | 158.0 | 125.0 | 0.0 | 646.5 | 56.4 | 0.0 | 107.0 | 0.0 | 44.8 |
| LnGrp LOS | F | F | E | F | F | | F | E | | F | | D |
| Approach Vol, veh/h | | 1413 | | | 817 | | | 643 | | | 802 | |
| Approach Delay, s/veh | | 361.1 | | | 142.5 | | | 198.7 | | | 62.3 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.8 | 65.0 | | 40.0 | 11.0 | 81.8 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 41.7 | | 38.0 | 9.0 | 48.6 | | 38.0 |
| Green Ext Time (p_c), s | 0.2 | 7.2 | | 0.0 | 0.0 | 5.7 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 218.9 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 70.5 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 14 | 372 | 392 | 5 | 597 | 309 |
| Future Vol, veh/h | 14 | 372 | 392 | 5 | 597 | 309 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 396 | 417 | 5 | 635 | 329 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 23 | 27.2 | 109.8 |
| HCM LOS | C | D | F |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 4% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 96% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 397 | 386 | 597 | 309 |
| LT Vol | 0 | 14 | 597 | 0 |
| Through Vol | 392 | 0 | 0 | 309 |
| RT Vol | 5 | 372 | 0 | 0 |
| Lane Flow Rate | 422 | 411 | 635 | 329 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.753 | 0.7 | 1.264 | 0.608 |
| Departure Headway (Hd) | 6.67 | 6.403 | 7.166 | 6.655 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 545 | 567 | 508 | 542 |
| Service Time | 4.67 | 4.403 | 4.924 | 4.413 |
| HCM Lane V/C Ratio | 0.774 | 0.725 | 1.25 | 0.607 |
| HCM Control Delay | 27.2 | 23 | 156.7 | 19.3 |
| HCM Lane LOS | D | C | F | C |
| HCM 95th-tile Q | 6.6 | 5.5 | 25.7 | 4 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 539 | 73 | 113 | 311 | 66 | 131 |
| Future Vol, veh/h | 539 | 73 | 113 | 311 | 66 | 131 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 580 | 78 | 122 | 334 | 71 | 141 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 664 | 0 | 1208 | 631 |
| Stage 1 | - | - | - | - | 625 | - |
| Stage 2 | - | - | - | - | 583 | - |
| 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 | - | - | 925 | - | 202 | 481 |
| Stage 1 | - | - | - | - | 534 | - |
| Stage 2 | - | - | - | - | 558 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 920 | - | 167 | 476 |
| Mov Cap-2 Maneuver | - | - | - | - | 167 | - |
| Stage 1 | - | - | - | - | 531 | - |
| Stage 2 | - | - | - | - | 465 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.5 | 43.4 |
| HCM LOS | | | E |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 294 | - | - | 920 | - |
| HCM Lane V/C Ratio | 0.721 | - | - | 0.132 | - |
| HCM Control Delay (s) | 43.4 | - | - | 9.5 | 0 |
| HCM Lane LOS | E | - | - | A | A |
| HCM 95th %tile Q(veh) | 5.2 | - | - | 0.5 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 666 | 20 | 20 | 464 | 10 | 10 |
| Future Vol, veh/h | 666 | 20 | 20 | 464 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 701 | 21 | 21 | 488 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 727 | 0 | 1253 | 722 |
| Stage 1 | - | - | - | - | 717 | - |
| Stage 2 | - | - | - | - | 536 | - |
| 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 | - | 190 | 427 |
| Stage 1 | - | - | - | - | 484 | - |
| Stage 2 | - | - | - | - | 587 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 872 | - | 182 | 423 |
| Mov Cap-2 Maneuver | - | - | - | - | 182 | - |
| Stage 1 | - | - | - | - | 482 | - |
| Stage 2 | - | - | - | - | 565 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.4 | 20.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 254 | - | - | 872 | - |
| HCM Lane V/C Ratio | 0.083 | - | - | 0.024 | - |
| HCM Control Delay (s) | 20.5 | - | - | 9.2 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.3 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 146.3 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 223 | 462 | 10 | 30 | 314 | 200 | 10 | 230 | 80 | 310 | 130 | 210 |
| Future Vol, veh/h | 223 | 462 | 10 | 30 | 314 | 200 | 10 | 230 | 80 | 310 | 130 | 210 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 228 | 471 | 10 | 31 | 320 | 204 | 10 | 235 | 82 | 316 | 133 | 214 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 154.7 | 270.5 | 23.8 | 93.6 |
| HCM LOS | F | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 12% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 83% | 0% |
| Vol Thru, % | 88% | 100% | 0% | 0% | 100% | 0% | 0% | 61% | 17% | 24% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 39% | 0% | 76% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 87 | 153 | 80 | 223 | 462 | 10 | 30 | 514 | 375 | 275 |
| LT Vol | 10 | 0 | 0 | 223 | 0 | 0 | 30 | 0 | 310 | 0 |
| Through Vol | 77 | 153 | 0 | 0 | 462 | 0 | 0 | 314 | 65 | 65 |
| RT Vol | 0 | 0 | 80 | 0 | 0 | 10 | 0 | 200 | 0 | 210 |
| Lane Flow Rate | 88 | 156 | 82 | 228 | 471 | 10 | 31 | 524 | 383 | 281 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.277 | 0.487 | 0.239 | 0.689 | 1.362 | 0.028 | 0.096 | 1.539 | 1.137 | 0.761 |
| Departure Headway (Hd) | 13.264 | 13.202 | 12.453 | 12.362 | 11.833 | 11.092 | 12.119 | 11.314 | 12.31 | 11.311 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 272 | 275 | 291 | 294 | 311 | 325 | 298 | 325 | 298 | 323 |
| Service Time | 10.964 | 10.902 | 10.153 | 10.062 | 9.533 | 8.792 | 9.819 | 9.014 | 10.01 | 9.011 |
| HCM Lane V/C Ratio | 0.324 | 0.567 | 0.282 | 0.776 | 1.514 | 0.031 | 0.104 | 1.612 | 1.285 | 0.87 |
| HCM Control Delay | 21 | 27.8 | 19 | 38.5 | 213.8 | 14.1 | 16.1 | 285.4 | 131 | 42.5 |
| HCM Lane LOS | C | D | C | E | F | B | C | F | F | E |
| HCM 95th-tile Q | 1.1 | 2.5 | 0.9 | 4.7 | 21.1 | 0.1 | 0.3 | 28 | 13.9 | 5.9 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 320 | 290 | 132 | 108 | 378 | 240 | 205 | 517 | 113 | 320 | 785 | 690 |
| Future Volume (veh/h) | 320 | 290 | 132 | 108 | 378 | 240 | 205 | 517 | 113 | 320 | 785 | 690 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 348 | 315 | 0 | 117 | 411 | 0 | 223 | 562 | 0 | 348 | 905 | 444 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 449 | 999 | 447 | 150 | 836 | 1016 | 318 | 1115 | 499 | 455 | 1306 | 540 |
| Arrive On Green | 0.13 | 0.28 | 0.00 | 0.08 | 0.24 | 0.00 | 0.09 | 0.31 | 0.00 | 0.13 | 0.35 | 0.35 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1541 |
| Grp Volume(v), veh/h | 348 | 315 | 0 | 117 | 411 | 0 | 223 | 562 | 0 | 348 | 905 | 444 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1541 |
| Q Serve(g_s), s | 8.2 | 5.9 | 0.0 | 5.4 | 8.5 | 0.0 | 5.3 | 10.9 | 0.0 | 8.0 | 17.5 | 22.1 |
| Cycle Q Clear(g_c), s | 8.2 | 5.9 | 0.0 | 5.4 | 8.5 | 0.0 | 5.3 | 10.9 | 0.0 | 8.0 | 17.5 | 22.1 |
| 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 | 449 | 999 | 447 | 150 | 836 | 1016 | 318 | 1115 | 499 | 455 | 1306 | 540 |
| V/C Ratio(X) | 0.77 | 0.32 | 0.00 | 0.78 | 0.49 | 0.00 | 0.70 | 0.50 | 0.00 | 0.76 | 0.69 | 0.82 |
| Avail Cap(c_a), veh/h | 735 | 1513 | 677 | 379 | 1513 | 1548 | 776 | 1303 | 583 | 800 | 1371 | 567 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 35.4 | 23.8 | 0.0 | 37.8 | 27.8 | 0.0 | 37.1 | 23.5 | 0.0 | 35.5 | 23.5 | 24.9 |
| Incr Delay (d2), s/veh | 2.9 | 0.2 | 0.0 | 8.4 | 0.4 | 0.0 | 2.8 | 0.4 | 0.0 | 2.7 | 1.4 | 9.1 |
| 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 | 4.1 | 2.9 | 0.0 | 3.0 | 4.2 | 0.0 | 2.6 | 5.4 | 0.0 | 4.1 | 9.2 | 10.7 |
| LnGrp Delay(d),s/veh | 38.3 | 24.0 | 0.0 | 46.2 | 28.2 | 0.0 | 39.9 | 23.9 | 0.0 | 38.2 | 24.9 | 34.0 |
| LnGrp LOS | D | C | | D | C | | D | C | | D | C | C |
| Approach Vol, veh/h | | 663 | | | 528 | | | 785 | | | 1697 | |
| Approach Delay, s/veh | | 31.5 | | | 32.2 | | | 28.4 | | | 30.0 | |
| Approach LOS | | C | | | C | | | C | | | C | |
| **Timer** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 14.8 | 30.5 | 11.1 | 27.8 | 11.8 | 33.5 | 15.0 | 23.9 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | | | |
| Max Green Setting (Gmax), s | 19.0 | 31.0 | 18.0 | 36.0 | 19.0 | 31.0 | 18.0 | 36.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 10.0 | 12.9 | 7.4 | 7.9 | 7.3 | 24.1 | 10.2 | 10.5 | | | | |
| Green Ext Time (p_c), s | 0.8 | 10.9 | 0.2 | 5.0 | 0.5 | 5.2 | 0.8 | 4.9 | | | | |
| **Intersection Summary** | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | | | 30.3 | | | | | | | | | |
| HCM 2010 LOS | | | C | | | | | | | | | |
| **Notes** | | | | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 145 | 287 | 45 | 124 | 476 | 190 | 14 | 330 | 98 | 300 | 420 | 315 |
| Future Volume (veh/h) | 145 | 287 | 45 | 124 | 476 | 190 | 14 | 330 | 98 | 300 | 420 | 315 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.98 | 1.00 | | 0.99 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 169 | 334 | 39 | 144 | 553 | 177 | 16 | 384 | 91 | 349 | 488 | 268 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 206 | 1052 | 122 | 179 | 829 | 264 | 33 | 757 | 177 | 420 | 815 | 445 |
| Arrive On Green | 0.12 | 0.33 | 0.33 | 0.10 | 0.31 | 0.31 | 0.02 | 0.27 | 0.27 | 0.12 | 0.37 | 0.37 |
| Sat Flow, veh/h | 1774 | 3188 | 369 | 1774 | 2632 | 839 | 1774 | 2838 | 665 | 3442 | 2201 | 1203 |
| Grp Volume(v), veh/h | 169 | 184 | 189 | 144 | 371 | 359 | 16 | 238 | 237 | 349 | 392 | 364 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1788 | 1774 | 1770 | 1701 | 1774 | 1770 | 1734 | 1721 | 1770 | 1634 |
| Q Serve(g_s), s | 8.3 | 6.9 | 7.0 | 7.0 | 16.1 | 16.2 | 0.8 | 10.1 | 10.3 | 8.8 | 15.9 | 16.0 |
| Cycle Q Clear(g_c), s | 8.3 | 6.9 | 7.0 | 7.0 | 16.1 | 16.2 | 0.8 | 10.1 | 10.3 | 8.8 | 15.9 | 16.0 |
| Prop In Lane | 1.00 | | 0.21 | 1.00 | | 0.49 | 1.00 | | 0.38 | 1.00 | | 0.74 |
| Lane Grp Cap(c), veh/h | 206 | 584 | 590 | 179 | 557 | 536 | 33 | 472 | 462 | 420 | 655 | 605 |
| V/C Ratio(X) | 0.82 | 0.32 | 0.32 | 0.80 | 0.67 | 0.67 | 0.49 | 0.50 | 0.51 | 0.83 | 0.60 | 0.60 |
| Avail Cap(c_a), veh/h | 320 | 1217 | 1229 | 320 | 1217 | 1170 | 220 | 718 | 704 | 427 | 718 | 663 |
| 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 | 38.3 | 22.2 | 22.3 | 39.0 | 26.3 | 26.4 | 43.1 | 27.6 | 27.6 | 38.0 | 22.6 | 22.6 |
| Incr Delay (d2), s/veh | 9.3 | 0.3 | 0.3 | 8.1 | 1.4 | 1.5 | 11.0 | 0.8 | 0.9 | 12.9 | 1.2 | 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 | 4.6 | 3.4 | 3.5 | 3.8 | 8.1 | 7.8 | 0.5 | 5.1 | 5.1 | 4.9 | 7.9 | 7.4 |
| LnGrp Delay(d),s/veh | 47.6 | 22.5 | 22.6 | 47.1 | 27.7 | 27.8 | 54.1 | 28.4 | 28.5 | 51.0 | 23.8 | 23.9 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 542 | | | 874 | | | 491 | | | 1105 | |
| Approach Delay, s/veh | | 30.4 | | | 31.0 | | | 29.3 | | | 32.4 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.8 | 27.7 | 13.0 | 33.3 | 5.6 | 36.8 | 14.3 | 31.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 61.0 | 11.0 | 36.0 | 16.0 | 61.0 |
| Max Q Clear Time (g_c+I1), s | 10.8 | 12.3 | 9.0 | 9.0 | 2.8 | 18.0 | 10.3 | 18.2 |
| Green Ext Time (p_c), s | 0.0 | 9.1 | 0.2 | 9.5 | 0.0 | 8.0 | 0.2 | 9.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 31.1 |
| HCM 2010 LOS | C |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 19.9 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 235 | 30 | 80 | 219 | 40 |
| Future Vol, veh/h | 80 | 80 | 20 | 50 | 250 | 130 | 20 | 235 | 30 | 80 | 219 | 40 |
| Peak Hour Factor | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 101 | 101 | 25 | 63 | 316 | 165 | 25 | 297 | 38 | 101 | 277 | 51 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Righ | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 15.4 | 21.1 | 18.8 | 21.6 |
| HCM LOS | C | C | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 15% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 42% | 0% |
| Vol Thru, % | 85% | 80% | 0% | 100% | 57% | 0% | 100% | 39% | 58% | 73% |
| Vol Right, % | 0% | 20% | 0% | 0% | 43% | 0% | 0% | 61% | 0% | 27% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 138 | 148 | 80 | 53 | 47 | 50 | 167 | 213 | 190 | 150 |
| LT Vol | 20 | 0 | 80 | 0 | 0 | 50 | 0 | 0 | 80 | 0 |
| Through Vol | 118 | 118 | 0 | 53 | 27 | 0 | 167 | 83 | 110 | 110 |
| RT Vol | 0 | 30 | 0 | 0 | 20 | 0 | 0 | 130 | 0 | 40 |
| Lane Flow Rate | 174 | 187 | 101 | 68 | 59 | 63 | 211 | 270 | 240 | 189 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.437 | 0.457 | 0.285 | 0.18 | 0.153 | 0.162 | 0.51 | 0.619 | 0.598 | 0.45 |
| Departure Headway (Hd) | 9.033 | 8.815 | 10.136 | 9.614 | 9.301 | 9.218 | 8.7 | 8.258 | 8.968 | 8.563 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 399 | 409 | 354 | 373 | 385 | 389 | 414 | 437 | 403 | 420 |
| Service Time | 6.791 | 6.572 | 7.902 | 7.38 | 7.067 | 6.973 | 6.455 | 6.013 | 6.724 | 6.319 |
| HCM Lane V/C Ratio | 0.436 | 0.457 | 0.285 | 0.182 | 0.153 | 0.162 | 0.51 | 0.618 | 0.596 | 0.45 |
| HCM Control Delay | 18.7 | 18.8 | 16.9 | 14.5 | 13.8 | 13.8 | 20.2 | 23.6 | 24.3 | 18.2 |
| HCM Lane LOS | C | C | C | B | B | B | C | C | C | C |
| HCM 95th-tile Q | 2.2 | 2.3 | 1.2 | 0.6 | 0.5 | 0.6 | 2.8 | 4.1 | 3.8 | 2.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 655 | 40 | 110 | 796 | 160 |
| Future Volume (veh/h) | 60 | 110 | 30 | 40 | 270 | 150 | 170 | 655 | 40 | 110 | 796 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 753 | 0 | 126 | 915 | 92 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 831 | 702 |
| Arrive On Green | 0.05 | 0.24 | 0.24 | 0.04 | 0.22 | 0.00 | 0.08 | 0.44 | 0.00 | 0.09 | 0.45 | 0.45 |
| Sat Flow, veh/h | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Grp Volume(v), veh/h | 69 | 126 | 5 | 46 | 310 | 0 | 195 | 753 | 0 | 126 | 915 | 92 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1573 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1574 |
| Q Serve(g_s), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 30.9 | 0.0 | 5.6 | 36.1 | 2.8 |
| Cycle Q Clear(g_c), s | 3.1 | 4.5 | 0.2 | 2.1 | 12.5 | 0.0 | 4.5 | 30.9 | 0.0 | 5.6 | 36.1 | 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 | 89 | 438 | 370 | 71 | 419 | 356 | 280 | 815 | 693 | 159 | 831 | 702 |
| V/C Ratio(X) | 0.78 | 0.29 | 0.01 | 0.65 | 0.74 | 0.00 | 0.70 | 0.92 | 0.00 | 0.79 | 1.10 | 0.13 |
| Avail Cap(c_a), veh/h | 176 | 921 | 778 | 176 | 921 | 783 | 426 | 829 | 705 | 219 | 831 | 702 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 38.0 | 25.4 | 23.7 | 38.3 | 29.1 | 0.0 | 36.2 | 21.5 | 0.0 | 36.1 | 22.4 | 13.2 |
| Incr Delay (d2), s/veh | 13.5 | 0.4 | 0.0 | 9.7 | 2.6 | 0.0 | 3.1 | 15.7 | 0.0 | 12.8 | 62.9 | 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 | 1.8 | 2.4 | 0.1 | 1.2 | 6.8 | 0.0 | 2.2 | 19.2 | 0.0 | 3.3 | 32.7 | 1.2 |
| LnGrp Delay(d),s/veh | 51.4 | 25.7 | 23.7 | 47.9 | 31.7 | 0.0 | 39.3 | 37.2 | 0.0 | 48.8 | 85.3 | 13.3 |
| LnGrp LOS | D | C | C | D | C | | D | D | | D | F | B |
| Approach Vol, veh/h | | 200 | | | 356 | | | 948 | | | 1133 | |
| Approach Delay, s/veh | | 34.5 | | | 33.8 | | | 37.6 | | | 75.4 | |
| Approach LOS | | C | | | C | | | D | | | E | |
| **Timer** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 11.2 | 39.4 | 7.2 | 23.0 | 10.6 | 40.1 | 8.0 | 22.2 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | | | |
| Max Green Setting (Gmax), s | 10.0 | 36.0 | 8.0 | 40.0 | 10.0 | 36.0 | 8.0 | 40.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 7.6 | 32.9 | 4.1 | 6.5 | 6.5 | 38.1 | 5.1 | 14.5 | | | | |
| Green Ext Time (p_c), s | 0.1 | 2.5 | 0.0 | 3.0 | 0.2 | 0.0 | 0.0 | 2.8 | | | | |
| **Intersection Summary** | | | | | | | | | | | | |
| HCM 2010 Ctrl Delay | | | 53.1 | | | | | | | | | |
| HCM 2010 LOS | | | D | | | | | | | | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 98 | 40 | 573 | 201 | 418 | 20 | 470 | 253 | 717 | 990 | 180 |
| Future Volume (veh/h) | 50 | 98 | 40 | 573 | 201 | 418 | 20 | 470 | 253 | 717 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 101 | 0 | 591 | 207 | 0 | 21 | 485 | 0 | 739 | 1021 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 66 | 438 | 137 | 712 | 1300 | 405 | 37 | 827 | 0 | 852 | 2281 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.22 | 0.28 | 0.00 | 0.02 | 0.24 | 0.00 | 0.27 | 0.48 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 101 | 0 | 591 | 207 | 0 | 21 | 485 | 0 | 739 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 2.8 | 1.8 | 0.0 | 15.9 | 3.0 | 0.0 | 1.2 | 11.2 | 0.0 | 19.9 | 12.9 | 0.0 |
| Cycle Q Clear(g_c), s | 2.8 | 1.8 | 0.0 | 15.9 | 3.0 | 0.0 | 1.2 | 11.2 | 0.0 | 19.9 | 12.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 66 | 438 | 137 | 712 | 1300 | 405 | 37 | 827 | 0 | 852 | 2281 | 0 |
| V/C Ratio(X) | 0.78 | 0.23 | 0.00 | 0.83 | 0.16 | 0.00 | 0.57 | 0.59 | 0.00 | 0.87 | 0.45 | 0.00 |
| Avail Cap(c_a), veh/h | 566 | 1883 | 586 | 1275 | 1883 | 586 | 556 | 1571 | 0 | 1098 | 2281 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.9 | 37.9 | 0.0 | 33.4 | 24.7 | 0.0 | 43.6 | 30.3 | 0.0 | 31.5 | 15.3 | 0.0 |
| Incr Delay (d2), s/veh | 17.8 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.3 | 0.7 | 0.0 | 6.1 | 0.1 | 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 | 1.6 | 0.8 | 0.0 | 7.2 | 1.3 | 0.0 | 0.7 | 3.6 | 0.0 | 9.4 | 5.6 | 0.0 |
| LnGrp Delay(d),s/veh | 60.7 | 38.2 | 0.0 | 36.0 | 24.8 | 0.0 | 56.9 | 31.0 | 0.0 | 37.6 | 15.5 | 0.0 |
| LnGrp LOS | E | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 153 | | | 798 | | | 506 | | | 1760 | |
| Approach Delay, s/veh | | 45.8 | | | 33.1 | | | 32.1 | | | 24.8 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 28.1 | 25.6 | 24.1 | 12.4 | 6.0 | 47.6 | 7.6 | 28.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 21.9 | 13.2 | 17.9 | 3.8 | 3.2 | 14.9 | 4.8 | 5.0 |
| Green Ext Time (p_c), s | 2.2 | 8.0 | 2.2 | 2.3 | 0.0 | 13.2 | 0.1 | 2.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.0 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 458 | 205 | 440 | 30 | 432 | 300 | 105 | 50 | 260 | 160 |
| Future Volume (veh/h) | 180 | 260 | 458 | 205 | 440 | 30 | 432 | 300 | 105 | 50 | 260 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 155 | 223 | 478 | 25 | 470 | 326 | 81 | 54 | 283 | 76 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 298 | 857 | 387 | 269 | 1569 | 81 | 264 | 934 | 228 | 80 | 633 | 166 |
| Arrive On Green | 0.09 | 0.25 | 0.25 | 0.15 | 0.32 | 0.32 | 0.15 | 0.33 | 0.33 | 0.05 | 0.23 | 0.23 |
| Sat Flow, veh/h | 3442 | 3390 | 1532 | 1774 | 4941 | 256 | 1774 | 2800 | 684 | 1774 | 2752 | 723 |
| Grp Volume(v), veh/h | 196 | 283 | 155 | 223 | 327 | 176 | 470 | 204 | 203 | 54 | 180 | 179 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1532 | 1774 | 1695 | 1807 | 1774 | 1770 | 1715 | 1774 | 1770 | 1705 |
| Q Serve(g_s), s | 4.1 | 5.0 | 6.2 | 9.0 | 5.4 | 5.4 | 11.0 | 6.4 | 6.6 | 2.2 | 6.4 | 6.7 |
| Cycle Q Clear(g_c), s | 4.1 | 5.0 | 6.2 | 9.0 | 5.4 | 5.4 | 11.0 | 6.4 | 6.6 | 2.2 | 6.4 | 6.7 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.40 | 1.00 | | 0.42 |
| Lane Grp Cap(c), veh/h | 298 | 857 | 387 | 269 | 1077 | 574 | 264 | 590 | 572 | 80 | 407 | 392 |
| V/C Ratio(X) | 0.66 | 0.33 | 0.40 | 0.83 | 0.30 | 0.31 | 1.78 | 0.35 | 0.35 | 0.67 | 0.44 | 0.46 |
| Avail Cap(c_a), veh/h | 746 | 1654 | 747 | 385 | 1654 | 881 | 264 | 863 | 837 | 264 | 863 | 832 |
| 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 | 32.6 | 22.5 | 22.9 | 30.4 | 19.0 | 19.0 | 31.4 | 18.5 | 18.6 | 34.7 | 24.4 | 24.5 |
| Incr Delay (d2), s/veh | 2.5 | 0.2 | 0.7 | 9.9 | 0.2 | 0.3 | 364.8 | 0.3 | 0.4 | 9.3 | 0.8 | 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 | 2.0 | 2.4 | 2.7 | 5.1 | 2.5 | 2.7 | 32.1 | 3.2 | 3.2 | 1.3 | 3.2 | 3.2 |
| LnGrp Delay(d),s/veh | 35.1 | 22.7 | 23.6 | 40.3 | 19.2 | 19.3 | 396.2 | 18.9 | 19.0 | 44.0 | 25.1 | 25.3 |
| LnGrp LOS | D | C | C | D | B | B | F | B | B | D | C | C |
| Approach Vol, veh/h | | 634 | | | 726 | | | 877 | | | 413 | |
| Approach Delay, s/veh | | 26.8 | | | 25.7 | | | 221.1 | | | 27.7 | |
| Approach LOS | | C | | | C | | | F | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.3 | 28.6 | 15.2 | 22.7 | 15.0 | 21.0 | 10.4 | 27.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 11.0 | 36.0 | 16.0 | 36.0 | 11.0 | 36.0 | 16.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 4.2 | 8.6 | 11.0 | 8.2 | 13.0 | 8.7 | 6.1 | 7.4 |
| Green Ext Time (p_c), s | 0.0 | 5.1 | 0.3 | 7.3 | 0.0 | 5.1 | 0.4 | 7.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 90.9 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Int Delay, s/veh | 13.1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 31 | 374 | 658 | 214 | 212 | 37 |
| Future Vol, veh/h | 31 | 374 | 658 | 214 | 212 | 37 |
| Conflicting Peds, #/hr | 10 | 0 | 0 | 2 | 2 | 10 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 83 | 83 | 83 | 83 | 83 | 83 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 37 | 451 | 793 | 258 | 255 | 45 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 803 | 0 | - | 0 | 1060 | 416 |
| Stage 1 | - | - | - | - | 803 | - |
| Stage 2 | - | - | - | - | 257 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 487 | - | - | - | 290 | 500 |
| Stage 1 | - | - | - | - | 318 | - |
| Stage 2 | - | - | - | - | 700 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 483 | - | - | - | 263 | 492 |
| Mov Cap-2 Maneuver | - | - | - | - | 263 | - |
| Stage 1 | - | - | - | - | 315 | - |
| Stage 2 | - | - | - | - | 641 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1 | 0 | 78.4 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 483 | - | - | - | 263 | 492 |
| HCM Lane V/C Ratio | 0.077 | - | - | - | 0.971 | 0.091 |
| HCM Control Delay (s) | 13.1 | - | - | - | 89.8 | 13 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | - | - | - | 9.3 | 0.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 169 | 595 | 211 | 161 | 740 | 300 | 181 | 346 | 165 | 270 | 495 | 121 |
| Future Volume (veh/h) | 169 | 595 | 211 | 161 | 740 | 300 | 181 | 346 | 165 | 270 | 495 | 121 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.80 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 206 | 726 | 117 | 196 | 902 | 0 | 221 | 422 | 0 | 329 | 604 | 142 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 118 | 441 | 196 | 184 | 896 | 475 | 177 | 559 | 475 | 276 | 518 | 122 |
| Arrive On Green | 0.16 | 0.16 | 0.16 | 0.30 | 0.30 | 0.00 | 0.10 | 0.30 | 0.00 | 0.16 | 0.36 | 0.36 |
| Sat Flow, veh/h | 759 | 2835 | 1260 | 614 | 2987 | 1583 | 1774 | 1863 | 1583 | 1774 | 1458 | 343 |
| Grp Volume(v), veh/h | 495 | 437 | 117 | 584 | 514 | 0 | 221 | 422 | 0 | 329 | 0 | 746 |
| Grp Sat Flow(s),veh/h/ln | 1825 | 1770 | 1260 | 1832 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1801 |
| Q Serve(g_s), s | 28.0 | 28.0 | 15.6 | 54.0 | 51.5 | 0.0 | 18.0 | 36.9 | 0.0 | 28.0 | 0.0 | 64.0 |
| Cycle Q Clear(g_c), s | 28.0 | 28.0 | 15.6 | 54.0 | 51.5 | 0.0 | 18.0 | 36.9 | 0.0 | 28.0 | 0.0 | 64.0 |
| Prop In Lane | 0.42 | | 1.00 | 0.34 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.19 |
| Lane Grp Cap(c), veh/h | 284 | 275 | 196 | 550 | 531 | 475 | 177 | 559 | 475 | 276 | 0 | 640 |
| V/C Ratio(X) | 1.74 | 1.59 | 0.60 | 1.06 | 0.97 | 0.00 | 1.25 | 0.76 | 0.00 | 1.19 | 0.00 | 1.17 |
| Avail Cap(c_a), veh/h | 284 | 275 | 196 | 550 | 531 | 475 | 177 | 559 | 475 | 276 | 0 | 640 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 76.0 | 76.0 | 70.7 | 63.0 | 62.1 | 0.0 | 81.0 | 57.0 | 0.0 | 76.0 | 0.0 | 58.0 |
| Incr Delay (d2), s/veh | 349.2 | 280.8 | 4.9 | 56.3 | 30.8 | 0.0 | 148.8 | 9.2 | 0.0 | 116.5 | 0.0 | 90.5 |
| 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 | 41.6 | 35.2 | 5.7 | 35.9 | 29.8 | 0.0 | 16.2 | 20.4 | 0.0 | 22.7 | 0.0 | 47.9 |
| LnGrp Delay(d),s/veh | 425.2 | 356.8 | 75.6 | 119.3 | 92.9 | 0.0 | 229.8 | 66.2 | 0.0 | 192.5 | 0.0 | 148.5 |
| LnGrp LOS | F | F | E | F | F | | F | E | | F | | F |
| Approach Vol, veh/h | | 1049 | | | 1098 | | | 643 | | | 1075 | |
| Approach Delay, s/veh | | 357.7 | | | 107.0 | | | 122.4 | | | 162.0 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 32.0 | 58.0 | | 32.0 | 22.0 | 68.0 | | 58.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 28.0 | 54.0 | | 28.0 | 18.0 | 54.0 | | 54.0 |
| Max Q Clear Time (g_c+I1), s | 30.0 | 38.9 | | 30.0 | 20.0 | 66.0 | | 56.0 |
| Green Ext Time (p_c), s | 0.0 | 7.2 | | 0.0 | 0.0 | 0.0 | | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 192.9 |
| HCM 2010 LOS | | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 73.9 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 14 | 572 | 318 | 3 | 364 | 381 |
| Future Vol, veh/h | 14 | 572 | 318 | 3 | 364 | 381 |
| Peak Hour Factor | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 16 | 673 | 374 | 4 | 428 | 448 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |

| Approach | WB | NB | SB |
|---|---|---|---|
| Opposing Approach | | SB | NB |
| Opposing Lanes | 0 | 2 | 1 |
| Conflicting Approach Left | NB | | WB |
| Conflicting Lanes Left | 1 | 0 | 1 |
| Conflicting Approach Right | SB | WB | |
| Conflicting Lanes Right | 2 | 1 | 0 |
| HCM Control Delay | 125 | 30.5 | 52.4 |
| HCM LOS | F | D | F |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 2% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 98% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 321 | 586 | 364 | 381 |
| LT Vol | 0 | 14 | 364 | 0 |
| Through Vol | 318 | 0 | 0 | 381 |
| RT Vol | 3 | 572 | 0 | 0 |
| Lane Flow Rate | 378 | 689 | 428 | 448 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.75 | 1.193 | 0.922 | 0.901 |
| Departure Headway (Hd) | 7.746 | 6.228 | 8.475 | 7.957 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 472 | 586 | 433 | 457 |
| Service Time | 5.746 | 4.228 | 6.175 | 5.657 |
| HCM Lane V/C Ratio | 0.801 | 1.176 | 0.988 | 0.98 |
| HCM Control Delay | 30.5 | 125 | 55.5 | 49.4 |
| HCM Lane LOS | D | F | F | E |
| HCM 95th-tile Q | 6.3 | 24.5 | 10.2 | 9.9 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 16.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 284 | 83 | 135 | 472 | 104 | 135 |
| Future Vol, veh/h | 284 | 83 | 135 | 472 | 104 | 135 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 316 | 92 | 150 | 524 | 116 | 150 |

| Major/Minor | Major1 | | | Major2 | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 415 | 0 | 1200 | 376 |
| Stage 1 | - | - | - | - | 369 | - |
| Stage 2 | - | - | - | - | 831 | - |
| 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 | - | - | 1144 | - | 204 | 670 |
| Stage 1 | - | - | - | - | 699 | - |
| Stage 2 | - | - | - | - | 428 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1137 | - | 164 | 662 |
| Mov Cap-2 Maneuver | - | - | - | - | 164 | - |
| Stage 1 | - | - | - | - | 695 | - |
| Stage 2 | - | - | - | - | 346 | - |

| Approach | EB | | WB | | NB | |
|---|---|---|---|---|---|---|
| HCM Control Delay, s | 0 | | 1.9 | | 76.7 | |
| HCM LOS | | | | | F | |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 285 | - | - | 1137 | - |
| HCM Lane V/C Ratio | 0.932 | - | - | 0.132 | - |
| HCM Control Delay (s) | 76.7 | - | - | 8.6 | 0 |
| HCM Lane LOS | F | - | - | A | A |
| HCM 95th %tile Q(veh) | 8.8 | - | - | 0.5 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 448 | 10 | 10 | 621 | 20 | 20 |
| Future Vol, veh/h | 448 | 10 | 10 | 621 | 20 | 20 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 88 | 88 | 88 | 88 | 88 | 88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 509 | 11 | 11 | 706 | 23 | 23 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 527 | 0 | 1257 | 529 |
| Stage 1 | - | - | - | - | 522 | - |
| Stage 2 | - | - | - | - | 735 | - |
| 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 | - | - | 1040 | - | 189 | 550 |
| Stage 1 | - | - | - | - | 595 | - |
| Stage 2 | - | - | - | - | 474 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1034 | - | 184 | 544 |
| Mov Cap-2 Maneuver | - | - | - | - | 184 | - |
| Stage 1 | - | - | - | - | 592 | - |
| Stage 2 | - | - | - | - | 463 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 20.7 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 275 | - | - | 1034 | - |
| HCM Lane V/C Ratio | 0.165 | - | - | 0.011 | - |
| HCM Control Delay (s) | 20.7 | - | - | 8.5 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.6 | - | - | 0 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 171.4 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 265 | 217 | 10 | 13 | 367 | 220 | 30 | 157 | 24 | 270 | 206 | 282 |
| Future Vol, veh/h | 265 | 217 | 10 | 13 | 367 | 220 | 30 | 157 | 24 | 270 | 206 | 282 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 291 | 238 | 11 | 14 | 403 | 242 | 33 | 173 | 26 | 297 | 226 | 310 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 49.2 | 396.4 | 21.8 | 114.2 |
| HCM LOS | E | F | C | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 36% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 72% | 0% |
| Vol Thru, % | 64% | 100% | 0% | 0% | 100% | 0% | 0% | 63% | 28% | 27% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 37% | 0% | 73% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 82 | 105 | 24 | 265 | 217 | 10 | 13 | 587 | 373 | 385 |
| LT Vol | 30 | 0 | 0 | 265 | 0 | 0 | 13 | 0 | 270 | 0 |
| Through Vol | 52 | 105 | 0 | 0 | 217 | 0 | 0 | 367 | 103 | 103 |
| RT Vol | 0 | 0 | 24 | 0 | 0 | 10 | 0 | 220 | 0 | 282 |
| Lane Flow Rate | 90 | 115 | 26 | 291 | 238 | 11 | 14 | 645 | 410 | 423 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.287 | 0.359 | 0.077 | 0.862 | 0.673 | 0.029 | 0.043 | 1.822 | 1.131 | 1.067 |
| Departure Headway (Hd) | 13.477 | 13.282 | 12.532 | 12.631 | 12.101 | 11.359 | 11.248 | 10.459 | 11.721 | 10.801 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 269 | 273 | 288 | 288 | 300 | 317 | 320 | 355 | 312 | 338 |
| Service Time | 11.177 | 10.982 | 10.232 | 10.331 | 9.801 | 9.059 | 8.948 | 8.159 | 9.421 | 8.501 |
| HCM Lane V/C Ratio | 0.335 | 0.421 | 0.09 | 1.01 | 0.793 | 0.035 | 0.044 | 1.817 | 1.314 | 1.251 |
| HCM Control Delay | 21.5 | 23.2 | 16.3 | 60.9 | 36.5 | 14.4 | 14.5 | 404.9 | 126.6 | 102.2 |
| HCM Lane LOS | C | C | C | F | E | B | B | F | F | F |
| HCM 95th-tile Q | 1.2 | 1.6 | 0.2 | 7.5 | 4.5 | 0.1 | 0.1 | 41.1 | 14.2 | 13 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 700 | 579 | 267 | 118 | 414 | 350 | 155 | 635 | 151 | 280 | 683 | 430 |
| Future Volume (veh/h) | 700 | 579 | 267 | 118 | 414 | 350 | 155 | 635 | 151 | 280 | 683 | 430 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 737 | 609 | 0 | 124 | 436 | 0 | 163 | 668 | 0 | 295 | 719 | 245 |
| Adj No. of Lanes | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 851 | 1331 | 595 | 153 | 761 | 894 | 229 | 1046 | 468 | 375 | 1247 | 511 |
| Arrive On Green | 0.25 | 0.38 | 0.00 | 0.09 | 0.22 | 0.00 | 0.07 | 0.30 | 0.00 | 0.11 | 0.33 | 0.33 |
| Sat Flow, veh/h | 3442 | 3539 | 1583 | 1774 | 3539 | 2787 | 3442 | 3539 | 1583 | 3548 | 3725 | 1526 |
| Grp Volume(v), veh/h | 737 | 609 | 0 | 124 | 436 | 0 | 163 | 668 | 0 | 295 | 719 | 245 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1770 | 1583 | 1774 | 1770 | 1393 | 1721 | 1770 | 1583 | 1774 | 1863 | 1526 |
| Q Serve(g_s), s | 24.1 | 15.2 | 0.0 | 8.1 | 12.9 | 0.0 | 5.4 | 19.2 | 0.0 | 9.5 | 18.7 | 14.9 |
| Cycle Q Clear(g_c), s | 24.1 | 15.2 | 0.0 | 8.1 | 12.9 | 0.0 | 5.4 | 19.2 | 0.0 | 9.5 | 18.7 | 14.9 |
| 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 | 851 | 1331 | 595 | 153 | 761 | 894 | 229 | 1046 | 468 | 375 | 1247 | 511 |
| V/C Ratio(X) | 0.87 | 0.46 | 0.00 | 0.81 | 0.57 | 0.00 | 0.71 | 0.64 | 0.00 | 0.79 | 0.58 | 0.48 |
| Avail Cap(c_a), veh/h | 3019 | 3467 | 1551 | 438 | 1236 | 1268 | 674 | 1839 | 823 | 876 | 2126 | 871 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 42.3 | 27.6 | 0.0 | 52.7 | 41.2 | 0.0 | 53.7 | 35.9 | 0.0 | 51.2 | 32.2 | 31.0 |
| Incr Delay (d2), s/veh | 2.8 | 0.2 | 0.0 | 9.6 | 0.7 | 0.0 | 4.0 | 0.7 | 0.0 | 3.7 | 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 | 11.8 | 7.5 | 0.0 | 4.4 | 6.4 | 0.0 | 2.7 | 9.5 | 0.0 | 4.9 | 9.7 | 6.4 |
| LnGrp Delay(d),s/veh | 45.1 | 27.9 | 0.0 | 62.3 | 41.9 | 0.0 | 57.7 | 36.6 | 0.0 | 54.9 | 32.6 | 31.7 |
| LnGrp LOS | D | C | | E | D | | E | D | | D | C | C |
| Approach Vol, veh/h | | 1346 | | | 560 | | | 831 | | | 1259 | |
| Approach Delay, s/veh | | 37.3 | | | 46.4 | | | 40.7 | | | 37.7 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 16.4 | 38.7 | 14.2 | 48.1 | 11.8 | 43.3 | 33.0 | 29.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 29.0 | 61.0 | 29.0 | 115.0 | 23.0 | 67.0 | 103.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 11.5 | 21.2 | 10.1 | 17.2 | 7.4 | 20.7 | 26.1 | 14.9 |
| Green Ext Time (p_c), s | 0.9 | 13.4 | 0.3 | 8.8 | 0.4 | 14.0 | 3.0 | 7.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 39.4 |
| HCM 2010 LOS | D |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 337 | 573 | 46 | 108 | 433 | 310 | 57 | 480 | 96 | 340 | 280 | 178 |
| Future Volume (veh/h) | 337 | 573 | 46 | 108 | 433 | 310 | 57 | 480 | 96 | 340 | 280 | 178 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 362 | 616 | 45 | 116 | 466 | 238 | 61 | 516 | 90 | 366 | 301 | 107 |
| Adj No. of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 2 | 2 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 396 | 1291 | 94 | 145 | 549 | 278 | 79 | 776 | 135 | 449 | 884 | 307 |
| Arrive On Green | 0.22 | 0.39 | 0.39 | 0.08 | 0.25 | 0.25 | 0.04 | 0.26 | 0.26 | 0.13 | 0.34 | 0.34 |
| Sat Flow, veh/h | 1774 | 3338 | 243 | 1774 | 2240 | 1134 | 1774 | 3002 | 521 | 3442 | 2564 | 891 |
| Grp Volume(v), veh/h | 362 | 326 | 335 | 116 | 367 | 337 | 61 | 303 | 303 | 366 | 206 | 202 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1812 | 1774 | 1770 | 1605 | 1774 | 1770 | 1753 | 1721 | 1770 | 1686 |
| Q Serve(g_s), s | 22.3 | 15.5 | 15.6 | 7.2 | 22.2 | 22.5 | 3.8 | 17.2 | 17.4 | 11.6 | 9.7 | 10.0 |
| Cycle Q Clear(g_c), s | 22.3 | 15.5 | 15.6 | 7.2 | 22.2 | 22.5 | 3.8 | 17.2 | 17.4 | 11.6 | 9.7 | 10.0 |
| Prop In Lane | 1.00 | | 0.13 | 1.00 | | 0.71 | 1.00 | | 0.30 | 1.00 | | 0.53 |
| Lane Grp Cap(c), veh/h | 396 | 685 | 701 | 145 | 434 | 393 | 79 | 457 | 453 | 449 | 610 | 581 |
| V/C Ratio(X) | 0.91 | 0.48 | 0.48 | 0.80 | 0.85 | 0.86 | 0.78 | 0.66 | 0.67 | 0.81 | 0.34 | 0.35 |
| Avail Cap(c_a), veh/h | 506 | 685 | 701 | 316 | 473 | 429 | 127 | 584 | 578 | 767 | 852 | 812 |
| 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 | 42.5 | 25.8 | 25.9 | 50.6 | 40.3 | 40.5 | 53.1 | 37.2 | 37.3 | 47.4 | 27.3 | 27.4 |
| Incr Delay (d2), s/veh | 18.1 | 0.5 | 0.5 | 9.8 | 12.6 | 14.7 | 15.0 | 1.9 | 2.0 | 3.6 | 0.3 | 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 | 13.0 | 7.7 | 7.9 | 3.9 | 12.3 | 11.5 | 2.2 | 8.7 | 8.7 | 5.8 | 4.8 | 4.7 |
| LnGrp Delay(d),s/veh | 60.6 | 26.4 | 26.4 | 60.4 | 53.0 | 55.2 | 68.1 | 39.1 | 39.3 | 51.1 | 27.6 | 27.7 |
| LnGrp LOS | E | C | C | E | D | E | E | D | D | D | C | C |
| Approach Vol, veh/h | | 1023 | | | 820 | | | 667 | | | 774 | |
| Approach Delay, s/veh | | 38.5 | | | 54.9 | | | 41.8 | | | 38.7 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 18.6 | 33.0 | 13.1 | 47.4 | 9.0 | 42.7 | 29.1 | 31.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 37.0 | 20.0 | 42.0 | 8.0 | 54.0 | 32.0 | 30.0 |
| Max Q Clear Time (g_c+I1), s | 13.6 | 19.4 | 9.2 | 17.6 | 5.8 | 12.0 | 24.3 | 24.5 |
| Green Ext Time (p_c), s | 1.0 | 6.3 | 0.2 | 10.4 | 0.0 | 8.2 | 0.7 | 2.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 43.3 |
| HCM 2010 LOS | D |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 17.3 |
| Intersection LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 194 | 70 | 110 | 238 | 30 |
| Future Vol, veh/h | 90 | 250 | 20 | 80 | 140 | 60 | 20 | 194 | 70 | 110 | 238 | 30 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 100 | 278 | 22 | 89 | 156 | 67 | 22 | 216 | 78 | 122 | 264 | 33 |
| Number of Lanes | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 3 | 3 | 2 | 2 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 2 | 3 | 3 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 2 | 2 | 3 | 3 |
| HCM Control Delay | 16.3 | 14.7 | 16.7 | 20.7 |
| HCM LOS | C | B | C | C |

| Lane | NBLn1 | NBLn2 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | WBLn3 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 17% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 48% | 0% |
| Vol Thru, % | 83% | 58% | 0% | 100% | 81% | 0% | 100% | 44% | 52% | 80% |
| Vol Right, % | 0% | 42% | 0% | 0% | 19% | 0% | 0% | 56% | 0% | 20% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 117 | 167 | 90 | 167 | 103 | 80 | 93 | 107 | 229 | 149 |
| LT Vol | 20 | 0 | 90 | 0 | 0 | 80 | 0 | 0 | 110 | 0 |
| Through Vol | 97 | 97 | 0 | 167 | 83 | 0 | 93 | 47 | 119 | 119 |
| RT Vol | 0 | 70 | 0 | 0 | 20 | 0 | 0 | 60 | 0 | 30 |
| Lane Flow Rate | 130 | 186 | 100 | 185 | 115 | 89 | 104 | 119 | 254 | 166 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.317 | 0.433 | 0.254 | 0.444 | 0.271 | 0.233 | 0.257 | 0.28 | 0.609 | 0.378 |
| Departure Headway (Hd) | 8.781 | 8.396 | 9.158 | 8.64 | 8.5 | 9.431 | 8.912 | 8.504 | 8.614 | 8.228 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 410 | 429 | 393 | 417 | 423 | 381 | 403 | 423 | 420 | 437 |
| Service Time | 6.531 | 6.146 | 6.907 | 6.389 | 6.249 | 7.182 | 6.663 | 6.255 | 6.36 | 5.973 |
| HCM Lane V/C Ratio | 0.317 | 0.434 | 0.254 | 0.444 | 0.272 | 0.234 | 0.258 | 0.281 | 0.605 | 0.38 |
| HCM Control Delay | 15.6 | 17.4 | 15 | 18.1 | 14.4 | 15 | 14.7 | 14.5 | 23.9 | 15.9 |
| HCM Lane LOS | C | C | B | C | B | B | B | B | C | C |
| HCM 95th-tile Q | 1.3 | 2.1 | 1 | 2.2 | 1.1 | 0.9 | 1 | 1.1 | 3.9 | 1.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 711 | 40 | 160 | 678 | 170 |
| Future Volume (veh/h) | 140 | 280 | 40 | 30 | 180 | 100 | 80 | 711 | 40 | 160 | 678 | 170 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 147 | 295 | 7 | 32 | 189 | 0 | 84 | 748 | 0 | 168 | 714 | 98 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 88 | 374 | 312 | 42 | 326 | 277 | 140 | 936 | 796 | 203 | 1074 | 908 |
| Arrive On Green | 0.05 | 0.20 | 0.20 | 0.02 | 0.17 | 0.00 | 0.04 | 0.50 | 0.00 | 0.11 | 0.58 | 0.58 |
| Sat Flow, veh/h | 1774 | 1863 | 1552 | 1774 | 1863 | 1583 | 3442 | 1863 | 1583 | 1774 | 1863 | 1576 |
| Grp Volume(v), veh/h | 147 | 295 | 7 | 32 | 189 | 0 | 84 | 748 | 0 | 168 | 714 | 98 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1552 | 1774 | 1863 | 1583 | 1721 | 1863 | 1583 | 1774 | 1863 | 1576 |
| Q Serve(g_s), s | 5.0 | 15.2 | 0.4 | 1.8 | 9.4 | 0.0 | 2.4 | 33.7 | 0.0 | 9.3 | 26.6 | 2.8 |
| Cycle Q Clear(g_c), s | 5.0 | 15.2 | 0.4 | 1.8 | 9.4 | 0.0 | 2.4 | 33.7 | 0.0 | 9.3 | 26.6 | 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 | 88 | 374 | 312 | 42 | 326 | 277 | 140 | 936 | 796 | 203 | 1074 | 908 |
| V/C Ratio(X) | 1.67 | 0.79 | 0.02 | 0.77 | 0.58 | 0.00 | 0.60 | 0.80 | 0.00 | 0.83 | 0.66 | 0.11 |
| Avail Cap(c_a), veh/h | 88 | 738 | 615 | 105 | 757 | 643 | 443 | 1735 | 1475 | 422 | 1938 | 1640 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 48.0 | 38.3 | 32.4 | 49.0 | 38.2 | 0.0 | 47.6 | 20.9 | 0.0 | 43.7 | 14.7 | 9.7 |
| Incr Delay (d2), s/veh | 346.9 | 3.7 | 0.0 | 25.0 | 1.6 | 0.0 | 4.1 | 1.6 | 0.0 | 8.2 | 0.7 | 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 | 10.9 | 8.2 | 0.2 | 1.2 | 5.0 | 0.0 | 1.2 | 17.7 | 0.0 | 5.0 | 13.7 | 1.2 |
| LnGrp Delay(d),s/veh | 394.8 | 42.0 | 32.4 | 74.0 | 39.9 | 0.0 | 51.7 | 22.5 | 0.0 | 51.9 | 15.4 | 9.7 |
| LnGrp LOS | F | D | C | E | D | | D | C | | D | B | A |
| Approach Vol, veh/h | | 449 | | | 221 | | | 832 | | | 980 | |
| Approach Delay, s/veh | | 157.4 | | | 44.8 | | | 25.4 | | | 21.1 | |
| Approach LOS | | F | | | D | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 15.6 | 54.7 | 6.4 | 24.3 | 8.1 | 62.2 | 9.0 | 21.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 24.0 | 94.0 | 6.0 | 40.0 | 13.0 | 105.0 | 5.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | 11.3 | 35.7 | 3.8 | 17.2 | 4.4 | 28.6 | 7.0 | 11.4 |
| Green Ext Time (p_c), s | 0.3 | 15.0 | 0.0 | 3.1 | 0.1 | 15.4 | 0.0 | 3.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 49.3 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 533 | 40 | 271 | 345 | 589 | 70 | 1210 | 594 | 572 | 320 | 300 |
| Future Volume (veh/h) | 220 | 533 | 40 | 271 | 345 | 589 | 70 | 1210 | 594 | 572 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 573 | 0 | 291 | 371 | 0 | 75 | 1301 | 0 | 615 | 344 | 0 |
| Adj No. of Lanes | 1 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 250 | 1197 | 356 | 326 | 963 | 300 | 71 | 1453 | 0 | 576 | 2306 | 0 |
| Arrive On Green | 0.15 | 0.25 | 0.00 | 0.10 | 0.20 | 0.00 | 0.04 | 0.40 | 0.00 | 0.18 | 0.54 | 0.00 |
| Sat Flow, veh/h | 1645 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 573 | 0 | 291 | 371 | 0 | 75 | 1301 | 0 | 615 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1645 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 36.4 | 26.3 | 0.0 | 22.9 | 17.3 | 0.0 | 11.0 | 85.4 | 0.0 | 46.0 | 10.3 | 0.0 |
| Cycle Q Clear(g_c), s | 36.4 | 26.3 | 0.0 | 22.9 | 17.3 | 0.0 | 11.0 | 85.4 | 0.0 | 46.0 | 10.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 250 | 1197 | 356 | 326 | 963 | 300 | 71 | 1453 | 0 | 576 | 2306 | 0 |
| V/C Ratio(X) | 0.95 | 0.48 | 0.00 | 0.89 | 0.39 | 0.00 | 1.06 | 0.90 | 0.00 | 1.07 | 0.15 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 1197 | 356 | 802 | 963 | 300 | 71 | 1453 | 0 | 576 | 2306 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 107.0 | 80.7 | 0.0 | 112.9 | 87.5 | 0.0 | 121.9 | 71.4 | 0.0 | 104.4 | 29.6 | 0.0 |
| Incr Delay (d2), s/veh | 37.4 | 1.4 | 0.0 | 8.4 | 1.2 | 0.0 | 122.9 | 8.9 | 0.0 | 56.6 | 0.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 19.2 | 11.6 | 0.0 | 10.5 | 7.7 | 0.0 | 7.4 | 29.8 | 0.0 | 24.8 | 4.1 | 0.0 |
| LnGrp Delay(d),s/veh | 144.4 | 82.1 | 0.0 | 121.3 | 88.7 | 0.0 | 246.1 | 80.3 | 0.0 | 161.0 | 29.7 | 0.0 |
| LnGrp LOS | F | F | | F | F | | F | F | | F | C | |
| Approach Vol, veh/h | | 810 | | | 662 | | | 1376 | | | 959 | |
| Approach Delay, s/veh | | 100.3 | | | 103.0 | | | 89.3 | | | 113.9 | |
| Approach LOS | | F | | | F | | | F | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 50.0 | 106.0 | 30.0 | 68.7 | 15.0 | 141.0 | 42.7 | 56.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 46.0 | 102.0 | 64.0 | 32.0 | 11.0 | 137.0 | 44.0 | 52.0 |
| Max Q Clear Time (g_c+I1), s | 48.0 | 87.4 | 24.9 | 28.3 | 13.0 | 12.3 | 38.4 | 19.3 |
| Green Ext Time (p_c), s | 0.0 | 9.9 | 1.1 | 2.1 | 0.0 | 23.3 | 0.3 | 8.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 100.2 |
| HCM 2010 LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 378 | 193 | 380 | 40 | 424 | 325 | 237 | 90 | 267 | 200 |
| Future Volume (veh/h) | 310 | 700 | 378 | 193 | 380 | 40 | 424 | 325 | 237 | 90 | 267 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.98 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 323 | 203 | 400 | 34 | 446 | 342 | 157 | 95 | 281 | 110 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 413 | 1072 | 464 | 173 | 1378 | 115 | 409 | 954 | 429 | 79 | 546 | 208 |
| Arrive On Green | 0.12 | 0.31 | 0.31 | 0.10 | 0.29 | 0.29 | 0.23 | 0.41 | 0.41 | 0.04 | 0.22 | 0.22 |
| Sat Flow, veh/h | 3442 | 3445 | 1491 | 1774 | 4775 | 400 | 1774 | 2355 | 1058 | 1774 | 2491 | 950 |
| Grp Volume(v), veh/h | 326 | 725 | 335 | 203 | 282 | 152 | 446 | 255 | 244 | 95 | 197 | 194 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1546 | 1774 | 1695 | 1785 | 1774 | 1770 | 1644 | 1774 | 1770 | 1671 |
| Q Serve(g_s), s | 10.4 | 21.1 | 21.5 | 11.0 | 7.3 | 7.5 | 26.0 | 11.3 | 11.7 | 5.0 | 11.1 | 11.5 |
| Cycle Q Clear(g_c), s | 10.4 | 21.1 | 21.5 | 11.0 | 7.3 | 7.5 | 26.0 | 11.3 | 11.7 | 5.0 | 11.1 | 11.5 |
| Prop In Lane | 1.00 | | 0.96 | 1.00 | | 0.22 | 1.00 | | 0.64 | 1.00 | | 0.57 |
| Lane Grp Cap(c), veh/h | 413 | 1054 | 481 | 173 | 978 | 515 | 409 | 717 | 666 | 79 | 388 | 366 |
| V/C Ratio(X) | 0.79 | 0.69 | 0.70 | 1.17 | 0.29 | 0.29 | 1.09 | 0.36 | 0.37 | 1.21 | 0.51 | 0.53 |
| Avail Cap(c_a), veh/h | 1099 | 1383 | 631 | 173 | 1082 | 570 | 409 | 910 | 845 | 79 | 643 | 608 |
| 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 | 48.2 | 34.0 | 34.2 | 50.9 | 31.1 | 31.2 | 43.4 | 23.3 | 23.4 | 53.9 | 38.7 | 38.9 |
| Incr Delay (d2), s/veh | 3.4 | 0.9 | 2.2 | 122.7 | 0.2 | 0.3 | 71.1 | 0.3 | 0.3 | 167.7 | 1.0 | 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 | 5.1 | 10.0 | 9.5 | 11.2 | 3.4 | 3.7 | 20.7 | 5.6 | 5.3 | 6.1 | 5.5 | 5.4 |
| LnGrp Delay(d),s/veh | 51.6 | 35.0 | 36.4 | 173.6 | 31.3 | 31.5 | 114.5 | 23.6 | 23.8 | 221.6 | 39.7 | 40.1 |
| LnGrp LOS | D | C | D | F | C | C | F | C | C | F | D | D |
| Approach Vol, veh/h | | 1386 | | | 637 | | | 945 | | | 486 | |
| Approach Delay, s/veh | | 39.3 | | | 76.7 | | | 66.5 | | | 75.4 | |
| Approach LOS | | D | | | E | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.0 | 49.7 | 15.0 | 39.1 | 30.0 | 28.7 | 17.5 | 36.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 5.0 | 58.0 | 11.0 | 46.0 | 26.0 | 41.0 | 36.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 7.0 | 13.7 | 13.0 | 23.5 | 28.0 | 13.5 | 12.4 | 9.5 |
| Green Ext Time (p_c), s | 0.0 | 6.6 | 0.0 | 11.6 | 0.0 | 6.1 | 1.2 | 12.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 58.7 |
| HCM 2010 LOS | E |

| Intersection | |
|---|---|
| Int Delay, s/veh | 11.3 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 49 | 968 | 511 | 175 | 236 | 42 |
| Future Vol, veh/h | 49 | 968 | 511 | 175 | 236 | 42 |
| Conflicting Peds, #/hr | 1 | 0 | 0 | 1 | 1 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | Yield | - | Stop |
| Storage Length | 105 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 53 | 1041 | 549 | 188 | 254 | 45 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 550 | 0 | - | 0 | 1073 | 277 |
| Stage 1 | - | - | - | - | 550 | - |
| Stage 2 | - | - | - | - | 523 | - |
| Critical Hdwy | 5.34 | - | - | - | 5.74 | 7.14 |
| Critical Hdwy Stg 1 | - | - | - | - | 6.64 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 6.04 | - |
| Follow-up Hdwy | 3.12 | - | - | - | 3.82 | 3.92 |
| Pot Cap-1 Maneuver | 642 | - | - | - | 285 | 614 |
| Stage 1 | - | - | - | - | 451 | - |
| Stage 2 | - | - | - | - | 511 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 641 | - | - | - | 261 | 613 |
| Mov Cap-2 Maneuver | - | - | - | - | 261 | - |
| Stage 1 | - | - | - | - | 451 | - |
| Stage 2 | - | - | - | - | 468 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0 | 78.5 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 641 | - | - | - | 261 | 613 |
| HCM Lane V/C Ratio | 0.082 | - | - | - | 0.972 | 0.074 |
| HCM Control Delay (s) | 11.1 | - | - | - | 90.5 | 11.3 |
| HCM Lane LOS | B | - | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.3 | - | - | - | 9.3 | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 955 | 215 | 200 | 600 | 200 | 155 | 481 | 223 | 200 | 396 | 192 |
| Future Volume (veh/h) | 180 | 955 | 215 | 200 | 600 | 200 | 155 | 481 | 223 | 200 | 396 | 192 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 202 | 1073 | 150 | 225 | 674 | 0 | 174 | 540 | 0 | 225 | 445 | 205 |
| Adj No. of Lanes | 0 | 2 | 1 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 114 | 638 | 328 | 179 | 569 | 330 | 72 | 658 | 559 | 244 | 544 | 250 |
| Arrive On Green | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.00 | 0.04 | 0.35 | 0.00 | 0.14 | 0.45 | 0.45 |
| Sat Flow, veh/h | 545 | 3060 | 1576 | 858 | 2731 | 1583 | 1774 | 1863 | 1583 | 1774 | 1208 | 556 |
| Grp Volume(v), veh/h | 680 | 595 | 150 | 477 | 422 | 0 | 174 | 540 | 0 | 225 | 0 | 650 |
| Grp Sat Flow(s),veh/h/ln | 1835 | 1770 | 1576 | 1820 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1764 |
| Q Serve(g_s), s | 36.0 | 36.0 | 14.4 | 36.0 | 36.0 | 0.0 | 7.0 | 45.6 | 0.0 | 21.6 | 0.0 | 55.4 |
| Cycle Q Clear(g_c), s | 36.0 | 36.0 | 14.4 | 36.0 | 36.0 | 0.0 | 7.0 | 45.6 | 0.0 | 21.6 | 0.0 | 55.4 |
| Prop In Lane | 0.30 | | 1.00 | 0.47 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.32 |
| Lane Grp Cap(c), veh/h | 382 | 369 | 328 | 379 | 369 | 330 | 72 | 658 | 559 | 244 | 0 | 794 |
| V/C Ratio(X) | 1.78 | 1.61 | 0.46 | 1.26 | 1.14 | 0.00 | 2.42 | 0.82 | 0.00 | 0.92 | 0.00 | 0.82 |
| Avail Cap(c_a), veh/h | 382 | 369 | 328 | 379 | 369 | 330 | 72 | 658 | 559 | 267 | 0 | 794 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 68.4 | 68.4 | 59.8 | 68.4 | 68.4 | 0.0 | 82.9 | 50.9 | 0.0 | 73.6 | 0.0 | 41.4 |
| Incr Delay (d2), s/veh | 360.8 | 288.3 | 1.0 | 135.9 | 92.3 | 0.0 | 679.6 | 11.1 | 0.0 | 33.4 | 0.0 | 9.2 |
| 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 | 56.5 | 47.0 | 6.4 | 32.3 | 27.0 | 0.0 | 17.0 | 25.6 | 0.0 | 12.9 | 0.0 | 28.9 |
| LnGrp Delay(d),s/veh | 429.2 | 356.7 | 60.8 | 204.3 | 160.7 | 0.0 | 762.5 | 62.0 | 0.0 | 107.0 | 0.0 | 50.5 |
| LnGrp LOS | F | F | E | F | F | | F | E | | F | | D |
| Approach Vol, veh/h | | 1425 | | | 899 | | | 714 | | | 875 | |
| Approach Delay, s/veh | | 360.2 | | | 183.8 | | | 232.7 | | | 65.0 | |
| Approach LOS | | F | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 |
| Phs Duration (G+Y+Rc), s | 27.8 | 65.0 | | 40.0 | 11.0 | 81.8 | | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 61.0 | | 36.0 | 7.0 | 61.0 | | 36.0 |
| Max Q Clear Time (g_c+I1), s | 23.6 | 47.6 | | 38.0 | 9.0 | 57.4 | | 38.0 |
| Green Ext Time (p_c), s | 0.2 | 6.7 | | 0.0 | 0.0 | 2.4 | | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 230.4 |
| HCM 2010 LOS | F |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 106.3 |
| Intersection LOS | F |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 14 | 426 | 422 | 5 | 660 | 341 |
| Future Vol, veh/h | 14 | 426 | 422 | 5 | 660 | 341 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 453 | 449 | 5 | 702 | 363 |
| Number of Lanes | 1 | 0 | 1 | 0 | 1 | 1 |
| **Approach** | **WB** | | **NB** | | **SB** | |
| Opposing Approach | | | SB | | NB | |
| Opposing Lanes | 0 | | 2 | | 1 | |
| Conflicting Approach Left | NB | | | | WB | |
| Conflicting Lanes Left | 1 | | 0 | | 1 | |
| Conflicting Approach Right | SB | | WB | | | |
| Conflicting Lanes Right | 2 | | 1 | | 0 | |
| HCM Control Delay | 31.7 | | 36.8 | | 168.8 | |
| HCM LOS | D | | E | | F | |

| Lane | NBLn1 | WBLn1 | SBLn1 | SBLn2 |
|---|---|---|---|---|
| Vol Left, % | 0% | 3% | 100% | 0% |
| Vol Thru, % | 99% | 0% | 0% | 100% |
| Vol Right, % | 1% | 97% | 0% | 0% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 427 | 440 | 660 | 341 |
| LT Vol | 0 | 14 | 660 | 0 |
| Through Vol | 422 | 0 | 0 | 341 |
| RT Vol | 5 | 426 | 0 | 0 |
| Lane Flow Rate | 454 | 468 | 702 | 363 |
| Geometry Grp | 5 | 2 | 7 | 7 |
| Degree of Util (X) | 0.841 | 0.81 | 1.469 | 0.707 |
| Departure Headway (Hd) | 6.984 | 6.554 | 7.531 | 7.018 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 522 | 557 | 484 | 512 |
| Service Time | 4.984 | 4.554 | 5.304 | 4.791 |
| HCM Lane V/C Ratio | 0.87 | 0.84 | 1.45 | 0.709 |
| HCM Control Delay | 36.8 | 31.7 | 243 | 25.1 |
| HCM Lane LOS | E | D | F | D |
| HCM 95th-tile Q | 8.6 | 7.9 | 35.2 | 5.6 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.7 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 602 | 73 | 111 | 365 | 66 | 128 |
| Future Vol, veh/h | 602 | 73 | 111 | 365 | 66 | 128 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 647 | 78 | 119 | 392 | 71 | 138 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 732 | 0 | 1330 | 699 |
| Stage 1 | - | - | - | - | 693 | - |
| Stage 2 | - | - | - | - | 637 | - |
| 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 | - | - | 873 | - | 171 | 440 |
| Stage 1 | - | - | - | - | 496 | - |
| Stage 2 | - | - | - | - | 527 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 869 | - | 140 | 436 |
| Mov Cap-2 Maneuver | - | - | - | - | 140 | - |
| Stage 1 | - | - | - | - | 494 | - |
| Stage 2 | - | - | - | - | 433 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.3 | 61.8 |
| HCM LOS | | | F |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 254 | - | - | 869 | - |
| HCM Lane V/C Ratio | 0.821 | - | - | 0.137 | - |
| HCM Control Delay (s) | 61.8 | - | - | 9.8 | 0 |
| HCM Lane LOS | F | - | - | A | A |
| HCM 95th %tile Q(veh) | 6.5 | - | - | 0.5 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.5 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 726 | 20 | 20 | 517 | 10 | 10 |
| Future Vol, veh/h | 726 | 20 | 20 | 517 | 10 | 10 |
| Conflicting Peds, #/hr | 0 | 5 | 5 | 0 | 5 | 5 |
| 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 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 764 | 21 | 21 | 544 | 11 | 11 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 790 | 0 | 1371 | 785 |
| Stage 1 | - | - | - | - | 780 | - |
| Stage 2 | - | - | - | - | 591 | - |
| 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 | - | - | 830 | - | 161 | 393 |
| Stage 1 | - | - | - | - | 452 | - |
| Stage 2 | - | - | - | - | 553 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 827 | - | 154 | 390 |
| Mov Cap-2 Maneuver | - | - | - | - | 154 | - |
| Stage 1 | - | - | - | - | 450 | - |
| Stage 2 | - | - | - | - | 531 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.4 | 23 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 221 | - | - | 827 | - |
| HCM Lane V/C Ratio | 0.095 | - | - | 0.025 | - |
| HCM Control Delay (s) | 23 | - | - | 9.5 | 0 |
| HCM Lane LOS | C | - | - | A | A |
| HCM 95th %tile Q(veh) | 0.3 | - | - | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 207.5 |
| Intersection LOS | F |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 337 | 498 | 10 | 42 | 351 | 200 | 10 | 252 | 92 | 310 | 152 | 339 |
| Future Vol, veh/h | 337 | 498 | 10 | 42 | 351 | 200 | 10 | 252 | 92 | 310 | 152 | 339 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 344 | 508 | 10 | 43 | 358 | 204 | 10 | 257 | 94 | 316 | 155 | 346 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 2 | 3 | 2 | 3 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 2 | 3 | 3 | 2 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 3 | 2 | 2 | 3 |
| HCM Control Delay | 214.5 | 366 | 25.9 | 162.9 |
| HCM LOS | F | F | D | F |

| Lane | NBLn1 | NBLn2 | NBLn3 | EBLn1 | EBLn2 | EBLn3 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Vol Left, % | 11% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 80% | 0% |
| Vol Thru, % | 89% | 100% | 0% | 0% | 100% | 0% | 0% | 64% | 20% | 18% |
| Vol Right, % | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 36% | 0% | 82% |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 94 | 168 | 92 | 337 | 498 | 10 | 42 | 551 | 386 | 415 |
| LT Vol | 10 | 0 | 0 | 337 | 0 | 0 | 42 | 0 | 310 | 0 |
| Through Vol | 84 | 168 | 0 | 0 | 498 | 0 | 0 | 351 | 76 | 76 |
| RT Vol | 0 | 0 | 92 | 0 | 0 | 10 | 0 | 200 | 0 | 339 |
| Lane Flow Rate | 96 | 171 | 94 | 344 | 508 | 10 | 43 | 562 | 394 | 423 |
| Geometry Grp | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Degree of Util (X) | 0.313 | 0.557 | 0.287 | 1.08 | 1.525 | 0.029 | 0.145 | 1.781 | 1.233 | 1.212 |
| Departure Headway (Hd) | 13.286 | 13.229 | 12.482 | 13.381 | 12.85 | 12.106 | 13.074 | 12.29 | 13.277 | 12.248 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 272 | 274 | 290 | 275 | 290 | 298 | 276 | 304 | 276 | 301 |
| Service Time | 10.986 | 10.929 | 10.182 | 11.081 | 10.55 | 9.806 | 10.774 | 9.99 | 10.977 | 9.948 |
| HCM Lane V/C Ratio | 0.353 | 0.624 | 0.324 | 1.251 | 1.752 | 0.034 | 0.156 | 1.849 | 1.428 | 1.405 |
| HCM Control Delay | 21.9 | 31.4 | 20.1 | 116.7 | 284.6 | 15.2 | 18 | 392.5 | 169 | 157.3 |
| HCM Lane LOS | C | D | C | F | F | C | C | F | F | F |
| HCM 95th-tile Q | 1.3 | 3.1 | 1.2 | 11.9 | 24.8 | 0.1 | 0.5 | 34.3 | 15.8 | 16.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 100 | 40 | 602 | 211 | 391 | 20 | 470 | 259 | 640 | 990 | 180 |
| Future Volume (veh/h) | 50 | 100 | 40 | 602 | 211 | 391 | 20 | 470 | 259 | 640 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 103 | 0 | 621 | 218 | 0 | 21 | 485 | 0 | 660 | 1021 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 129 | 445 | 138 | 743 | 1352 | 421 | 37 | 877 | 0 | 774 | 2234 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.23 | 0.29 | 0.00 | 0.02 | 0.25 | 0.00 | 0.24 | 0.47 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 103 | 0 | 621 | 218 | 0 | 21 | 485 | 0 | 660 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 1.4 | 1.8 | 0.0 | 16.8 | 3.1 | 0.0 | 1.2 | 11.0 | 0.0 | 17.9 | 13.2 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 1.8 | 0.0 | 16.8 | 3.1 | 0.0 | 1.2 | 11.0 | 0.0 | 17.9 | 13.2 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 129 | 445 | 138 | 743 | 1352 | 421 | 37 | 877 | 0 | 774 | 2234 | 0 |
| V/C Ratio(X) | 0.40 | 0.23 | 0.00 | 0.84 | 0.16 | 0.00 | 0.57 | 0.55 | 0.00 | 0.85 | 0.46 | 0.00 |
| Avail Cap(c_a), veh/h | 1092 | 1874 | 583 | 1268 | 1874 | 583 | 553 | 1564 | 0 | 1092 | 2234 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.4 | 38.0 | 0.0 | 33.1 | 24.2 | 0.0 | 43.8 | 29.3 | 0.0 | 32.8 | 16.0 | 0.0 |
| Incr Delay (d2), s/veh | 2.0 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.4 | 0.5 | 0.0 | 4.8 | 0.1 | 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 | 0.8 | 0.0 | 7.7 | 1.4 | 0.0 | 0.7 | 3.5 | 0.0 | 8.4 | 5.7 | 0.0 |
| LnGrp Delay(d),s/veh | 44.4 | 38.2 | 0.0 | 35.7 | 24.2 | 0.0 | 57.2 | 29.9 | 0.0 | 37.5 | 16.2 | 0.0 |
| LnGrp LOS | D | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 155 | | | 839 | | | 506 | | | 1681 | |
| Approach Delay, s/veh | | 40.3 | | | 32.7 | | | 31.0 | | | 24.5 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 26.0 | 27.0 | 25.1 | 12.5 | 6.1 | 46.9 | 7.6 | 30.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 19.9 | 13.0 | 18.8 | 3.8 | 3.2 | 15.2 | 3.4 | 5.1 |
| Green Ext Time (p_c), s | 2.1 | 9.6 | 2.3 | 2.4 | 0.0 | 13.2 | 0.1 | 2.4 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2010 Ctrl Delay | | | 28.5 |
| HCM 2010 LOS | | | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR | | |
|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | |
| Traffic Volume (veh/h) | 33 | 346 | 561 | 216 | 212 | 34 | | |
| Future Volume (veh/h) | 33 | 346 | 561 | 216 | 212 | 34 | | |
| Number | 5 | 2 | 6 | 16 | 7 | 14 | | |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 | | |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | | |
| Adj Flow Rate, veh/h | 40 | 417 | 676 | 0 | 255 | 0 | | |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 | | |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | | |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | | |
| Cap, veh/h | 67 | 2739 | 1866 | 0 | 344 | 307 | | |
| Arrive On Green | 0.04 | 0.54 | 0.37 | 0.00 | 0.19 | 0.00 | | |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 | | |
| Grp Volume(v), veh/h | 40 | 417 | 676 | 0 | 255 | 0 | | |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 | | |
| Q Serve(g_s), s | 0.7 | 1.2 | 2.9 | 0.0 | 4.0 | 0.0 | | |
| Cycle Q Clear(g_c), s | 0.7 | 1.2 | 2.9 | 0.0 | 4.0 | 0.0 | | |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 | | |
| Lane Grp Cap(c), veh/h | 67 | 2739 | 1866 | 0 | 344 | 307 | | |
| V/C Ratio(X) | 0.60 | 0.15 | 0.36 | 0.00 | 0.74 | 0.00 | | |
| Avail Cap(c_a), veh/h | 297 | 4424 | 2893 | 0 | 950 | 848 | | |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | | |
| Uniform Delay (d), s/veh | 14.2 | 3.5 | 6.9 | 0.0 | 11.3 | 0.0 | | |
| Incr Delay (d2), s/veh | 8.2 | 0.0 | 0.1 | 0.0 | 3.2 | 0.0 | | |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.5 | 1.3 | 0.0 | 2.2 | 0.0 | | |
| LnGrp Delay(d),s/veh | 22.3 | 3.5 | 7.0 | 0.0 | 14.5 | 0.0 | | |
| LnGrp LOS | C | A | A | | B | | | |
| Approach Vol, veh/h | | 457 | 676 | | 255 | | | |
| Approach Delay, s/veh | | 5.1 | 7.0 | | 14.5 | | | |
| Approach LOS | | A | A | | B | | | |
| **Timer** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 20.1 | | 9.8 | 5.1 | 15.0 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.2 | | 6.0 | 2.7 | 4.9 | | |
| Green Ext Time (p_c), s | | 8.1 | | 0.5 | 0.0 | 5.8 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 7.8 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 203 | 93 | 686 | 300 | 179 | 378 | 153 | 270 | 476 | 94 |
| Future Volume (veh/h) | 164 | 579 | 203 | 93 | 686 | 300 | 179 | 378 | 153 | 270 | 476 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.88 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 706 | 31 | 113 | 837 | 0 | 218 | 461 | 0 | 329 | 580 | 109 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 229 | 1007 | 396 | 139 | 828 | 370 | 215 | 576 | 490 | 353 | 590 | 111 |
| Arrive On Green | 0.13 | 0.28 | 0.28 | 0.08 | 0.23 | 0.00 | 0.12 | 0.31 | 0.00 | 0.20 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3539 | 1390 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1525 | 287 |
| Grp Volume(v), veh/h | 200 | 706 | 31 | 113 | 837 | 0 | 218 | 461 | 0 | 329 | 0 | 689 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1390 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1811 |
| Q Serve(g_s), s | 13.7 | 22.1 | 2.0 | 7.8 | 29.0 | 0.0 | 15.0 | 28.2 | 0.0 | 22.6 | 0.0 | 46.7 |
| Cycle Q Clear(g_c), s | 13.7 | 22.1 | 2.0 | 7.8 | 29.0 | 0.0 | 15.0 | 28.2 | 0.0 | 22.6 | 0.0 | 46.7 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 229 | 1007 | 396 | 139 | 828 | 370 | 215 | 576 | 490 | 353 | 0 | 701 |
| V/C Ratio(X) | 0.87 | 0.70 | 0.08 | 0.81 | 1.01 | 0.00 | 1.02 | 0.80 | 0.00 | 0.93 | 0.00 | 0.98 |
| Avail Cap(c_a), veh/h | 315 | 1007 | 396 | 229 | 828 | 370 | 215 | 576 | 490 | 358 | 0 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 39.6 | 32.4 | 56.3 | 47.5 | 0.0 | 54.5 | 39.3 | 0.0 | 48.8 | 0.0 | 37.6 |
| Incr Delay (d2), s/veh | 17.8 | 2.2 | 0.1 | 10.9 | 34.1 | 0.0 | 65.6 | 11.1 | 0.0 | 30.6 | 0.0 | 30.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 7.9 | 11.1 | 0.8 | 4.2 | 18.1 | 0.0 | 11.2 | 16.3 | 0.0 | 14.1 | 0.0 | 29.2 |
| LnGrp Delay(d),s/veh | 70.8 | 41.8 | 32.5 | 67.2 | 81.5 | 0.0 | 120.2 | 50.5 | 0.0 | 79.5 | 0.0 | 67.6 |
| LnGrp LOS | E | D | C | E | F | | F | D | | E | | E |
| Approach Vol, veh/h | | 937 | | | 950 | | | 679 | | | 1018 | |
| Approach Delay, s/veh | | 47.7 | | | 79.8 | | | 72.8 | | | 71.4 | |
| Approach LOS | | D | | | E | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 28.7 | 42.3 | 13.7 | 39.3 | 19.0 | 52.0 | 20.0 | 33.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 38.0 | 16.0 | 35.0 | 15.0 | 48.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 24.6 | 30.2 | 9.8 | 24.1 | 17.0 | 48.7 | 15.7 | 31.0 |
| Green Ext Time (p_c), s | 0.0 | 4.5 | 0.1 | 7.3 | 0.0 | 0.0 | 0.3 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 67.7 |
| HCM 2010 LOS | E |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 282 | 206 | 10 | 12 | 318 | 220 | 30 | 159 | 25 | 270 | 203 | 190 |
| Future Volume (veh/h) | 282 | 206 | 10 | 12 | 318 | 220 | 30 | 159 | 25 | 270 | 203 | 190 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 310 | 226 | 6 | 13 | 349 | 219 | 33 | 175 | 0 | 297 | 223 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 343 | 1001 | 845 | 21 | 381 | 239 | 51 | 289 | 150 | 351 | 350 | 0 |
| Arrive On Green | 0.19 | 0.54 | 0.54 | 0.01 | 0.36 | 0.36 | 0.09 | 0.09 | 0.00 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1572 | 1774 | 1068 | 670 | 544 | 3061 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 310 | 226 | 6 | 13 | 0 | 568 | 111 | 97 | 0 | 297 | 223 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1572 | 1774 | 0 | 1738 | 1836 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 17.3 | 6.5 | 0.2 | 0.7 | 0.0 | 31.7 | 5.9 | 5.3 | 0.0 | 16.4 | 11.7 | 0.0 |
| Cycle Q Clear(g_c), s | 17.3 | 6.5 | 0.2 | 0.7 | 0.0 | 31.7 | 5.9 | 5.3 | 0.0 | 16.4 | 11.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.39 | 0.30 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 343 | 1001 | 845 | 21 | 0 | 620 | 173 | 167 | 150 | 351 | 350 | 0 |
| V/C Ratio(X) | 0.90 | 0.23 | 0.01 | 0.61 | 0.00 | 0.92 | 0.64 | 0.58 | 0.00 | 0.85 | 0.64 | 0.00 |
| Avail Cap(c_a), veh/h | 385 | 1047 | 883 | 70 | 0 | 668 | 326 | 314 | 281 | 437 | 436 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.0 | 12.3 | 10.9 | 49.9 | 0.0 | 31.2 | 44.3 | 44.0 | 0.0 | 39.2 | 37.3 | 0.0 |
| Incr Delay (d2), s/veh | 22.6 | 0.1 | 0.0 | 24.5 | 0.0 | 16.9 | 3.9 | 3.1 | 0.0 | 11.9 | 2.1 | 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 | 10.7 | 3.4 | 0.1 | 0.5 | 0.0 | 18.1 | 3.2 | 2.8 | 0.0 | 9.2 | 5.9 | 0.0 |
| LnGrp Delay(d),s/veh | 62.6 | 12.5 | 10.9 | 74.3 | 0.0 | 48.1 | 48.2 | 47.1 | 0.0 | 51.1 | 39.4 | 0.0 |
| LnGrp LOS | E | B | B | E | | D | D | D | | D | D | |
| Approach Vol, veh/h | | 542 | | | 581 | | | 208 | | | 520 | |
| Approach Delay, s/veh | | 41.1 | | | 48.6 | | | 47.7 | | | 46.1 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 13.6 | 5.2 | 58.5 | | 24.1 | 23.6 | 40.2 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 18.0 | 4.0 | 57.0 | | 25.0 | 22.0 | 39.0 |
| Max Q Clear Time (g_c+I1), s | | 7.9 | 2.7 | 8.5 | | 18.4 | 19.3 | 33.7 |
| Green Ext Time (p_c), s | | 0.8 | 0.0 | 6.9 | | 1.7 | 0.3 | 2.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 45.6 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 93 | 40 | 542 | 191 | 371 | 20 | 470 | 240 | 633 | 990 | 180 |
| Future Volume (veh/h) | 50 | 93 | 40 | 542 | 191 | 371 | 20 | 470 | 240 | 633 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 54 | 100 | 0 | 583 | 205 | 0 | 22 | 505 | 0 | 681 | 1065 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 98 | 1011 | 301 | 618 | 1780 | 554 | 33 | 928 | 0 | 719 | 1976 | 0 |
| Arrive On Green | 0.03 | 0.21 | 0.00 | 0.19 | 0.38 | 0.00 | 0.02 | 0.26 | 0.00 | 0.23 | 0.46 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 54 | 100 | 0 | 583 | 205 | 0 | 22 | 505 | 0 | 681 | 1065 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 2.4 | 2.5 | 0.0 | 26.1 | 4.1 | 0.0 | 1.9 | 17.4 | 0.0 | 30.4 | 25.8 | 0.0 |
| Cycle Q Clear(g_c), s | 2.4 | 2.5 | 0.0 | 26.1 | 4.1 | 0.0 | 1.9 | 17.4 | 0.0 | 30.4 | 25.8 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 98 | 1011 | 301 | 618 | 1780 | 554 | 33 | 928 | 0 | 719 | 1976 | 0 |
| V/C Ratio(X) | 0.55 | 0.10 | 0.00 | 0.94 | 0.12 | 0.00 | 0.66 | 0.54 | 0.00 | 0.95 | 0.54 | 0.00 |
| Avail Cap(c_a), veh/h | 243 | 1011 | 301 | 618 | 1780 | 554 | 125 | 928 | 0 | 728 | 1976 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 69.1 | 45.6 | 0.0 | 57.5 | 29.3 | 0.0 | 70.3 | 46.5 | 0.0 | 55.1 | 27.9 | 0.0 |
| Incr Delay (d2), s/veh | 4.8 | 0.2 | 0.0 | 23.2 | 0.1 | 0.0 | 19.9 | 2.3 | 0.0 | 21.2 | 1.1 | 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 | 1.1 | 0.0 | 13.5 | 1.8 | 0.0 | 1.1 | 6.0 | 0.0 | 15.5 | 10.4 | 0.0 |
| LnGrp Delay(d),s/veh | 73.9 | 45.8 | 0.0 | 80.7 | 29.4 | 0.0 | 90.3 | 48.8 | 0.0 | 76.3 | 29.0 | 0.0 |
| LnGrp LOS | E | D | | F | C | | F | D | | E | C | |
| Approach Vol, veh/h | | 154 | | | 788 | | | 527 | | | 1746 | |
| Approach Delay, s/veh | | 55.6 | | | 67.4 | | | 50.5 | | | 47.5 | |
| Approach LOS | | E | | | E | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 36.6 | 41.0 | 32.0 | 35.0 | 6.9 | 70.7 | 8.4 | 58.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 33.0 | 37.0 | 28.0 | 31.0 | 11.0 | 59.0 | 11.0 | 48.0 |
| Max Q Clear Time (g_c+I1), s | 32.4 | 19.4 | 28.1 | 4.5 | 3.9 | 27.8 | 4.4 | 6.1 |
| Green Ext Time (p_c), s | 0.2 | 10.8 | 0.0 | 2.2 | 0.0 | 15.2 | 0.1 | 2.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 53.2 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 22 | 345 | 561 | 210 | 210 | 31 |
| Future Volume (veh/h) | 22 | 345 | 561 | 210 | 210 | 31 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 24 | 371 | 603 | 0 | 226 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 43 | 2702 | 1827 | 0 | 308 | 275 |
| Arrive On Green | 0.02 | 0.53 | 0.36 | 0.00 | 0.17 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 24 | 371 | 603 | 0 | 226 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.4 | 1.0 | 2.3 | 0.0 | 3.3 | 0.0 |
| Cycle Q Clear(g_c), s | 0.4 | 1.0 | 2.3 | 0.0 | 3.3 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 43 | 2702 | 1827 | 0 | 308 | 275 |
| V/C Ratio(X) | 0.55 | 0.14 | 0.33 | 0.00 | 0.73 | 0.00 |
| Avail Cap(c_a), veh/h | 327 | 4880 | 3191 | 0 | 1048 | 935 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 13.1 | 3.2 | 6.3 | 0.0 | 10.6 | 0.0 |
| Incr Delay (d2), s/veh | 10.6 | 0.0 | 0.1 | 0.0 | 3.4 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.3 | 0.5 | 1.1 | 0.0 | 1.9 | 0.0 |
| LnGrp Delay(d),s/veh | 23.7 | 3.2 | 6.4 | 0.0 | 14.0 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 395 | 603 | | 226 | |
| Approach Delay, s/veh | | 4.5 | 6.4 | | 14.0 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 18.4 | | 8.7 | 4.7 | 13.7 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.0 | | 5.3 | 2.4 | 4.3 | | |
| Green Ext Time (p_c), s | | 7.2 | | 0.5 | 0.0 | 5.3 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 7.2 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 200 | 74 | 686 | 300 | 170 | 273 | 93 | 270 | 444 | 94 |
| Future Volume (veh/h) | 164 | 579 | 200 | 74 | 686 | 300 | 170 | 273 | 93 | 270 | 444 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 184 | 651 | 134 | 83 | 771 | 0 | 191 | 307 | 0 | 303 | 499 | 96 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 220 | 1064 | 474 | 107 | 839 | 375 | 159 | 535 | 455 | 340 | 591 | 114 |
| Arrive On Green | 0.12 | 0.30 | 0.30 | 0.06 | 0.24 | 0.00 | 0.09 | 0.29 | 0.00 | 0.19 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3539 | 1578 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1519 | 292 |
| Grp Volume(v), veh/h | 184 | 651 | 134 | 83 | 771 | 0 | 191 | 307 | 0 | 303 | 0 | 595 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1578 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1811 |
| Q Serve(g_s), s | 10.2 | 15.8 | 6.5 | 4.6 | 21.3 | 0.0 | 9.0 | 14.1 | 0.0 | 16.7 | 0.0 | 29.9 |
| Cycle Q Clear(g_c), s | 10.2 | 15.8 | 6.5 | 4.6 | 21.3 | 0.0 | 9.0 | 14.1 | 0.0 | 16.7 | 0.0 | 29.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 220 | 1064 | 474 | 107 | 839 | 375 | 159 | 535 | 455 | 340 | 0 | 705 |
| V/C Ratio(X) | 0.84 | 0.61 | 0.28 | 0.77 | 0.92 | 0.00 | 1.20 | 0.57 | 0.00 | 0.89 | 0.00 | 0.84 |
| Avail Cap(c_a), veh/h | 390 | 1064 | 474 | 283 | 848 | 379 | 159 | 535 | 455 | 460 | 0 | 705 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 42.9 | 30.0 | 26.8 | 46.4 | 37.3 | 0.0 | 45.6 | 30.5 | 0.0 | 39.4 | 0.0 | 27.8 |
| Incr Delay (d2), s/veh | 8.2 | 1.0 | 0.3 | 11.2 | 14.8 | 0.0 | 134.5 | 4.4 | 0.0 | 15.2 | 0.0 | 11.8 |
| 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 | 5.5 | 7.8 | 2.9 | 2.6 | 12.1 | 0.0 | 10.3 | 7.9 | 0.0 | 9.6 | 0.0 | 17.2 |
| LnGrp Delay(d),s/veh | 51.0 | 31.1 | 27.1 | 57.6 | 52.1 | 0.0 | 180.1 | 34.9 | 0.0 | 54.6 | 0.0 | 39.6 |
| LnGrp LOS | D | C | C | E | D | | F | C | | D | | D |
| Approach Vol, veh/h | | 969 | | | 854 | | | 498 | | | 898 | |
| Approach Delay, s/veh | | 34.3 | | | 52.6 | | | 90.6 | | | 44.7 | |
| Approach LOS | | C | | | D | | | F | | | D | |
| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 23.2 | 32.8 | 10.1 | 34.1 | 13.0 | 43.0 | 16.4 | 27.8 | | | | |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | | | |
| Max Green Setting (Gmax), s | 26.0 | 22.0 | 16.0 | 30.0 | 9.0 | 39.0 | 22.0 | 24.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 18.7 | 16.1 | 6.6 | 17.8 | 11.0 | 31.9 | 12.2 | 23.3 | | | | |
| Green Ext Time (p_c), s | 0.6 | 2.9 | 0.1 | 7.7 | 0.0 | 3.3 | 0.3 | 0.5 | | | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 50.8 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 116 | 171 | 10 | 10 | 306 | 220 | 30 | 150 | 20 | 270 | 200 | 138 |
| Future Volume (veh/h) | 116 | 171 | 10 | 10 | 306 | 220 | 30 | 150 | 20 | 270 | 200 | 138 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 118 | 174 | 4 | 10 | 312 | 194 | 31 | 153 | 0 | 276 | 204 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 153 | 765 | 641 | 18 | 360 | 224 | 58 | 306 | 160 | 363 | 362 | 0 |
| Arrive On Green | 0.09 | 0.41 | 0.41 | 0.01 | 0.34 | 0.34 | 0.10 | 0.10 | 0.00 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1560 | 1774 | 1074 | 668 | 578 | 3026 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 118 | 174 | 4 | 10 | 0 | 506 | 98 | 86 | 0 | 276 | 204 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1560 | 1774 | 0 | 1742 | 1834 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 3.8 | 3.6 | 0.1 | 0.3 | 0.0 | 16.0 | 3.0 | 2.7 | 0.0 | 8.6 | 6.1 | 0.0 |
| Cycle Q Clear(g_c), s | 3.8 | 3.6 | 0.1 | 0.3 | 0.0 | 16.0 | 3.0 | 2.7 | 0.0 | 8.6 | 6.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.38 | 0.31 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 153 | 765 | 641 | 18 | 0 | 584 | 186 | 179 | 160 | 363 | 362 | 0 |
| V/C Ratio(X) | 0.77 | 0.23 | 0.01 | 0.55 | 0.00 | 0.87 | 0.53 | 0.48 | 0.00 | 0.76 | 0.56 | 0.00 |
| Avail Cap(c_a), veh/h | 302 | 889 | 745 | 121 | 0 | 654 | 500 | 483 | 432 | 484 | 483 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 26.2 | 11.2 | 10.2 | 28.9 | 0.0 | 18.3 | 25.0 | 24.9 | 0.0 | 22.0 | 21.0 | 0.0 |
| Incr Delay (d2), s/veh | 8.0 | 0.1 | 0.0 | 23.4 | 0.0 | 11.0 | 2.3 | 2.0 | 0.0 | 4.9 | 1.4 | 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 | 2.2 | 1.9 | 0.0 | 0.3 | 0.0 | 9.4 | 1.6 | 1.4 | 0.0 | 4.7 | 3.1 | 0.0 |
| LnGrp Delay(d),s/veh | 34.3 | 11.4 | 10.2 | 52.3 | 0.0 | 29.2 | 27.4 | 26.9 | 0.0 | 26.8 | 22.3 | 0.0 |
| LnGrp LOS | C | B | B | D | | C | C | C | | C | C | |
| Approach Vol, veh/h | | 296 | | | 516 | | | 184 | | | 480 | |
| Approach Delay, s/veh | | 20.5 | | | 29.7 | | | 27.1 | | | 24.9 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 9.9 | 4.6 | 28.1 | | 16.0 | 9.1 | 23.7 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 16.0 | 4.0 | 28.0 | | 16.0 | 10.0 | 22.0 |
| Max Q Clear Time (g_c+I1), s | | 5.0 | 2.3 | 5.6 | | 10.6 | 5.8 | 18.0 |
| Green Ext Time (p_c), s | | 0.7 | 0.0 | 4.9 | | 1.4 | 0.1 | 1.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 26.0 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 97 | 40 | 572 | 201 | 381 | 20 | 470 | 250 | 637 | 990 | 180 |
| Future Volume (veh/h) | 50 | 97 | 40 | 572 | 201 | 381 | 20 | 470 | 250 | 637 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 100 | 0 | 590 | 207 | 0 | 21 | 485 | 0 | 657 | 1021 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 130 | 439 | 137 | 713 | 1300 | 405 | 37 | 901 | 0 | 774 | 2267 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.22 | 0.28 | 0.00 | 0.02 | 0.26 | 0.00 | 0.24 | 0.48 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 100 | 0 | 590 | 207 | 0 | 21 | 485 | 0 | 657 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 1.4 | 1.7 | 0.0 | 15.7 | 3.0 | 0.0 | 1.1 | 10.7 | 0.0 | 17.4 | 12.8 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 1.7 | 0.0 | 15.7 | 3.0 | 0.0 | 1.1 | 10.7 | 0.0 | 17.4 | 12.8 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 130 | 439 | 137 | 713 | 1300 | 405 | 37 | 901 | 0 | 774 | 2267 | 0 |
| V/C Ratio(X) | 0.40 | 0.23 | 0.00 | 0.83 | 0.16 | 0.00 | 0.57 | 0.54 | 0.00 | 0.85 | 0.45 | 0.00 |
| Avail Cap(c_a), veh/h | 1113 | 1911 | 595 | 1293 | 1911 | 595 | 564 | 1594 | 0 | 1113 | 2267 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 41.6 | 37.3 | 0.0 | 32.9 | 24.4 | 0.0 | 43.0 | 28.2 | 0.0 | 32.1 | 15.3 | 0.0 |
| Incr Delay (d2), s/veh | 2.0 | 0.3 | 0.0 | 2.5 | 0.1 | 0.0 | 13.2 | 0.5 | 0.0 | 4.4 | 0.1 | 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 | 0.8 | 0.0 | 7.1 | 1.3 | 0.0 | 0.6 | 3.5 | 0.0 | 8.1 | 5.5 | 0.0 |
| LnGrp Delay(d),s/veh | 43.5 | 37.6 | 0.0 | 35.4 | 24.4 | 0.0 | 56.2 | 28.7 | 0.0 | 36.5 | 15.4 | 0.0 |
| LnGrp LOS | D | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 152 | | | 797 | | | 506 | | | 1678 | |
| Approach Delay, s/veh | | 39.6 | | | 32.6 | | | 29.9 | | | 23.7 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 25.6 | 27.2 | 23.8 | 12.3 | 6.0 | 46.7 | 7.6 | 28.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 19.4 | 12.7 | 17.7 | 3.7 | 3.1 | 14.8 | 3.4 | 5.0 |
| Green Ext Time (p_c), s | 2.1 | 10.1 | 2.2 | 2.3 | 0.0 | 13.3 | 0.1 | 2.3 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 27.7 |
| HCM 2010 LOS | | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 373 | 105 | 440 | 30 | 393 | 292 | 79 | 50 | 179 | 160 |
| Future Volume (veh/h) | 180 | 260 | 373 | 105 | 440 | 30 | 393 | 292 | 79 | 50 | 179 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 130 | 114 | 478 | 24 | 427 | 317 | 65 | 54 | 195 | 27 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 304 | 1006 | 424 | 147 | 1407 | 70 | 577 | 931 | 188 | 87 | 625 | 85 |
| Arrive On Green | 0.09 | 0.29 | 0.29 | 0.08 | 0.28 | 0.28 | 0.17 | 0.32 | 0.32 | 0.05 | 0.20 | 0.20 |
| Sat Flow, veh/h | 3442 | 3478 | 1464 | 1774 | 4952 | 246 | 3442 | 2916 | 589 | 1774 | 3114 | 424 |
| Grp Volume(v), veh/h | 196 | 275 | 138 | 114 | 326 | 176 | 427 | 190 | 192 | 54 | 109 | 113 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1551 | 1774 | 1695 | 1808 | 1721 | 1770 | 1735 | 1774 | 1770 | 1769 |
| Q Serve(g_s), s | 3.4 | 3.9 | 4.3 | 3.9 | 4.7 | 4.8 | 7.3 | 5.1 | 5.2 | 1.8 | 3.2 | 3.4 |
| Cycle Q Clear(g_c), s | 3.4 | 3.9 | 4.3 | 3.9 | 4.7 | 4.8 | 7.3 | 5.1 | 5.2 | 1.8 | 3.2 | 3.4 |
| Prop In Lane | 1.00 | | 0.94 | 1.00 | | 0.14 | 1.00 | | 0.34 | 1.00 | | 0.24 |
| Lane Grp Cap(c), veh/h | 304 | 981 | 449 | 147 | 963 | 514 | 577 | 565 | 554 | 87 | 355 | 355 |
| V/C Ratio(X) | 0.64 | 0.28 | 0.31 | 0.77 | 0.34 | 0.34 | 0.74 | 0.34 | 0.35 | 0.62 | 0.31 | 0.32 |
| Avail Cap(c_a), veh/h | 558 | 1924 | 880 | 288 | 1924 | 1026 | 1004 | 1291 | 1266 | 259 | 1033 | 1032 |
| 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 | 27.2 | 16.9 | 17.1 | 27.7 | 17.5 | 17.5 | 24.4 | 16.0 | 16.1 | 28.8 | 21.0 | 21.1 |
| Incr Delay (d2), s/veh | 2.3 | 0.2 | 0.4 | 8.3 | 0.2 | 0.4 | 1.9 | 0.3 | 0.4 | 7.1 | 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 | 1.7 | 1.8 | 1.9 | 2.2 | 2.2 | 2.4 | 3.6 | 2.5 | 2.6 | 1.1 | 1.6 | 1.7 |
| LnGrp Delay(d),s/veh | 29.5 | 17.1 | 17.5 | 36.0 | 17.7 | 17.9 | 26.3 | 16.4 | 16.4 | 35.9 | 21.5 | 21.6 |
| LnGrp LOS | C | B | B | D | B | B | C | B | B | D | C | C |
| Approach Vol, veh/h | | 609 | | | 616 | | | 809 | | | 276 | |
| Approach Delay, s/veh | | 21.2 | | | 21.1 | | | 21.6 | | | 24.3 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.0 | 23.7 | 9.1 | 21.8 | 14.3 | 16.4 | 9.5 | 21.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 9.0 | 45.0 | 10.0 | 35.0 | 18.0 | 36.0 | 10.0 | 35.0 |
| Max Q Clear Time (g_c+I1), s | 3.8 | 7.2 | 5.9 | 6.3 | 9.3 | 5.4 | 5.4 | 6.8 |
| Green Ext Time (p_c), s | 0.0 | 4.0 | 0.1 | 7.1 | 1.1 | 3.9 | 0.3 | 7.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 21.7 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 33 | 346 | 561 | 213 | 211 | 34 |
| Future Volume (veh/h) | 33 | 346 | 561 | 213 | 211 | 34 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 40 | 417 | 676 | 0 | 254 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 67 | 2741 | 1867 | 0 | 342 | 306 |
| Arrive On Green | 0.04 | 0.54 | 0.37 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 40 | 417 | 676 | 0 | 254 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.7 | 1.2 | 2.9 | 0.0 | 4.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.7 | 1.2 | 2.9 | 0.0 | 4.0 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 67 | 2741 | 1867 | 0 | 342 | 306 |
| V/C Ratio(X) | 0.60 | 0.15 | 0.36 | 0.00 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 297 | 4429 | 2896 | 0 | 951 | 849 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.1 | 3.5 | 6.9 | 0.0 | 11.3 | 0.0 |
| Incr Delay (d2), s/veh | 8.2 | 0.0 | 0.1 | 0.0 | 3.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.5 | 1.3 | 0.0 | 2.2 | 0.0 |
| LnGrp Delay(d),s/veh | 22.3 | 3.5 | 7.0 | 0.0 | 14.5 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 457 | 676 | | 254 | |
| Approach Delay, s/veh | | 5.1 | 7.0 | | 14.5 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 20.1 | | 9.8 | 5.1 | 15.0 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.2 | | 6.0 | 2.7 | 4.9 | | |
| Green Ext Time (p_c), s | | 8.1 | | 0.5 | 0.0 | 5.8 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 7.8 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 201 | 84 | 686 | 300 | 174 | 305 | 123 | 270 | 455 | 94 |
| Future Volume (veh/h) | 164 | 579 | 201 | 84 | 686 | 300 | 174 | 305 | 123 | 270 | 455 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.88 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 706 | 28 | 102 | 837 | 0 | 212 | 372 | 0 | 329 | 555 | 109 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 232 | 1054 | 416 | 128 | 848 | 379 | 220 | 531 | 452 | 359 | 550 | 108 |
| Arrive On Green | 0.13 | 0.30 | 0.30 | 0.07 | 0.24 | 0.00 | 0.12 | 0.29 | 0.00 | 0.20 | 0.36 | 0.36 |
| Sat Flow, veh/h | 1774 | 3539 | 1397 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1512 | 297 |
| Grp Volume(v), veh/h | 200 | 706 | 28 | 102 | 837 | 0 | 212 | 372 | 0 | 329 | 0 | 664 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1397 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1809 |
| Q Serve(g_s), s | 12.5 | 19.7 | 1.6 | 6.4 | 26.6 | 0.0 | 13.4 | 20.1 | 0.0 | 20.5 | 0.0 | 41.0 |
| Cycle Q Clear(g_c), s | 12.5 | 19.7 | 1.6 | 6.4 | 26.6 | 0.0 | 13.4 | 20.1 | 0.0 | 20.5 | 0.0 | 41.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 232 | 1054 | 416 | 128 | 848 | 379 | 220 | 531 | 452 | 359 | 0 | 658 |
| V/C Ratio(X) | 0.86 | 0.67 | 0.07 | 0.79 | 0.99 | 0.00 | 0.96 | 0.70 | 0.00 | 0.92 | 0.00 | 1.01 |
| Avail Cap(c_a), veh/h | 346 | 1054 | 416 | 252 | 848 | 379 | 220 | 531 | 452 | 409 | 0 | 658 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 48.0 | 34.7 | 28.4 | 51.5 | 42.7 | 0.0 | 49.1 | 36.0 | 0.0 | 44.0 | 0.0 | 35.9 |
| Incr Delay (d2), s/veh | 13.5 | 1.6 | 0.1 | 10.5 | 27.7 | 0.0 | 49.8 | 7.5 | 0.0 | 23.3 | 0.0 | 37.4 |
| 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 | 7.0 | 9.9 | 0.6 | 3.5 | 16.2 | 0.0 | 9.6 | 11.4 | 0.0 | 12.4 | 0.0 | 27.1 |
| LnGrp Delay(d),s/veh | 61.5 | 36.4 | 28.4 | 62.0 | 70.4 | 0.0 | 99.0 | 43.5 | 0.0 | 67.4 | 0.0 | 73.3 |
| LnGrp LOS | E | D | C | E | E | | F | D | | E | | F |
| Approach Vol, veh/h | | 934 | | | 939 | | | 584 | | | 993 | |
| Approach Delay, s/veh | | 41.5 | | | 69.5 | | | 63.6 | | | 71.3 | |
| Approach LOS | | D | | | E | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 26.8 | 36.2 | 12.2 | 37.6 | 18.0 | 45.0 | 18.7 | 31.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 29.0 | 16.0 | 33.0 | 14.0 | 41.0 | 22.0 | 27.0 |
| Max Q Clear Time (g_c+I1), s | 22.5 | 22.1 | 8.4 | 21.7 | 15.4 | 43.0 | 14.5 | 28.6 |
| Green Ext Time (p_c), s | 0.4 | 3.7 | 0.1 | 7.5 | 0.0 | 0.0 | 0.3 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 61.5 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 11 | 554 | 263 | 2 | 314 | 164 |
| Future Volume (vph) | 11 | 554 | 263 | 2 | 314 | 164 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1594 | | 1861 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1594 | | 1861 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Adj. Flow (vph) | 13 | 652 | 309 | 2 | 369 | 193 |
| RTOR Reduction (vph) | 529 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 136 | 0 | 310 | 0 | 369 | 193 |
| Confl. Peds. (#/hr) | 1 | 1 | | 1 | 1 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 9.0 | | 12.7 | | 14.1 | 30.8 |
| Effective Green, g (s) | 9.0 | | 12.7 | | 14.1 | 30.8 |
| Actuated g/C Ratio | 0.19 | | 0.27 | | 0.29 | 0.64 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 300 | | 494 | | 522 | 1200 |
| v/s Ratio Prot | c0.09 | | c0.17 | | c0.21 | 0.10 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.45 | | 0.63 | | 0.71 | 0.16 |
| Uniform Delay, d1 | 17.2 | | 15.5 | | 15.0 | 3.4 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.1 | | 2.5 | | 4.3 | 0.1 |
| Delay (s) | 18.3 | | 18.0 | | 19.4 | 3.4 |
| Level of Service | B | | B | | B | A |
| Approach Delay (s) | 18.3 | | 18.0 | | | 13.9 |
| Approach LOS | B | | B | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 16.6 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.61 | | |
| Actuated Cycle Length (s) | 47.8 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 76.4% | 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 (veh/h) | 182 | 191 | 10 | 10 | 313 | 220 | 30 | 150 | 20 | 270 | 200 | 160 |
| Future Volume (veh/h) | 182 | 191 | 10 | 10 | 313 | 220 | 30 | 150 | 20 | 270 | 200 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 210 | 6 | 11 | 344 | 219 | 33 | 165 | 0 | 297 | 220 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 242 | 927 | 782 | 19 | 395 | 251 | 56 | 297 | 155 | 368 | 367 | 0 |
| Arrive On Green | 0.14 | 0.50 | 0.50 | 0.01 | 0.37 | 0.37 | 0.10 | 0.10 | 0.00 | 0.21 | 0.21 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1571 | 1774 | 1061 | 676 | 571 | 3032 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 200 | 210 | 6 | 11 | 0 | 563 | 106 | 92 | 0 | 297 | 220 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1571 | 1774 | 0 | 1737 | 1834 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 9.4 | 5.5 | 0.2 | 0.5 | 0.0 | 25.9 | 4.8 | 4.3 | 0.0 | 13.7 | 9.7 | 0.0 |
| Cycle Q Clear(g_c), s | 9.4 | 5.5 | 0.2 | 0.5 | 0.0 | 25.9 | 4.8 | 4.3 | 0.0 | 13.7 | 9.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.39 | 0.31 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 242 | 927 | 782 | 19 | 0 | 646 | 179 | 173 | 155 | 368 | 367 | 0 |
| V/C Ratio(X) | 0.83 | 0.23 | 0.01 | 0.58 | 0.00 | 0.87 | 0.59 | 0.53 | 0.00 | 0.81 | 0.60 | 0.00 |
| Avail Cap(c_a), veh/h | 454 | 1235 | 1042 | 83 | 0 | 788 | 384 | 371 | 332 | 516 | 515 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 36.1 | 12.2 | 10.9 | 42.3 | 0.0 | 25.1 | 37.1 | 36.9 | 0.0 | 32.4 | 30.8 | 0.0 |
| Incr Delay (d2), s/veh | 7.0 | 0.1 | 0.0 | 24.6 | 0.0 | 9.0 | 3.1 | 2.5 | 0.0 | 6.4 | 1.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.1 | 2.8 | 0.1 | 0.4 | 0.0 | 14.0 | 2.6 | 2.2 | 0.0 | 7.3 | 4.9 | 0.0 |
| LnGrp Delay(d),s/veh | 43.1 | 12.3 | 10.9 | 66.9 | 0.0 | 34.1 | 40.2 | 39.4 | 0.0 | 38.8 | 32.4 | 0.0 |
| LnGrp LOS | D | B | B | E | | C | D | D | | D | C | |
| Approach Vol, veh/h | | 416 | | | 574 | | | 198 | | | 517 | |
| Approach Delay, s/veh | | 27.1 | | | 34.7 | | | 39.8 | | | 36.0 | |
| Approach LOS | | C | | | C | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 12.4 | 4.9 | 46.8 | | 21.8 | 15.7 | 36.0 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 18.0 | 4.0 | 57.0 | | 25.0 | 22.0 | 39.0 |
| Max Q Clear Time (g_c+I1), s | | 6.8 | 2.5 | 7.5 | | 15.7 | 11.4 | 27.9 |
| Green Ext Time (p_c), s | | 0.8 | 0.0 | 6.7 | | 2.1 | 0.4 | 4.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 33.9 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 532 | 40 | 268 | 343 | 473 | 70 | 1210 | 595 | 482 | 320 | 300 |
| Future Volume (veh/h) | 220 | 532 | 40 | 268 | 343 | 473 | 70 | 1210 | 595 | 482 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 572 | 0 | 288 | 369 | 0 | 75 | 1301 | 0 | 518 | 344 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 284 | 1023 | 305 | 334 | 1096 | 341 | 93 | 1548 | 0 | 447 | 2187 | 0 |
| Arrive On Green | 0.09 | 0.22 | 0.00 | 0.10 | 0.23 | 0.00 | 0.06 | 0.43 | 0.00 | 0.14 | 0.51 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 572 | 0 | 288 | 369 | 0 | 75 | 1301 | 0 | 518 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 10.4 | 15.5 | 0.0 | 12.7 | 9.3 | 0.0 | 6.4 | 45.8 | 0.0 | 20.0 | 6.1 | 0.0 |
| Cycle Q Clear(g_c), s | 10.4 | 15.5 | 0.0 | 12.7 | 9.3 | 0.0 | 6.4 | 45.8 | 0.0 | 20.0 | 6.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 284 | 1023 | 305 | 334 | 1096 | 341 | 93 | 1548 | 0 | 447 | 2187 | 0 |
| V/C Ratio(X) | 0.83 | 0.56 | 0.00 | 0.86 | 0.34 | 0.00 | 0.81 | 0.84 | 0.00 | 1.16 | 0.16 | 0.00 |
| Avail Cap(c_a), veh/h | 357 | 1023 | 305 | 380 | 1096 | 341 | 150 | 1548 | 0 | 447 | 2187 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 64.1 | 49.9 | 0.0 | 63.0 | 45.7 | 0.0 | 66.7 | 36.6 | 0.0 | 61.5 | 18.6 | 0.0 |
| Incr Delay (d2), s/veh | 12.9 | 2.2 | 0.0 | 16.7 | 0.8 | 0.0 | 15.2 | 5.7 | 0.0 | 94.3 | 0.2 | 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 | 5.1 | 6.9 | 0.0 | 6.4 | 4.2 | 0.0 | 3.3 | 16.1 | 0.0 | 14.7 | 2.5 | 0.0 |
| LnGrp Delay(d),s/veh | 77.0 | 52.1 | 0.0 | 79.7 | 46.5 | 0.0 | 81.8 | 42.3 | 0.0 | 155.8 | 18.8 | 0.0 |
| LnGrp LOS | E | D | | E | D | | F | D | | F | B | |
| Approach Vol, veh/h | | 809 | | | 657 | | | 1376 | | | 862 | |
| Approach Delay, s/veh | | 59.4 | | | 61.0 | | | 44.5 | | | 101.1 | |
| Approach LOS | | E | | | E | | | D | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 24.0 | 65.0 | 18.9 | 35.0 | 12.1 | 76.9 | 16.7 | 37.2 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 20.0 | 61.0 | 17.0 | 31.0 | 13.0 | 68.0 | 16.0 | 32.0 |
| Max Q Clear Time (g_c+I1), s | 22.0 | 47.8 | 14.7 | 17.5 | 8.4 | 8.1 | 12.4 | 11.3 |
| Green Ext Time (p_c), s | 0.0 | 9.2 | 0.2 | 5.6 | 0.1 | 21.0 | 0.3 | 7.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 63.8 |
| HCM 2010 LOS | E |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 289 | 140 | 380 | 40 | 304 | 255 | 139 | 90 | 248 | 200 |
| Future Volume (veh/h) | 310 | 700 | 289 | 140 | 380 | 40 | 304 | 255 | 139 | 90 | 248 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 238 | 147 | 400 | 34 | 320 | 268 | 99 | 95 | 261 | 110 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 415 | 1293 | 412 | 183 | 1546 | 129 | 434 | 746 | 268 | 123 | 579 | 237 |
| Arrive On Green | 0.12 | 0.34 | 0.34 | 0.10 | 0.32 | 0.32 | 0.13 | 0.29 | 0.29 | 0.07 | 0.24 | 0.24 |
| Sat Flow, veh/h | 3442 | 3791 | 1208 | 1774 | 4776 | 400 | 3442 | 2530 | 908 | 1774 | 2436 | 996 |
| Grp Volume(v), veh/h | 326 | 658 | 317 | 147 | 282 | 152 | 320 | 185 | 182 | 95 | 187 | 184 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1609 | 1774 | 1695 | 1786 | 1721 | 1770 | 1669 | 1774 | 1770 | 1663 |
| Q Serve(g_s), s | 7.7 | 13.2 | 13.5 | 6.8 | 5.1 | 5.2 | 7.5 | 6.9 | 7.2 | 4.4 | 7.5 | 7.9 |
| Cycle Q Clear(g_c), s | 7.7 | 13.2 | 13.5 | 6.8 | 5.1 | 5.2 | 7.5 | 6.9 | 7.2 | 4.4 | 7.5 | 7.9 |
| Prop In Lane | 1.00 | | 0.75 | 1.00 | | 0.22 | 1.00 | | 0.54 | 1.00 | | 0.60 |
| Lane Grp Cap(c), veh/h | 415 | 1157 | 549 | 183 | 1097 | 578 | 434 | 522 | 492 | 123 | 421 | 395 |
| V/C Ratio(X) | 0.79 | 0.57 | 0.58 | 0.80 | 0.26 | 0.26 | 0.74 | 0.35 | 0.37 | 0.77 | 0.45 | 0.46 |
| Avail Cap(c_a), veh/h | 536 | 1422 | 675 | 276 | 1422 | 749 | 1196 | 1124 | 1060 | 276 | 785 | 737 |
| 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 | 35.6 | 22.5 | 22.5 | 36.6 | 20.8 | 20.9 | 35.1 | 23.2 | 23.3 | 38.2 | 27.1 | 27.2 |
| Incr Delay (d2), s/veh | 5.8 | 0.4 | 1.0 | 9.7 | 0.1 | 0.2 | 2.5 | 0.4 | 0.5 | 9.9 | 0.7 | 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 | 4.0 | 6.3 | 6.1 | 3.8 | 2.4 | 2.6 | 3.7 | 3.4 | 3.3 | 2.5 | 3.8 | 3.7 |
| LnGrp Delay(d),s/veh | 41.4 | 22.9 | 23.5 | 46.3 | 20.9 | 21.1 | 37.6 | 23.6 | 23.8 | 48.1 | 27.8 | 28.1 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 1301 | | | 581 | | | 687 | | | 466 | |
| Approach Delay, s/veh | | 27.7 | | | 27.4 | | | 30.1 | | | 32.1 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 9.8 | 28.6 | 12.6 | 32.5 | 14.5 | 23.8 | 14.1 | 31.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 13.0 | 53.0 | 13.0 | 35.0 | 29.0 | 37.0 | 13.0 | 35.0 |
| Max Q Clear Time (g_c+I1), s | 6.4 | 9.2 | 8.8 | 15.5 | 9.5 | 9.9 | 9.7 | 7.2 |
| Green Ext Time (p_c), s | 0.1 | 5.2 | 0.1 | 10.0 | 1.1 | 4.9 | 0.4 | 11.9 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.9 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 48 | 871 | 456 | 172 | 233 | 44 |
| Future Volume (veh/h) | 48 | 871 | 456 | 172 | 233 | 44 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 52 | 937 | 490 | 0 | 251 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 83 | 2815 | 1926 | 0 | 337 | 301 |
| Arrive On Green | 0.05 | 0.55 | 0.38 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 52 | 937 | 490 | 0 | 251 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.9 | 3.1 | 2.1 | 0.0 | 4.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.9 | 3.1 | 2.1 | 0.0 | 4.2 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 83 | 2815 | 1926 | 0 | 337 | 301 |
| V/C Ratio(X) | 0.63 | 0.33 | 0.25 | 0.00 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 4239 | 2771 | 0 | 910 | 812 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.6 | 3.8 | 6.7 | 0.0 | 11.9 | 0.0 |
| Incr Delay (d2), s/veh | 7.7 | 0.1 | 0.1 | 0.0 | 3.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 1.4 | 1.0 | 0.0 | 2.3 | 0.0 |
| LnGrp Delay(d),s/veh | 22.3 | 3.9 | 6.7 | 0.0 | 15.2 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 989 | 490 | | 251 | |
| Approach Delay, s/veh | | 4.8 | 6.7 | | 15.2 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 21.3 | | 9.9 | 5.5 | 15.8 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 5.1 | | 6.2 | 2.9 | 4.1 | | |
| Green Ext Time (p_c), s | | 10.4 | | 0.5 | 0.0 | 7.7 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 6.9 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 158 | 901 | 195 | 96 | 569 | 200 | 133 | 419 | 97 | 200 | 339 | 184 |
| Future Volume (veh/h) | 158 | 901 | 195 | 96 | 569 | 200 | 133 | 419 | 97 | 200 | 339 | 184 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 178 | 1012 | 128 | 108 | 639 | 0 | 149 | 471 | 0 | 225 | 381 | 197 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 213 | 1043 | 465 | 137 | 890 | 398 | 157 | 603 | 512 | 262 | 443 | 229 |
| Arrive On Green | 0.12 | 0.29 | 0.29 | 0.08 | 0.25 | 0.00 | 0.09 | 0.32 | 0.00 | 0.15 | 0.38 | 0.38 |
| Sat Flow, veh/h | 1774 | 3539 | 1578 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1158 | 599 |
| Grp Volume(v), veh/h | 178 | 1012 | 128 | 108 | 639 | 0 | 149 | 471 | 0 | 225 | 0 | 578 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1578 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1757 |
| Q Serve(g_s), s | 10.0 | 28.8 | 6.3 | 6.1 | 16.8 | 0.0 | 8.5 | 23.3 | 0.0 | 12.6 | 0.0 | 30.8 |
| Cycle Q Clear(g_c), s | 10.0 | 28.8 | 6.3 | 6.1 | 16.8 | 0.0 | 8.5 | 23.3 | 0.0 | 12.6 | 0.0 | 30.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.34 |
| Lane Grp Cap(c), veh/h | 213 | 1043 | 465 | 137 | 890 | 398 | 157 | 603 | 512 | 262 | 0 | 673 |
| V/C Ratio(X) | 0.83 | 0.97 | 0.28 | 0.79 | 0.72 | 0.00 | 0.95 | 0.78 | 0.00 | 0.86 | 0.00 | 0.86 |
| Avail Cap(c_a), veh/h | 383 | 1043 | 465 | 279 | 890 | 398 | 157 | 603 | 512 | 453 | 0 | 673 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 43.8 | 35.5 | 27.6 | 46.2 | 34.8 | 0.0 | 46.2 | 31.2 | 0.0 | 42.3 | 0.0 | 28.9 |
| Incr Delay (d2), s/veh | 8.3 | 21.0 | 0.3 | 9.7 | 2.8 | 0.0 | 57.1 | 9.7 | 0.0 | 8.0 | 0.0 | 13.5 |
| 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 | 5.4 | 17.1 | 2.8 | 3.4 | 8.5 | 0.0 | 6.6 | 13.7 | 0.0 | 6.8 | 0.0 | 17.4 |
| LnGrp Delay(d),s/veh | 52.1 | 56.5 | 27.9 | 55.9 | 37.6 | 0.0 | 103.3 | 40.9 | 0.0 | 50.3 | 0.0 | 42.4 |
| LnGrp LOS | D | E | C | E | D | | F | D | | D | | D |
| Approach Vol, veh/h | | 1318 | | | 747 | | | 620 | | | 803 | |
| Approach Delay, s/veh | | 53.1 | | | 40.3 | | | 55.9 | | | 44.6 | |
| Approach LOS | | D | | | D | | | E | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 19.1 | 36.9 | 11.8 | 34.0 | 13.0 | 43.0 | 16.2 | 29.6 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 22.0 | 16.0 | 30.0 | 9.0 | 39.0 | 22.0 | 24.0 |
| Max Q Clear Time (g_c+I1), s | 14.6 | 25.3 | 8.1 | 30.8 | 10.5 | 32.8 | 12.0 | 18.8 |
| Green Ext Time (p_c), s | 0.5 | 0.0 | 0.1 | 0.0 | 0.0 | 3.4 | 0.3 | 4.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 48.9 |
| HCM 2010 LOS | D |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 12 | 356 | 204 | 1 | 617 | 223 |
| Future Volume (vph) | 12 | 356 | 204 | 1 | 617 | 223 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1593 | | 1861 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1593 | | 1861 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 13 | 379 | 217 | 1 | 656 | 237 |
| RTOR Reduction (vph) | 327 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 65 | 0 | 218 | 0 | 656 | 237 |
| Confl. Peds. (#/hr) | | 3 | | 3 | 3 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 8.3 | | 12.7 | | 27.1 | 43.8 |
| Effective Green, g (s) | 8.3 | | 12.7 | | 27.1 | 43.8 |
| Actuated g/C Ratio | 0.14 | | 0.21 | | 0.45 | 0.73 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 219 | | 393 | | 798 | 1357 |
| v/s Ratio Prot | c0.04 | | c0.12 | | c0.37 | 0.13 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.30 | | 0.55 | | 0.82 | 0.17 |
| Uniform Delay, d1 | 23.3 | | 21.2 | | 14.4 | 2.5 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 0.8 | | 1.7 | | 6.8 | 0.1 |
| Delay (s) | 24.0 | | 22.9 | | 21.2 | 2.6 |
| Level of Service | C | | C | | C | A |
| Approach Delay (s) | 24.0 | | 22.9 | | | 16.3 |
| Approach LOS | C | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 19.3 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.66 | | |
| Actuated Cycle Length (s) | 60.1 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 78.2% | 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 (veh/h) | 149 | 416 | 10 | 30 | 283 | 200 | 10 | 230 | 80 | 310 | 130 | 180 |
| Future Volume (veh/h) | 149 | 416 | 10 | 30 | 283 | 200 | 10 | 230 | 80 | 310 | 130 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 152 | 424 | 4 | 31 | 289 | 174 | 10 | 235 | 0 | 316 | 133 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 192 | 735 | 615 | 47 | 340 | 205 | 16 | 405 | 184 | 380 | 379 | 0 |
| Arrive On Green | 0.11 | 0.39 | 0.39 | 0.03 | 0.31 | 0.31 | 0.12 | 0.12 | 0.00 | 0.21 | 0.21 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1560 | 1774 | 1089 | 656 | 141 | 3484 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 152 | 424 | 4 | 31 | 0 | 463 | 131 | 114 | 0 | 316 | 133 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1560 | 1774 | 0 | 1745 | 1856 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 5.4 | 11.5 | 0.1 | 1.1 | 0.0 | 16.0 | 4.3 | 3.9 | 0.0 | 11.0 | 4.1 | 0.0 |
| Cycle Q Clear(g_c), s | 5.4 | 11.5 | 0.1 | 1.1 | 0.0 | 16.0 | 4.3 | 3.9 | 0.0 | 11.0 | 4.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.38 | 0.08 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 192 | 735 | 615 | 47 | 0 | 545 | 216 | 206 | 184 | 380 | 379 | 0 |
| V/C Ratio(X) | 0.79 | 0.58 | 0.01 | 0.66 | 0.00 | 0.85 | 0.61 | 0.55 | 0.00 | 0.83 | 0.35 | 0.00 |
| Avail Cap(c_a), veh/h | 276 | 810 | 679 | 110 | 0 | 596 | 461 | 440 | 394 | 441 | 440 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 28.0 | 15.3 | 11.8 | 31.0 | 0.0 | 20.7 | 27.0 | 26.9 | 0.0 | 24.2 | 21.5 | 0.0 |
| Incr Delay (d2), s/veh | 9.5 | 0.8 | 0.0 | 14.7 | 0.0 | 10.5 | 2.8 | 2.3 | 0.0 | 11.3 | 0.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.1 | 6.1 | 0.0 | 0.7 | 0.0 | 9.2 | 2.4 | 2.0 | 0.0 | 6.5 | 2.1 | 0.0 |
| LnGrp Delay(d),s/veh | 37.5 | 16.1 | 11.8 | 45.8 | 0.0 | 31.2 | 29.8 | 29.2 | 0.0 | 35.4 | 22.0 | 0.0 |
| LnGrp LOS | D | B | B | D | | C | C | C | | D | C | |
| Approach Vol, veh/h | | 580 | | | 494 | | | 245 | | | 449 | |
| Approach Delay, s/veh | | 21.7 | | | 32.1 | | | 29.5 | | | 31.5 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 11.5 | 5.7 | 29.4 | | 17.8 | 11.0 | 24.1 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 16.0 | 4.0 | 28.0 | | 16.0 | 10.0 | 22.0 |
| Max Q Clear Time (g_c+I1), s | | 6.3 | 3.1 | 13.5 | | 13.0 | 7.4 | 18.0 |
| Green Ext Time (p_c), s | | 0.9 | 0.0 | 5.3 | | 0.8 | 0.1 | 2.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.2 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 100 | 40 | 602 | 211 | 391 | 20 | 470 | 259 | 640 | 990 | 180 |
| Future Volume (veh/h) | 50 | 100 | 40 | 602 | 211 | 391 | 20 | 470 | 259 | 640 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 103 | 0 | 621 | 218 | 0 | 21 | 485 | 0 | 660 | 1021 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 129 | 445 | 138 | 743 | 1352 | 421 | 37 | 877 | 0 | 774 | 2234 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.23 | 0.29 | 0.00 | 0.02 | 0.25 | 0.00 | 0.24 | 0.47 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 103 | 0 | 621 | 218 | 0 | 21 | 485 | 0 | 660 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 1.4 | 1.8 | 0.0 | 16.8 | 3.1 | 0.0 | 1.2 | 11.0 | 0.0 | 17.9 | 13.2 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 1.8 | 0.0 | 16.8 | 3.1 | 0.0 | 1.2 | 11.0 | 0.0 | 17.9 | 13.2 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 129 | 445 | 138 | 743 | 1352 | 421 | 37 | 877 | 0 | 774 | 2234 | 0 |
| V/C Ratio(X) | 0.40 | 0.23 | 0.00 | 0.84 | 0.16 | 0.00 | 0.57 | 0.55 | 0.00 | 0.85 | 0.46 | 0.00 |
| Avail Cap(c_a), veh/h | 1092 | 1874 | 583 | 1268 | 1874 | 583 | 553 | 1564 | 0 | 1092 | 2234 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.4 | 38.0 | 0.0 | 33.1 | 24.2 | 0.0 | 43.8 | 29.3 | 0.0 | 32.8 | 16.0 | 0.0 |
| Incr Delay (d2), s/veh | 2.0 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.4 | 0.5 | 0.0 | 4.8 | 0.1 | 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 | 0.8 | 0.0 | 7.7 | 1.4 | 0.0 | 0.7 | 3.5 | 0.0 | 8.4 | 5.7 | 0.0 |
| LnGrp Delay(d),s/veh | 44.4 | 38.2 | 0.0 | 35.7 | 24.2 | 0.0 | 57.2 | 29.9 | 0.0 | 37.5 | 16.2 | 0.0 |
| LnGrp LOS | D | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 155 | | | 839 | | | 506 | | | 1681 | |
| Approach Delay, s/veh | | 40.3 | | | 32.7 | | | 31.0 | | | 24.5 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 26.0 | 27.0 | 25.1 | 12.5 | 6.1 | 46.9 | 7.6 | 30.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 19.9 | 13.0 | 18.8 | 3.8 | 3.2 | 15.2 | 3.4 | 5.1 |
| Green Ext Time (p_c), s | 2.1 | 9.6 | 2.3 | 2.4 | 0.0 | 13.2 | 0.1 | 2.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.5 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 388 | 105 | 440 | 30 | 443 | 313 | 79 | 50 | 185 | 160 |
| Future Volume (veh/h) | 180 | 260 | 388 | 105 | 440 | 30 | 443 | 313 | 79 | 50 | 185 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.96 | 1.00 | | 0.97 | 1.00 | | 0.96 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 147 | 114 | 478 | 24 | 482 | 340 | 65 | 54 | 201 | 27 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 301 | 964 | 437 | 147 | 1386 | 69 | 626 | 990 | 187 | 85 | 629 | 83 |
| Arrive On Green | 0.09 | 0.28 | 0.28 | 0.08 | 0.28 | 0.28 | 0.18 | 0.34 | 0.34 | 0.05 | 0.20 | 0.20 |
| Sat Flow, veh/h | 3442 | 3390 | 1535 | 1774 | 4952 | 246 | 3442 | 2955 | 557 | 1774 | 3127 | 413 |
| Grp Volume(v), veh/h | 196 | 283 | 147 | 114 | 326 | 176 | 482 | 202 | 203 | 54 | 112 | 116 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1535 | 1774 | 1695 | 1808 | 1721 | 1770 | 1742 | 1774 | 1770 | 1771 |
| Q Serve(g_s), s | 3.5 | 4.2 | 4.9 | 4.0 | 4.9 | 5.0 | 8.5 | 5.5 | 5.6 | 1.9 | 3.5 | 3.6 |
| Cycle Q Clear(g_c), s | 3.5 | 4.2 | 4.9 | 4.0 | 4.9 | 5.0 | 8.5 | 5.5 | 5.6 | 1.9 | 3.5 | 3.6 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.32 | 1.00 | | 0.23 |
| Lane Grp Cap(c), veh/h | 301 | 964 | 437 | 147 | 949 | 506 | 626 | 593 | 584 | 85 | 356 | 356 |
| V/C Ratio(X) | 0.65 | 0.29 | 0.34 | 0.77 | 0.34 | 0.35 | 0.77 | 0.34 | 0.35 | 0.63 | 0.32 | 0.32 |
| Avail Cap(c_a), veh/h | 537 | 1850 | 838 | 277 | 1850 | 987 | 966 | 1241 | 1222 | 249 | 993 | 994 |
| 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 | 28.3 | 17.9 | 18.2 | 28.8 | 18.4 | 18.4 | 25.0 | 16.0 | 16.1 | 30.0 | 21.9 | 21.9 |
| Incr Delay (d2), s/veh | 2.4 | 0.2 | 0.5 | 8.4 | 0.2 | 0.4 | 2.0 | 0.3 | 0.4 | 7.5 | 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 | 1.8 | 2.0 | 2.1 | 2.3 | 2.3 | 2.6 | 4.2 | 2.7 | 2.8 | 1.1 | 1.7 | 1.8 |
| LnGrp Delay(d),s/veh | 30.7 | 18.1 | 18.6 | 37.2 | 18.6 | 18.8 | 27.0 | 16.3 | 16.4 | 37.4 | 22.4 | 22.4 |
| LnGrp LOS | C | B | B | D | B | B | C | B | B | D | C | C |
| Approach Vol, veh/h | | 626 | | | 616 | | | 887 | | | 282 | |
| Approach Delay, s/veh | | 22.2 | | | 22.1 | | | 22.1 | | | 25.3 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.1 | 25.5 | 9.3 | 22.2 | 15.7 | 16.9 | 9.6 | 22.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 9.0 | 45.0 | 10.0 | 35.0 | 18.0 | 36.0 | 10.0 | 35.0 |
| Max Q Clear Time (g_c+I1), s | 3.9 | 7.6 | 6.0 | 6.9 | 10.5 | 5.6 | 5.5 | 7.0 |
| Green Ext Time (p_c), s | 0.0 | 4.2 | 0.1 | 7.2 | 1.1 | 4.1 | 0.2 | 7.2 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 22.5 |
| HCM 2010 LOS | | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 33 | 346 | 561 | 216 | 212 | 34 |
| Future Volume (veh/h) | 33 | 346 | 561 | 216 | 212 | 34 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 40 | 417 | 676 | 0 | 255 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 67 | 2739 | 1866 | 0 | 344 | 307 |
| Arrive On Green | 0.04 | 0.54 | 0.37 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 40 | 417 | 676 | 0 | 255 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.7 | 1.2 | 2.9 | 0.0 | 4.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.7 | 1.2 | 2.9 | 0.0 | 4.0 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 67 | 2739 | 1866 | 0 | 344 | 307 |
| V/C Ratio(X) | 0.60 | 0.15 | 0.36 | 0.00 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 297 | 4424 | 2893 | 0 | 950 | 848 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.2 | 3.5 | 6.9 | 0.0 | 11.3 | 0.0 |
| Incr Delay (d2), s/veh | 8.2 | 0.0 | 0.1 | 0.0 | 3.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.5 | 1.3 | 0.0 | 2.2 | 0.0 |
| LnGrp Delay(d),s/veh | 22.3 | 3.5 | 7.0 | 0.0 | 14.5 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 457 | 676 | | 255 | |
| Approach Delay, s/veh | | 5.1 | 7.0 | | 14.5 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 20.1 | | 9.8 | 5.1 | 15.0 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.2 | | 6.0 | 2.7 | 4.9 | | |
| Green Ext Time (p_c), s | | 8.1 | | 0.5 | 0.0 | 5.8 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 7.8 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 164 | 579 | 203 | 93 | 686 | 300 | 179 | 378 | 153 | 270 | 476 | 94 |
| Future Volume (veh/h) | 164 | 579 | 203 | 93 | 686 | 300 | 179 | 378 | 153 | 270 | 476 | 94 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.88 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 706 | 31 | 113 | 837 | 0 | 218 | 461 | 0 | 329 | 580 | 109 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 229 | 1007 | 396 | 139 | 828 | 370 | 215 | 576 | 490 | 353 | 590 | 111 |
| Arrive On Green | 0.13 | 0.28 | 0.28 | 0.08 | 0.23 | 0.00 | 0.12 | 0.31 | 0.00 | 0.20 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3539 | 1390 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1525 | 287 |
| Grp Volume(v), veh/h | 200 | 706 | 31 | 113 | 837 | 0 | 218 | 461 | 0 | 329 | 0 | 689 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1390 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1811 |
| Q Serve(g_s), s | 13.7 | 22.1 | 2.0 | 7.8 | 29.0 | 0.0 | 15.0 | 28.2 | 0.0 | 22.6 | 0.0 | 46.7 |
| Cycle Q Clear(g_c), s | 13.7 | 22.1 | 2.0 | 7.8 | 29.0 | 0.0 | 15.0 | 28.2 | 0.0 | 22.6 | 0.0 | 46.7 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.16 |
| Lane Grp Cap(c), veh/h | 229 | 1007 | 396 | 139 | 828 | 370 | 215 | 576 | 490 | 353 | 0 | 701 |
| V/C Ratio(X) | 0.87 | 0.70 | 0.08 | 0.81 | 1.01 | 0.00 | 1.02 | 0.80 | 0.00 | 0.93 | 0.00 | 0.98 |
| Avail Cap(c_a), veh/h | 315 | 1007 | 396 | 229 | 828 | 370 | 215 | 576 | 490 | 358 | 0 | 701 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 39.6 | 32.4 | 56.3 | 47.5 | 0.0 | 54.5 | 39.3 | 0.0 | 48.8 | 0.0 | 37.6 |
| Incr Delay (d2), s/veh | 17.8 | 2.2 | 0.1 | 10.9 | 34.1 | 0.0 | 65.6 | 11.1 | 0.0 | 30.6 | 0.0 | 30.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 7.9 | 11.1 | 0.8 | 4.2 | 18.1 | 0.0 | 11.2 | 16.3 | 0.0 | 14.1 | 0.0 | 29.2 |
| LnGrp Delay(d),s/veh | 70.8 | 41.8 | 32.5 | 67.2 | 81.5 | 0.0 | 120.2 | 50.5 | 0.0 | 79.5 | 0.0 | 67.6 |
| LnGrp LOS | E | D | C | E | F | | F | D | | E | | E |
| Approach Vol, veh/h | | 937 | | | 950 | | | 679 | | | 1018 | |
| Approach Delay, s/veh | | 47.7 | | | 79.8 | | | 72.8 | | | 71.4 | |
| Approach LOS | | D | | | E | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 28.7 | 42.3 | 13.7 | 39.3 | 19.0 | 52.0 | 20.0 | 33.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 25.0 | 38.0 | 16.0 | 35.0 | 15.0 | 48.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 24.6 | 30.2 | 9.8 | 24.1 | 17.0 | 48.7 | 15.7 | 31.0 |
| Green Ext Time (p_c), s | 0.0 | 4.5 | 0.1 | 7.3 | 0.0 | 0.0 | 0.3 | 0.0 |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 67.7 |
| HCM 2010 LOS | | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 11 | 611 | 281 | 2 | 331 | 169 |
| Future Volume (vph) | 11 | 611 | 281 | 2 | 331 | 169 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1594 | | 1861 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1594 | | 1861 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Adj. Flow (vph) | 13 | 719 | 331 | 2 | 389 | 199 |
| RTOR Reduction (vph) | 509 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 223 | 0 | 333 | 0 | 389 | 199 |
| Confl. Peds. (#/hr) | 1 | 1 | | 1 | 1 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 11.3 | | 13.4 | | 14.7 | 32.1 |
| Effective Green, g (s) | 11.3 | | 13.4 | | 14.7 | 32.1 |
| Actuated g/C Ratio | 0.22 | | 0.26 | | 0.29 | 0.62 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 350 | | 485 | | 506 | 1163 |
| v/s Ratio Prot | c0.14 | | c0.18 | | c0.22 | 0.11 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.64 | | 0.69 | | 0.77 | 0.17 |
| Uniform Delay, d1 | 18.2 | | 17.1 | | 16.8 | 4.1 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 3.8 | | 4.0 | | 6.9 | 0.1 |
| Delay (s) | 22.0 | | 21.1 | | 23.7 | 4.1 |
| Level of Service | C | | C | | C | A |
| Approach Delay (s) | 22.0 | | 21.1 | | | 17.1 |
| Approach LOS | C | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 20.1 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.70 | | |
| Actuated Cycle Length (s) | 51.4 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 81.8% | 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 (veh/h) | 282 | 206 | 10 | 12 | 318 | 220 | 30 | 159 | 25 | 270 | 203 | 190 |
| Future Volume (veh/h) | 282 | 206 | 10 | 12 | 318 | 220 | 30 | 159 | 25 | 270 | 203 | 190 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 310 | 226 | 6 | 13 | 349 | 219 | 33 | 175 | 0 | 297 | 223 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 343 | 1001 | 845 | 21 | 381 | 239 | 51 | 289 | 150 | 351 | 350 | 0 |
| Arrive On Green | 0.19 | 0.54 | 0.54 | 0.01 | 0.36 | 0.36 | 0.09 | 0.09 | 0.00 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1572 | 1774 | 1068 | 670 | 544 | 3061 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 310 | 226 | 6 | 13 | 0 | 568 | 111 | 97 | 0 | 297 | 223 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1572 | 1774 | 0 | 1738 | 1836 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 17.3 | 6.5 | 0.2 | 0.7 | 0.0 | 31.7 | 5.9 | 5.3 | 0.0 | 16.4 | 11.7 | 0.0 |
| Cycle Q Clear(g_c), s | 17.3 | 6.5 | 0.2 | 0.7 | 0.0 | 31.7 | 5.9 | 5.3 | 0.0 | 16.4 | 11.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.39 | 0.30 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 343 | 1001 | 845 | 21 | 0 | 620 | 173 | 167 | 150 | 351 | 350 | 0 |
| V/C Ratio(X) | 0.90 | 0.23 | 0.01 | 0.61 | 0.00 | 0.92 | 0.64 | 0.58 | 0.00 | 0.85 | 0.64 | 0.00 |
| Avail Cap(c_a), veh/h | 385 | 1047 | 883 | 70 | 0 | 668 | 326 | 314 | 281 | 437 | 436 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.0 | 12.3 | 10.9 | 49.9 | 0.0 | 31.2 | 44.3 | 44.0 | 0.0 | 39.2 | 37.3 | 0.0 |
| Incr Delay (d2), s/veh | 22.6 | 0.1 | 0.0 | 24.5 | 0.0 | 16.9 | 3.9 | 3.1 | 0.0 | 11.9 | 2.1 | 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 | 10.7 | 3.4 | 0.1 | 0.5 | 0.0 | 18.1 | 3.2 | 2.8 | 0.0 | 9.2 | 5.9 | 0.0 |
| LnGrp Delay(d),s/veh | 62.6 | 12.5 | 10.9 | 74.3 | 0.0 | 48.1 | 48.2 | 47.1 | 0.0 | 51.1 | 39.4 | 0.0 |
| LnGrp LOS | E | B | B | E | | D | D | D | | D | D | |
| Approach Vol, veh/h | | 542 | | | 581 | | | 208 | | | 520 | |
| Approach Delay, s/veh | | 41.1 | | | 48.6 | | | 47.7 | | | 46.1 | |
| Approach LOS | | D | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 13.6 | 5.2 | 58.5 | | 24.1 | 23.6 | 40.2 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 18.0 | 4.0 | 57.0 | | 25.0 | 22.0 | 39.0 |
| Max Q Clear Time (g_c+I1), s | | 7.9 | 2.7 | 8.5 | | 18.4 | 19.3 | 33.7 |
| Green Ext Time (p_c), s | | 0.8 | 0.0 | 6.9 | | 1.7 | 0.3 | 2.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 45.6 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 541 | 40 | 284 | 348 | 478 | 70 | 1210 | 623 | 491 | 320 | 300 |
| Future Volume (veh/h) | 220 | 541 | 40 | 284 | 348 | 478 | 70 | 1210 | 623 | 491 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 582 | 0 | 305 | 374 | 0 | 75 | 1301 | 0 | 528 | 344 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 245 | 1120 | 334 | 269 | 1157 | 360 | 94 | 1320 | 0 | 611 | 2136 | 0 |
| Arrive On Green | 0.08 | 0.24 | 0.00 | 0.08 | 0.25 | 0.00 | 0.06 | 0.36 | 0.00 | 0.19 | 0.50 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 582 | 0 | 305 | 374 | 0 | 75 | 1301 | 0 | 528 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 9.7 | 14.0 | 0.0 | 11.0 | 8.5 | 0.0 | 5.9 | 46.4 | 0.0 | 20.9 | 5.7 | 0.0 |
| Cycle Q Clear(g_c), s | 9.7 | 14.0 | 0.0 | 11.0 | 8.5 | 0.0 | 5.9 | 46.4 | 0.0 | 20.9 | 5.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 245 | 1120 | 334 | 269 | 1157 | 360 | 94 | 1320 | 0 | 611 | 2136 | 0 |
| V/C Ratio(X) | 0.97 | 0.52 | 0.00 | 1.13 | 0.32 | 0.00 | 0.80 | 0.99 | 0.00 | 0.86 | 0.16 | 0.00 |
| Avail Cap(c_a), veh/h | 245 | 1120 | 334 | 269 | 1157 | 360 | 277 | 1320 | 0 | 1247 | 2136 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 60.1 | 43.3 | 0.0 | 59.7 | 40.4 | 0.0 | 60.7 | 41.2 | 0.0 | 51.1 | 17.9 | 0.0 |
| Incr Delay (d2), s/veh | 48.7 | 1.7 | 0.0 | 95.8 | 0.7 | 0.0 | 14.0 | 21.6 | 0.0 | 3.8 | 0.2 | 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 | 5.9 | 6.3 | 0.0 | 8.4 | 3.8 | 0.0 | 3.0 | 18.1 | 0.0 | 9.6 | 2.3 | 0.0 |
| LnGrp Delay(d),s/veh | 108.8 | 45.0 | 0.0 | 155.5 | 41.1 | 0.0 | 74.7 | 62.7 | 0.0 | 54.9 | 18.0 | 0.0 |
| LnGrp LOS | F | D | | F | D | | E | E | | D | B | |
| Approach Vol, veh/h | | 819 | | | 679 | | | 1376 | | | 872 | |
| Approach Delay, s/veh | | 63.4 | | | 92.5 | | | 63.4 | | | 40.3 | |
| Approach LOS | | E | | | F | | | E | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 29.0 | 51.5 | 15.0 | 35.0 | 11.5 | 69.0 | 14.0 | 36.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 51.0 | 36.0 | 11.0 | 31.0 | 22.0 | 65.0 | 10.0 | 32.0 |
| Max Q Clear Time (g_c+I1), s | 22.9 | 48.4 | 13.0 | 16.0 | 7.9 | 7.7 | 11.7 | 10.5 |
| Green Ext Time (p_c), s | 2.1 | 0.0 | 0.0 | 6.1 | 0.1 | 20.8 | 0.0 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 63.3 |
| HCM 2010 LOS | E |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 334 | 140 | 380 | 40 | 331 | 266 | 140 | 90 | 267 | 200 |
| Future Volume (veh/h) | 310 | 700 | 334 | 140 | 380 | 40 | 331 | 266 | 140 | 90 | 267 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 286 | 147 | 400 | 34 | 348 | 280 | 100 | 95 | 281 | 110 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 426 | 1228 | 470 | 184 | 1538 | 129 | 450 | 769 | 268 | 122 | 597 | 227 |
| Arrive On Green | 0.12 | 0.34 | 0.34 | 0.10 | 0.32 | 0.32 | 0.13 | 0.30 | 0.30 | 0.07 | 0.24 | 0.24 |
| Sat Flow, veh/h | 3442 | 3589 | 1375 | 1774 | 4776 | 400 | 3442 | 2555 | 889 | 1774 | 2492 | 950 |
| Grp Volume(v), veh/h | 326 | 696 | 327 | 147 | 282 | 152 | 348 | 192 | 188 | 95 | 197 | 194 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1574 | 1774 | 1695 | 1785 | 1721 | 1770 | 1674 | 1774 | 1770 | 1672 |
| Q Serve(g_s), s | 8.0 | 14.8 | 15.0 | 7.0 | 5.4 | 5.5 | 8.5 | 7.4 | 7.7 | 4.6 | 8.3 | 8.7 |
| Cycle Q Clear(g_c), s | 8.0 | 14.8 | 15.0 | 7.0 | 5.4 | 5.5 | 8.5 | 7.4 | 7.7 | 4.6 | 8.3 | 8.7 |
| Prop In Lane | 1.00 | | 0.87 | 1.00 | | 0.22 | 1.00 | | 0.53 | 1.00 | | 0.57 |
| Lane Grp Cap(c), veh/h | 426 | 1160 | 538 | 184 | 1092 | 575 | 450 | 533 | 504 | 122 | 424 | 400 |
| V/C Ratio(X) | 0.77 | 0.60 | 0.61 | 0.80 | 0.26 | 0.26 | 0.77 | 0.36 | 0.37 | 0.78 | 0.47 | 0.48 |
| Avail Cap(c_a), veh/h | 752 | 1403 | 651 | 387 | 1403 | 739 | 791 | 936 | 885 | 265 | 793 | 750 |
| 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 | 36.9 | 23.7 | 23.8 | 38.1 | 21.8 | 21.8 | 36.6 | 23.8 | 23.9 | 39.8 | 28.3 | 28.5 |
| Incr Delay (d2), s/veh | 2.9 | 0.5 | 1.1 | 7.7 | 0.1 | 0.2 | 2.9 | 0.4 | 0.5 | 10.0 | 0.8 | 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 | 4.0 | 6.9 | 6.7 | 3.8 | 2.5 | 2.7 | 4.2 | 3.7 | 3.6 | 2.6 | 4.2 | 4.1 |
| LnGrp Delay(d),s/veh | 39.8 | 24.2 | 24.9 | 45.8 | 21.9 | 22.1 | 39.4 | 24.2 | 24.4 | 49.8 | 29.1 | 29.4 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 1349 | | | 581 | | | 728 | | | 486 | |
| Approach Delay, s/veh | | 28.1 | | | 28.0 | | | 31.5 | | | 33.3 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 10.0 | 30.2 | 13.0 | 33.8 | 15.4 | 24.8 | 14.8 | 32.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 13.0 | 46.0 | 19.0 | 36.0 | 20.0 | 39.0 | 19.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 6.6 | 9.7 | 9.0 | 17.0 | 10.5 | 10.7 | 10.0 | 7.5 |
| Green Ext Time (p_c), s | 0.1 | 5.4 | 0.3 | 10.2 | 0.9 | 5.2 | 0.8 | 12.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 29.7 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 48 | 871 | 456 | 173 | 236 | 44 |
| Future Volume (veh/h) | 48 | 871 | 456 | 173 | 236 | 44 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 52 | 937 | 490 | 0 | 254 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 82 | 2808 | 1922 | 0 | 341 | 304 |
| Arrive On Green | 0.05 | 0.55 | 0.38 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 52 | 937 | 490 | 0 | 254 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.9 | 3.2 | 2.1 | 0.0 | 4.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.9 | 3.2 | 2.1 | 0.0 | 4.2 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 82 | 2808 | 1922 | 0 | 341 | 304 |
| V/C Ratio(X) | 0.63 | 0.33 | 0.26 | 0.00 | 0.75 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 4226 | 2763 | 0 | 907 | 810 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.7 | 3.8 | 6.7 | 0.0 | 11.9 | 0.0 |
| Incr Delay (d2), s/veh | 7.7 | 0.1 | 0.1 | 0.0 | 3.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 1.5 | 1.0 | 0.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 22.3 | 3.9 | 6.8 | 0.0 | 15.2 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 989 | 490 | | 254 | |
| Approach Delay, s/veh | | 4.9 | 6.8 | | 15.2 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 21.3 | | 10.0 | 5.5 | 15.8 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 5.2 | | 6.2 | 2.9 | 4.1 | | |
| Green Ext Time (p_c), s | | 10.4 | | 0.5 | 0.0 | 7.7 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 6.9 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 158 | 901 | 199 | 124 | 569 | 200 | 135 | 458 | 113 | 200 | 405 | 184 |
| Future Volume (veh/h) | 158 | 901 | 199 | 124 | 569 | 200 | 135 | 458 | 113 | 200 | 405 | 184 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 178 | 1012 | 133 | 139 | 639 | 0 | 152 | 515 | 0 | 225 | 455 | 197 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 213 | 1021 | 455 | 170 | 937 | 419 | 154 | 585 | 498 | 261 | 463 | 200 |
| Arrive On Green | 0.12 | 0.29 | 0.29 | 0.10 | 0.26 | 0.00 | 0.09 | 0.31 | 0.00 | 0.15 | 0.38 | 0.38 |
| Sat Flow, veh/h | 1774 | 3539 | 1578 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1234 | 534 |
| Grp Volume(v), veh/h | 178 | 1012 | 133 | 139 | 639 | 0 | 152 | 515 | 0 | 225 | 0 | 652 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1578 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1768 |
| Q Serve(g_s), s | 10.2 | 29.6 | 6.8 | 8.0 | 16.8 | 0.0 | 8.9 | 27.2 | 0.0 | 12.9 | 0.0 | 38.0 |
| Cycle Q Clear(g_c), s | 10.2 | 29.6 | 6.8 | 8.0 | 16.8 | 0.0 | 8.9 | 27.2 | 0.0 | 12.9 | 0.0 | 38.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.30 |
| Lane Grp Cap(c), veh/h | 213 | 1021 | 455 | 170 | 937 | 419 | 154 | 585 | 498 | 261 | 0 | 663 |
| V/C Ratio(X) | 0.84 | 0.99 | 0.29 | 0.82 | 0.68 | 0.00 | 0.99 | 0.88 | 0.00 | 0.86 | 0.00 | 0.98 |
| Avail Cap(c_a), veh/h | 375 | 1021 | 455 | 273 | 937 | 419 | 154 | 585 | 498 | 444 | 0 | 663 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 44.8 | 36.8 | 28.7 | 46.1 | 34.3 | 0.0 | 47.4 | 33.8 | 0.0 | 43.3 | 0.0 | 32.2 |
| Incr Delay (d2), s/veh | 8.5 | 25.9 | 0.4 | 9.7 | 2.0 | 0.0 | 69.4 | 17.1 | 0.0 | 8.5 | 0.0 | 31.1 |
| 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 | 5.5 | 18.1 | 3.0 | 4.4 | 8.5 | 0.0 | 7.3 | 16.8 | 0.0 | 6.9 | 0.0 | 24.2 |
| LnGrp Delay(d),s/veh | 53.2 | 62.7 | 29.1 | 55.8 | 36.3 | 0.0 | 116.8 | 50.9 | 0.0 | 51.8 | 0.0 | 63.2 |
| LnGrp LOS | D | E | C | E | D | | F | D | | D | | E |
| Approach Vol, veh/h | | 1323 | | | 778 | | | 667 | | | 877 | |
| Approach Delay, s/veh | | 58.1 | | | 39.8 | | | 65.9 | | | 60.3 | |
| Approach LOS | | E | | | D | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 19.3 | 36.7 | 14.0 | 34.0 | 13.0 | 43.0 | 16.5 | 31.5 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 26.0 | 22.0 | 16.0 | 30.0 | 9.0 | 39.0 | 22.0 | 24.0 |
| Max Q Clear Time (g_c+I1), s | 14.9 | 29.2 | 10.0 | 31.6 | 10.9 | 40.0 | 12.2 | 18.8 |
| Green Ext Time (p_c), s | 0.5 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.3 | 4.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 56.1 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 12 | 387 | 214 | 1 | 668 | 239 |
| Future Volume (vph) | 12 | 387 | 214 | 1 | 668 | 239 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.98 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1592 | | 1861 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1592 | | 1861 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 13 | 412 | 228 | 1 | 711 | 254 |
| RTOR Reduction (vph) | 357 | 0 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 68 | 0 | 229 | 0 | 711 | 254 |
| Confl. Peds. (#/hr) | | 3 | | 3 | 3 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 8.5 | | 12.9 | | 30.3 | 47.2 |
| Effective Green, g (s) | 8.5 | | 12.9 | | 30.3 | 47.2 |
| Actuated g/C Ratio | 0.13 | | 0.20 | | 0.48 | 0.74 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 212 | | 376 | | 841 | 1380 |
| v/s Ratio Prot | c0.04 | | c0.12 | | c0.40 | 0.14 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.32 | | 0.61 | | 0.85 | 0.18 |
| Uniform Delay, d1 | 25.0 | | 23.1 | | 14.6 | 2.5 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 0.9 | | 2.8 | | 7.8 | 0.1 |
| Delay (s) | 25.9 | | 25.9 | | 22.5 | 2.5 |
| Level of Service | C | | C | | C | A |
| Approach Delay (s) | 25.9 | | 25.9 | | | 17.2 |
| Approach LOS | C | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 20.7 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.70 | | |
| Actuated Cycle Length (s) | 63.7 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 83.5% | ICU Level of Service | E |
| 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 (veh/h) | 202 | 424 | 10 | 35 | 297 | 200 | 10 | 235 | 83 | 310 | 138 | 270 |
| Future Volume (veh/h) | 202 | 424 | 10 | 35 | 297 | 200 | 10 | 235 | 83 | 310 | 138 | 270 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 206 | 433 | 4 | 36 | 303 | 174 | 10 | 240 | 0 | 316 | 141 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 248 | 770 | 645 | 51 | 336 | 193 | 16 | 401 | 182 | 372 | 371 | 0 |
| Arrive On Green | 0.14 | 0.41 | 0.41 | 0.03 | 0.30 | 0.30 | 0.11 | 0.11 | 0.00 | 0.21 | 0.21 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1560 | 1774 | 1110 | 638 | 139 | 3487 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 206 | 433 | 4 | 36 | 0 | 477 | 134 | 116 | 0 | 316 | 141 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1560 | 1774 | 0 | 1748 | 1856 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 7.8 | 12.2 | 0.1 | 1.4 | 0.0 | 18.0 | 4.7 | 4.3 | 0.0 | 11.8 | 4.7 | 0.0 |
| Cycle Q Clear(g_c), s | 7.8 | 12.2 | 0.1 | 1.4 | 0.0 | 18.0 | 4.7 | 4.3 | 0.0 | 11.8 | 4.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.36 | 0.07 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 248 | 770 | 645 | 51 | 0 | 529 | 213 | 203 | 182 | 372 | 371 | 0 |
| V/C Ratio(X) | 0.83 | 0.56 | 0.01 | 0.70 | 0.00 | 0.90 | 0.63 | 0.57 | 0.00 | 0.85 | 0.38 | 0.00 |
| Avail Cap(c_a), veh/h | 258 | 770 | 645 | 103 | 0 | 560 | 432 | 412 | 369 | 413 | 412 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 28.8 | 15.4 | 11.8 | 33.1 | 0.0 | 23.0 | 29.0 | 28.8 | 0.0 | 26.1 | 23.3 | 0.0 |
| Incr Delay (d2), s/veh | 19.5 | 0.9 | 0.0 | 15.9 | 0.0 | 17.2 | 3.0 | 2.5 | 0.0 | 14.2 | 0.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.1 | 6.5 | 0.0 | 0.9 | 0.0 | 11.1 | 2.6 | 2.2 | 0.0 | 7.2 | 2.3 | 0.0 |
| LnGrp Delay(d),s/veh | 48.3 | 16.3 | 11.9 | 49.0 | 0.0 | 40.2 | 32.0 | 31.3 | 0.0 | 40.3 | 23.9 | 0.0 |
| LnGrp LOS | D | B | B | D | | D | C | C | | D | C | |
| Approach Vol, veh/h | | 643 | | | 513 | | | 250 | | | 457 | |
| Approach Delay, s/veh | | 26.5 | | | 40.8 | | | 31.7 | | | 35.2 | |
| Approach LOS | | C | | | D | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 11.9 | 6.0 | 32.4 | | 18.4 | 13.6 | 24.8 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 16.0 | 4.0 | 28.0 | | 16.0 | 10.0 | 22.0 |
| Max Q Clear Time (g_c+I1), s | | 6.7 | 3.4 | 14.2 | | 13.8 | 9.8 | 20.0 |
| Green Ext Time (p_c), s | | 0.9 | 0.0 | 5.3 | | 0.6 | 0.0 | 0.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 33.3 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 93 | 40 | 534 | 188 | 389 | 20 | 470 | 239 | 686 | 990 | 180 |
| Future Volume (veh/h) | 50 | 93 | 40 | 534 | 188 | 389 | 20 | 470 | 239 | 686 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 96 | 0 | 551 | 194 | 0 | 21 | 485 | 0 | 707 | 1021 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 131 | 430 | 134 | 673 | 1232 | 384 | 37 | 884 | 0 | 827 | 2320 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.21 | 0.26 | 0.00 | 0.02 | 0.26 | 0.00 | 0.26 | 0.49 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 96 | 0 | 551 | 194 | 0 | 21 | 485 | 0 | 707 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 1.4 | 1.7 | 0.0 | 14.4 | 2.8 | 0.0 | 1.1 | 10.6 | 0.0 | 18.4 | 12.3 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 1.7 | 0.0 | 14.4 | 2.8 | 0.0 | 1.1 | 10.6 | 0.0 | 18.4 | 12.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 131 | 430 | 134 | 673 | 1232 | 384 | 37 | 884 | 0 | 827 | 2320 | 0 |
| V/C Ratio(X) | 0.40 | 0.22 | 0.00 | 0.82 | 0.16 | 0.00 | 0.57 | 0.55 | 0.00 | 0.86 | 0.44 | 0.00 |
| Avail Cap(c_a), veh/h | 1131 | 1940 | 604 | 1313 | 1940 | 604 | 572 | 1619 | 0 | 1131 | 2320 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 40.9 | 36.9 | 0.0 | 32.9 | 24.9 | 0.0 | 42.3 | 28.2 | 0.0 | 30.9 | 14.4 | 0.0 |
| Incr Delay (d2), s/veh | 1.9 | 0.3 | 0.0 | 2.5 | 0.1 | 0.0 | 13.0 | 0.5 | 0.0 | 4.9 | 0.1 | 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 | 0.6 | 0.7 | 0.0 | 6.6 | 1.2 | 0.0 | 0.6 | 3.4 | 0.0 | 8.7 | 5.3 | 0.0 |
| LnGrp Delay(d),s/veh | 42.8 | 37.1 | 0.0 | 35.4 | 25.0 | 0.0 | 55.4 | 28.7 | 0.0 | 35.8 | 14.5 | 0.0 |
| LnGrp LOS | D | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 148 | | | 745 | | | 506 | | | 1728 | |
| Approach Delay, s/veh | | 39.1 | | | 32.7 | | | 29.8 | | | 23.2 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 26.7 | 26.4 | 22.5 | 12.0 | 6.0 | 47.0 | 7.6 | 26.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 20.4 | 12.6 | 16.4 | 3.7 | 3.1 | 14.3 | 3.4 | 4.8 |
| Green Ext Time (p_c), s | 2.2 | 9.4 | 2.1 | 2.2 | 0.0 | 13.4 | 0.1 | 2.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 27.3 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 22 | 372 | 655 | 210 | 210 | 32 |
| Future Volume (veh/h) | 22 | 372 | 655 | 210 | 210 | 32 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 27 | 448 | 789 | 0 | 253 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 48 | 2783 | 1983 | 0 | 340 | 304 |
| Arrive On Green | 0.03 | 0.55 | 0.39 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 27 | 448 | 789 | 0 | 253 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.5 | 1.3 | 3.4 | 0.0 | 4.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.5 | 1.3 | 3.4 | 0.0 | 4.1 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 48 | 2783 | 1983 | 0 | 340 | 304 |
| V/C Ratio(X) | 0.57 | 0.16 | 0.40 | 0.00 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 289 | 4313 | 2820 | 0 | 926 | 826 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.7 | 3.4 | 6.8 | 0.0 | 11.7 | 0.0 |
| Incr Delay (d2), s/veh | 10.2 | 0.0 | 0.1 | 0.0 | 3.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.4 | 0.6 | 1.6 | 0.0 | 2.3 | 0.0 |
| LnGrp Delay(d),s/veh | 25.0 | 3.5 | 6.9 | 0.0 | 14.9 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 475 | 789 | | 253 | |
| Approach Delay, s/veh | | 4.7 | 6.9 | | 14.9 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 20.8 | | 9.9 | 4.8 | 16.0 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.3 | | 6.1 | 2.5 | 5.4 | | |
| Green Ext Time (p_c), s | | 9.3 | | 0.5 | 0.0 | 6.3 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 7.5 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 168 | 595 | 200 | 110 | 740 | 300 | 170 | 276 | 103 | 270 | 465 | 120 |
| Future Volume (veh/h) | 168 | 595 | 200 | 110 | 740 | 300 | 170 | 276 | 103 | 270 | 465 | 120 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.87 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 205 | 726 | 10 | 134 | 902 | 0 | 207 | 337 | 0 | 329 | 567 | 137 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 234 | 970 | 379 | 161 | 825 | 369 | 200 | 563 | 478 | 363 | 571 | 138 |
| Arrive On Green | 0.13 | 0.27 | 0.27 | 0.09 | 0.23 | 0.00 | 0.11 | 0.30 | 0.00 | 0.20 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3539 | 1384 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1449 | 350 |
| Grp Volume(v), veh/h | 205 | 726 | 10 | 134 | 902 | 0 | 207 | 337 | 0 | 329 | 0 | 704 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1384 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1800 |
| Q Serve(g_s), s | 14.1 | 23.3 | 0.7 | 9.2 | 29.0 | 0.0 | 14.0 | 19.2 | 0.0 | 22.5 | 0.0 | 48.4 |
| Cycle Q Clear(g_c), s | 14.1 | 23.3 | 0.7 | 9.2 | 29.0 | 0.0 | 14.0 | 19.2 | 0.0 | 22.5 | 0.0 | 48.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.19 |
| Lane Grp Cap(c), veh/h | 234 | 970 | 379 | 161 | 825 | 369 | 200 | 563 | 478 | 363 | 0 | 709 |
| V/C Ratio(X) | 0.88 | 0.75 | 0.03 | 0.83 | 1.09 | 0.00 | 1.04 | 0.60 | 0.00 | 0.91 | 0.00 | 0.99 |
| Avail Cap(c_a), veh/h | 314 | 970 | 379 | 257 | 825 | 369 | 200 | 563 | 478 | 585 | 0 | 709 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 41.2 | 33.0 | 55.6 | 47.7 | 0.0 | 55.2 | 37.0 | 0.0 | 48.3 | 0.0 | 37.5 |
| Incr Delay (d2), s/veh | 18.8 | 3.3 | 0.0 | 11.9 | 59.8 | 0.0 | 73.6 | 4.7 | 0.0 | 11.9 | 0.0 | 32.1 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 8.1 | 11.8 | 0.3 | 5.1 | 21.0 | 0.0 | 10.9 | 10.6 | 0.0 | 12.3 | 0.0 | 30.4 |
| LnGrp Delay(d),s/veh | 71.8 | 44.5 | 33.0 | 67.6 | 107.5 | 0.0 | 128.9 | 41.6 | 0.0 | 60.2 | 0.0 | 69.6 |
| LnGrp LOS | E | D | C | E | F | | F | D | | E | | E |
| Approach Vol, veh/h | | 941 | | | 1036 | | | 544 | | | 1033 | |
| Approach Delay, s/veh | | 50.3 | | | 102.3 | | | 74.8 | | | 66.6 | |
| Approach LOS | | D | | | F | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 29.4 | 41.6 | 15.3 | 38.1 | 18.0 | 53.0 | 20.4 | 33.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 41.0 | 22.0 | 18.0 | 33.0 | 14.0 | 49.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 24.5 | 21.2 | 11.2 | 25.3 | 16.0 | 50.4 | 16.1 | 31.0 |
| Green Ext Time (p_c), s | 0.9 | 0.6 | 0.2 | 5.7 | 0.0 | 0.0 | 0.3 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 74.0 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 14 | 449 | 296 | 3 | 300 | 363 |
| Future Volume (vph) | 14 | 449 | 296 | 3 | 300 | 363 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1596 | | 1859 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1596 | | 1859 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Adj. Flow (vph) | 16 | 528 | 348 | 4 | 353 | 427 |
| RTOR Reduction (vph) | 435 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 109 | 0 | 351 | 0 | 353 | 427 |
| Confl. Peds. (#/hr) | 1 | 1 | | 1 | 1 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 8.4 | | 13.5 | | 13.8 | 31.3 |
| Effective Green, g (s) | 8.4 | | 13.5 | | 13.8 | 31.3 |
| Actuated g/C Ratio | 0.18 | | 0.28 | | 0.29 | 0.66 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 281 | | 526 | | 512 | 1222 |
| v/s Ratio Prot | c0.07 | | c0.19 | | c0.20 | 0.23 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.39 | | 0.67 | | 0.69 | 0.35 |
| Uniform Delay, d1 | 17.4 | | 15.1 | | 15.0 | 3.7 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 0.9 | | 3.2 | | 3.9 | 0.2 |
| Delay (s) | 18.3 | | 18.3 | | 18.9 | 3.8 |
| Level of Service | B | | B | | B | A |
| Approach Delay (s) | 18.3 | | 18.3 | | | 10.7 |
| Approach LOS | B | | B | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 14.7 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.61 | | |
| Actuated Cycle Length (s) | 47.7 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 71.0% | ICU Level of Service | C |
| 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 (veh/h) | 129 | 180 | 10 | 10 | 335 | 220 | 30 | 150 | 20 | 270 | 200 | 195 |
| Future Volume (veh/h) | 129 | 180 | 10 | 10 | 335 | 220 | 30 | 150 | 20 | 270 | 200 | 195 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 142 | 198 | 6 | 11 | 368 | 223 | 33 | 165 | 0 | 297 | 220 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 180 | 901 | 759 | 19 | 426 | 258 | 57 | 300 | 157 | 377 | 376 | 0 |
| Arrive On Green | 0.10 | 0.48 | 0.48 | 0.01 | 0.39 | 0.39 | 0.10 | 0.10 | 0.00 | 0.21 | 0.21 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1571 | 1774 | 1084 | 657 | 571 | 3032 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 142 | 198 | 6 | 11 | 0 | 591 | 106 | 92 | 0 | 297 | 220 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1571 | 1774 | 0 | 1741 | 1834 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 6.4 | 5.1 | 0.2 | 0.5 | 0.0 | 25.7 | 4.6 | 4.1 | 0.0 | 13.0 | 9.2 | 0.0 |
| Cycle Q Clear(g_c), s | 6.4 | 5.1 | 0.2 | 0.5 | 0.0 | 25.7 | 4.6 | 4.1 | 0.0 | 13.0 | 9.2 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.38 | 0.31 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 180 | 901 | 759 | 19 | 0 | 684 | 182 | 175 | 157 | 377 | 376 | 0 |
| V/C Ratio(X) | 0.79 | 0.22 | 0.01 | 0.57 | 0.00 | 0.86 | 0.58 | 0.53 | 0.00 | 0.79 | 0.58 | 0.00 |
| Avail Cap(c_a), veh/h | 409 | 1266 | 1067 | 86 | 0 | 866 | 378 | 365 | 327 | 581 | 580 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 36.2 | 12.3 | 11.0 | 40.6 | 0.0 | 23.0 | 35.5 | 35.3 | 0.0 | 30.7 | 29.2 | 0.0 |
| Incr Delay (d2), s/veh | 7.5 | 0.1 | 0.0 | 24.3 | 0.0 | 7.5 | 3.0 | 2.4 | 0.0 | 4.0 | 1.4 | 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 | 3.5 | 2.6 | 0.1 | 0.4 | 0.0 | 13.7 | 2.4 | 2.1 | 0.0 | 6.8 | 4.6 | 0.0 |
| LnGrp Delay(d),s/veh | 43.7 | 12.4 | 11.0 | 64.8 | 0.0 | 30.5 | 38.5 | 37.7 | 0.0 | 34.6 | 30.6 | 0.0 |
| LnGrp LOS | D | B | B | E | | C | D | D | | C | C | |
| Approach Vol, veh/h | | 346 | | | 602 | | | 198 | | | 517 | |
| Approach Delay, s/veh | | 25.2 | | | 31.1 | | | 38.1 | | | 32.9 | |
| Approach LOS | | C | | | C | | | D | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 12.2 | 4.9 | 43.8 | | 21.5 | 12.4 | 36.4 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 17.0 | 4.0 | 56.0 | | 27.0 | 19.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | | 6.6 | 2.5 | 7.1 | | 15.0 | 8.4 | 27.7 |
| Green Ext Time (p_c), s | | 0.7 | 0.0 | 6.9 | | 2.5 | 0.3 | 4.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 31.3 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 518 | 40 | 245 | 336 | 521 | 70 | 1210 | 554 | 505 | 320 | 300 |
| Future Volume (veh/h) | 220 | 518 | 40 | 245 | 336 | 521 | 70 | 1210 | 554 | 505 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 557 | 0 | 263 | 361 | 0 | 75 | 1301 | 0 | 543 | 344 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 93 | 1366 | 0 | 621 | 2206 | 0 |
| Arrive On Green | 0.06 | 0.22 | 0.00 | 0.09 | 0.26 | 0.00 | 0.06 | 0.38 | 0.00 | 0.19 | 0.51 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 557 | 0 | 263 | 361 | 0 | 75 | 1301 | 0 | 543 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 8.0 | 14.6 | 0.0 | 11.4 | 8.6 | 0.0 | 6.3 | 48.8 | 0.0 | 23.1 | 5.9 | 0.0 |
| Cycle Q Clear(g_c), s | 8.0 | 14.6 | 0.0 | 11.4 | 8.6 | 0.0 | 6.3 | 48.8 | 0.0 | 23.1 | 5.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 93 | 1366 | 0 | 621 | 2206 | 0 |
| V/C Ratio(X) | 1.30 | 0.53 | 0.00 | 0.89 | 0.30 | 0.00 | 0.81 | 0.95 | 0.00 | 0.87 | 0.16 | 0.00 |
| Avail Cap(c_a), veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 153 | 1366 | 0 | 1118 | 2206 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 66.0 | 48.1 | 0.0 | 62.7 | 41.8 | 0.0 | 65.2 | 42.4 | 0.0 | 54.7 | 17.9 | 0.0 |
| Incr Delay (d2), s/veh | 168.6 | 1.9 | 0.0 | 25.9 | 0.6 | 0.0 | 14.9 | 15.3 | 0.0 | 4.1 | 0.2 | 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 | 7.8 | 6.5 | 0.0 | 6.1 | 3.8 | 0.0 | 3.3 | 18.2 | 0.0 | 10.5 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 234.6 | 50.0 | 0.0 | 88.7 | 42.4 | 0.0 | 80.2 | 57.7 | 0.0 | 58.8 | 18.1 | 0.0 |
| LnGrp LOS | F | D | | F | D | | F | E | | E | B | |
| Approach Vol, veh/h | | 794 | | | 624 | | | 1376 | | | 887 | |
| Approach Delay, s/veh | | 105.1 | | | 61.9 | | | 58.9 | | | 43.0 | |
| Approach LOS | | F | | | E | | | E | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 31.2 | 56.7 | 17.0 | 35.0 | 11.9 | 76.0 | 12.0 | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 49.0 | 36.0 | 13.0 | 31.0 | 13.0 | 72.0 | 8.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 25.1 | 50.8 | 13.4 | 16.6 | 8.3 | 7.9 | 10.0 | 10.6 |
| Green Ext Time (p_c), s | 2.1 | 0.0 | 0.0 | 5.7 | 0.1 | 21.4 | 0.0 | 7.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 65.6 |
| HCM 2010 LOS | E |

Notes

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 43 | 962 | 505 | 170 | 230 | 33 |
| Future Volume (veh/h) | 43 | 962 | 505 | 170 | 230 | 33 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 46 | 1034 | 543 | 0 | 247 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 74 | 2860 | 2009 | 0 | 331 | 296 |
| Arrive On Green | 0.04 | 0.56 | 0.40 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 46 | 1034 | 543 | 0 | 247 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.8 | 3.6 | 2.3 | 0.0 | 4.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.8 | 3.6 | 2.3 | 0.0 | 4.2 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 74 | 2860 | 2009 | 0 | 331 | 296 |
| V/C Ratio(X) | 0.62 | 0.36 | 0.27 | 0.00 | 0.75 | 0.00 |
| Avail Cap(c_a), veh/h | 278 | 4145 | 2710 | 0 | 890 | 794 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 15.0 | 3.8 | 6.5 | 0.0 | 12.3 | 0.0 |
| Incr Delay (d2), s/veh | 8.1 | 0.1 | 0.1 | 0.0 | 3.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 1.6 | 1.1 | 0.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 23.1 | 3.9 | 6.6 | 0.0 | 15.6 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 1080 | 543 | | 247 | |
| Approach Delay, s/veh | | 4.7 | 6.6 | | 15.6 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 21.9 | | 10.0 | 5.3 | 16.6 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 5.6 | | 6.2 | 2.8 | 4.3 | | |
| Green Ext Time (p_c), s | | 11.4 | | 0.5 | 0.0 | 8.3 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 6.7 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | ↰ | ↑↑ | ↱ | ↰ | ↑↑ | ↱ | ↰ | ↑ | ↱ | ↰ | ↑↱ | |
| Traffic Volume (veh/h) | 179 | 955 | 190 | 83 | 600 | 200 | 130 | 414 | 113 | 200 | 308 | 191 |
| Future Volume (veh/h) | 179 | 955 | 190 | 83 | 600 | 200 | 130 | 414 | 113 | 200 | 308 | 191 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 201 | 1073 | 53 | 93 | 674 | 0 | 146 | 465 | 0 | 225 | 346 | 199 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 233 | 1113 | 496 | 118 | 883 | 395 | 174 | 619 | 527 | 253 | 419 | 241 |
| Arrive On Green | 0.13 | 0.31 | 0.31 | 0.07 | 0.25 | 0.00 | 0.10 | 0.33 | 0.00 | 0.14 | 0.38 | 0.38 |
| Sat Flow, veh/h | 1774 | 3539 | 1578 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1111 | 639 |
| Grp Volume(v), veh/h | 201 | 1073 | 53 | 93 | 674 | 0 | 146 | 465 | 0 | 225 | 0 | 545 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1578 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1749 |
| Q Serve(g_s), s | 12.3 | 33.2 | 2.7 | 5.7 | 19.6 | 0.0 | 9.0 | 24.7 | 0.0 | 13.9 | 0.0 | 31.4 |
| Cycle Q Clear(g_c), s | 12.3 | 33.2 | 2.7 | 5.7 | 19.6 | 0.0 | 9.0 | 24.7 | 0.0 | 13.9 | 0.0 | 31.4 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.37 |
| Lane Grp Cap(c), veh/h | 233 | 1113 | 496 | 118 | 883 | 395 | 174 | 619 | 527 | 253 | 0 | 659 |
| V/C Ratio(X) | 0.86 | 0.96 | 0.11 | 0.79 | 0.76 | 0.00 | 0.84 | 0.75 | 0.00 | 0.89 | 0.00 | 0.83 |
| Avail Cap(c_a), veh/h | 351 | 1113 | 496 | 255 | 922 | 413 | 191 | 619 | 527 | 255 | 0 | 659 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 47.3 | 37.5 | 27.0 | 51.1 | 38.7 | 0.0 | 49.3 | 33.0 | 0.0 | 46.9 | 0.0 | 31.4 |
| Incr Delay (d2), s/veh | 13.1 | 18.8 | 0.1 | 10.9 | 3.7 | 0.0 | 25.2 | 8.2 | 0.0 | 29.5 | 0.0 | 11.4 |
| 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 | 6.9 | 19.2 | 1.2 | 3.2 | 10.0 | 0.0 | 5.6 | 14.1 | 0.0 | 8.9 | 0.0 | 17.2 |
| LnGrp Delay(d),s/veh | 60.4 | 56.3 | 27.1 | 62.0 | 42.4 | 0.0 | 74.5 | 41.2 | 0.0 | 76.3 | 0.0 | 42.7 |
| LnGrp LOS | E | E | C | E | D | | E | D | | E | | D |
| Approach Vol, veh/h | | 1327 | | | 767 | | | 611 | | | 770 | |
| Approach Delay, s/veh | | 55.8 | | | 44.7 | | | 49.1 | | | 52.5 | |
| Approach LOS | | E | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 19.9 | 41.0 | 11.4 | 39.0 | 14.9 | 45.9 | 18.6 | 31.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 16.0 | 37.0 | 16.0 | 35.0 | 12.0 | 41.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 15.9 | 26.7 | 7.7 | 35.2 | 11.0 | 33.4 | 14.3 | 21.6 |
| Green Ext Time (p_c), s | 0.0 | 4.8 | 0.1 | 0.0 | 0.0 | 3.9 | 0.3 | 5.8 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 51.5 |
| HCM 2010 LOS | D |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 14 | 307 | 383 | 5 | 507 | 299 |
| Future Volume (vph) | 14 | 307 | 383 | 5 | 507 | 299 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1595 | | 1859 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1595 | | 1859 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 15 | 327 | 407 | 5 | 539 | 318 |
| RTOR Reduction (vph) | 286 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 56 | 0 | 411 | 0 | 539 | 318 |
| Confl. Peds. (#/hr) | | 3 | | 3 | 3 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 8.3 | | 20.1 | | 25.4 | 49.5 |
| Effective Green, g (s) | 8.3 | | 20.1 | | 25.4 | 49.5 |
| Actuated g/C Ratio | 0.13 | | 0.31 | | 0.39 | 0.75 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 201 | | 567 | | 683 | 1401 |
| v/s Ratio Prot | c0.04 | | c0.22 | | c0.30 | 0.17 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.28 | | 0.73 | | 0.79 | 0.23 |
| Uniform Delay, d1 | 26.0 | | 20.4 | | 17.8 | 2.4 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 0.8 | | 4.6 | | 6.0 | 0.1 |
| Delay (s) | 26.8 | | 25.0 | | 23.9 | 2.5 |
| Level of Service | C | | C | | C | A |
| Approach Delay (s) | 26.8 | | 25.0 | | | 16.0 |
| Approach LOS | C | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 20.6 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.69 | | |
| Actuated Cycle Length (s) | 65.8 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 78.6% | 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 (veh/h) | 157 | 437 | 10 | 30 | 285 | 200 | 10 | 230 | 80 | 310 | 130 | 131 |
| Future Volume (veh/h) | 157 | 437 | 10 | 30 | 285 | 200 | 10 | 230 | 80 | 310 | 130 | 131 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 160 | 446 | 3 | 31 | 291 | 175 | 10 | 235 | 0 | 316 | 133 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 204 | 793 | 664 | 45 | 367 | 220 | 16 | 392 | 178 | 388 | 387 | 0 |
| Arrive On Green | 0.11 | 0.43 | 0.43 | 0.03 | 0.34 | 0.34 | 0.11 | 0.11 | 0.00 | 0.22 | 0.22 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1560 | 1774 | 1090 | 655 | 141 | 3484 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 160 | 446 | 3 | 31 | 0 | 466 | 131 | 114 | 0 | 316 | 133 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1560 | 1774 | 0 | 1745 | 1856 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 6.4 | 13.3 | 0.1 | 1.3 | 0.0 | 17.8 | 5.0 | 4.5 | 0.0 | 12.4 | 4.7 | 0.0 |
| Cycle Q Clear(g_c), s | 6.4 | 13.3 | 0.1 | 1.3 | 0.0 | 17.8 | 5.0 | 4.5 | 0.0 | 12.4 | 4.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.38 | 0.08 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 204 | 793 | 664 | 45 | 0 | 587 | 209 | 199 | 178 | 388 | 387 | 0 |
| V/C Ratio(X) | 0.79 | 0.56 | 0.00 | 0.68 | 0.00 | 0.79 | 0.63 | 0.57 | 0.00 | 0.82 | 0.34 | 0.00 |
| Avail Cap(c_a), veh/h | 507 | 1191 | 998 | 145 | 0 | 760 | 480 | 457 | 409 | 531 | 530 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 31.6 | 15.9 | 12.1 | 35.5 | 0.0 | 22.1 | 31.2 | 30.9 | 0.0 | 27.3 | 24.3 | 0.0 |
| Incr Delay (d2), s/veh | 6.5 | 0.6 | 0.0 | 16.7 | 0.0 | 4.4 | 3.1 | 2.6 | 0.0 | 6.9 | 0.5 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.5 | 7.0 | 0.0 | 0.8 | 0.0 | 9.3 | 2.7 | 2.3 | 0.0 | 6.8 | 2.3 | 0.0 |
| LnGrp Delay(d),s/veh | 38.2 | 16.6 | 12.1 | 52.2 | 0.0 | 26.5 | 34.3 | 33.5 | 0.0 | 34.2 | 24.8 | 0.0 |
| LnGrp LOS | D | B | B | D | | C | C | C | | C | C | |
| Approach Vol, veh/h | | 609 | | | 497 | | | 245 | | | 449 | |
| Approach Delay, s/veh | | 22.2 | | | 28.1 | | | 33.9 | | | 31.4 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 12.3 | 5.9 | 35.3 | | 20.1 | 12.4 | 28.7 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 19.0 | 6.0 | 47.0 | | 22.0 | 21.0 | 32.0 |
| Max Q Clear Time (g_c+I1), s | | 7.0 | 3.3 | 15.3 | | 14.4 | 8.4 | 19.8 |
| Green Ext Time (p_c), s | | 1.1 | 0.0 | 7.4 | | 1.6 | 0.3 | 5.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 27.7 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 96 | 40 | 554 | 195 | 407 | 20 | 470 | 247 | 706 | 990 | 180 |
| Future Volume (veh/h) | 50 | 96 | 40 | 554 | 195 | 407 | 20 | 470 | 247 | 706 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 99 | 0 | 571 | 201 | 0 | 21 | 485 | 0 | 728 | 1021 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 130 | 435 | 136 | 693 | 1267 | 394 | 37 | 851 | 0 | 844 | 2301 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.22 | 0.27 | 0.00 | 0.02 | 0.25 | 0.00 | 0.26 | 0.49 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 99 | 0 | 571 | 201 | 0 | 21 | 485 | 0 | 728 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 1.4 | 1.7 | 0.0 | 15.2 | 2.9 | 0.0 | 1.1 | 10.9 | 0.0 | 19.3 | 12.6 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 1.7 | 0.0 | 15.2 | 2.9 | 0.0 | 1.1 | 10.9 | 0.0 | 19.3 | 12.6 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 130 | 435 | 136 | 693 | 1267 | 394 | 37 | 851 | 0 | 844 | 2301 | 0 |
| V/C Ratio(X) | 0.40 | 0.23 | 0.00 | 0.82 | 0.16 | 0.00 | 0.57 | 0.57 | 0.00 | 0.86 | 0.44 | 0.00 |
| Avail Cap(c_a), veh/h | 1113 | 1909 | 595 | 1292 | 1909 | 595 | 563 | 1593 | 0 | 1113 | 2301 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 41.6 | 37.4 | 0.0 | 33.2 | 24.8 | 0.0 | 43.0 | 29.4 | 0.0 | 31.2 | 14.9 | 0.0 |
| Incr Delay (d2), s/veh | 2.0 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.2 | 0.6 | 0.0 | 5.6 | 0.1 | 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 | 0.8 | 0.0 | 6.9 | 1.3 | 0.0 | 0.6 | 3.5 | 0.0 | 9.2 | 5.4 | 0.0 |
| LnGrp Delay(d),s/veh | 43.6 | 37.7 | 0.0 | 35.7 | 24.9 | 0.0 | 56.2 | 30.0 | 0.0 | 36.8 | 15.0 | 0.0 |
| LnGrp LOS | D | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 151 | | | 772 | | | 506 | | | 1749 | |
| Approach Delay, s/veh | | 39.7 | | | 32.9 | | | 31.1 | | | 24.1 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 27.5 | 25.9 | 23.3 | 12.2 | 6.0 | 47.4 | 7.6 | 27.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 21.3 | 12.9 | 17.2 | 3.7 | 3.1 | 14.6 | 3.4 | 4.9 |
| Green Ext Time (p_c), s | 2.2 | 8.6 | 2.1 | 2.3 | 0.0 | 13.3 | 0.1 | 2.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.1 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 439 | 202 | 440 | 30 | 396 | 286 | 103 | 50 | 255 | 160 |
| Future Volume (veh/h) | 180 | 260 | 439 | 202 | 440 | 30 | 396 | 286 | 103 | 50 | 255 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 134 | 220 | 478 | 25 | 430 | 311 | 79 | 54 | 277 | 76 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 292 | 844 | 365 | 263 | 1524 | 79 | 541 | 948 | 236 | 81 | 626 | 168 |
| Arrive On Green | 0.08 | 0.25 | 0.25 | 0.15 | 0.31 | 0.31 | 0.16 | 0.34 | 0.34 | 0.05 | 0.23 | 0.23 |
| Sat Flow, veh/h | 3442 | 3442 | 1488 | 1774 | 4941 | 256 | 3442 | 2787 | 695 | 1774 | 2738 | 734 |
| Grp Volume(v), veh/h | 196 | 278 | 139 | 220 | 327 | 176 | 430 | 195 | 195 | 54 | 177 | 176 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1540 | 1774 | 1695 | 1807 | 1721 | 1770 | 1713 | 1774 | 1770 | 1703 |
| Q Serve(g_s), s | 4.0 | 4.9 | 5.4 | 8.7 | 5.3 | 5.4 | 8.7 | 5.9 | 6.1 | 2.2 | 6.2 | 6.5 |
| Cycle Q Clear(g_c), s | 4.0 | 4.9 | 5.4 | 8.7 | 5.3 | 5.4 | 8.7 | 5.9 | 6.1 | 2.2 | 6.2 | 6.5 |
| Prop In Lane | 1.00 | | 0.97 | 1.00 | | 0.14 | 1.00 | | 0.41 | 1.00 | | 0.43 |
| Lane Grp Cap(c), veh/h | 292 | 831 | 377 | 263 | 1046 | 557 | 541 | 602 | 583 | 81 | 405 | 389 |
| V/C Ratio(X) | 0.67 | 0.33 | 0.37 | 0.84 | 0.31 | 0.32 | 0.80 | 0.32 | 0.33 | 0.67 | 0.44 | 0.45 |
| Avail Cap(c_a), veh/h | 522 | 1637 | 743 | 318 | 1730 | 922 | 712 | 1025 | 992 | 220 | 879 | 846 |
| 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 | 32.2 | 22.5 | 22.7 | 30.0 | 19.2 | 19.2 | 29.4 | 17.7 | 17.8 | 34.0 | 24.0 | 24.1 |
| Incr Delay (d2), s/veh | 2.7 | 0.2 | 0.6 | 15.0 | 0.2 | 0.3 | 4.7 | 0.3 | 0.3 | 9.0 | 0.7 | 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 | 2.0 | 2.3 | 2.4 | 5.4 | 2.5 | 2.7 | 4.5 | 2.9 | 2.9 | 1.3 | 3.1 | 3.1 |
| LnGrp Delay(d),s/veh | 34.8 | 22.7 | 23.3 | 45.0 | 19.3 | 19.5 | 34.1 | 18.1 | 18.1 | 43.1 | 24.7 | 24.9 |
| LnGrp LOS | C | C | C | D | B | B | C | B | B | D | C | C |
| Approach Vol, veh/h | | 613 | | | 723 | | | 820 | | | 407 | |
| Approach Delay, s/veh | | 26.7 | | | 27.2 | | | 26.5 | | | 27.2 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.3 | 28.7 | 14.8 | 21.8 | 15.4 | 20.6 | 10.2 | 26.4 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 9.0 | 42.0 | 13.0 | 35.0 | 15.0 | 36.0 | 11.0 | 37.0 |
| Max Q Clear Time (g_c+I1), s | 4.2 | 8.1 | 10.7 | 7.4 | 10.7 | 8.5 | 6.0 | 7.4 |
| Green Ext Time (p_c), s | 0.0 | 5.1 | 0.1 | 7.1 | 0.7 | 4.9 | 0.3 | 7.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 26.9 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 31 | 373 | 655 | 212 | 211 | 37 |
| Future Volume (veh/h) | 31 | 373 | 655 | 212 | 211 | 37 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 37 | 449 | 789 | 0 | 254 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 62 | 2798 | 1964 | 0 | 341 | 304 |
| Arrive On Green | 0.04 | 0.55 | 0.39 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 37 | 449 | 789 | 0 | 254 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.6 | 1.4 | 3.5 | 0.0 | 4.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.6 | 1.4 | 3.5 | 0.0 | 4.2 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 62 | 2798 | 1964 | 0 | 341 | 304 |
| V/C Ratio(X) | 0.59 | 0.16 | 0.40 | 0.00 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 286 | 4256 | 2783 | 0 | 914 | 815 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.8 | 3.4 | 6.9 | 0.0 | 11.8 | 0.0 |
| Incr Delay (d2), s/veh | 8.7 | 0.0 | 0.1 | 0.0 | 3.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.6 | 1.6 | 0.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 23.4 | 3.5 | 7.1 | 0.0 | 15.1 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 486 | 789 | | 254 | |
| Approach Delay, s/veh | | 5.0 | 7.1 | | 15.1 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 21.1 | | 10.0 | 5.1 | 16.0 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.4 | | 6.2 | 2.6 | 5.5 | | |
| Green Ext Time (p_c), s | | 9.3 | | 0.5 | 0.0 | 6.3 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 7.7 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 168 | 595 | 207 | 143 | 740 | 300 | 177 | 301 | 139 | 270 | 479 | 118 |
| Future Volume (veh/h) | 168 | 595 | 207 | 143 | 740 | 300 | 177 | 301 | 139 | 270 | 479 | 118 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.86 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 205 | 726 | 18 | 174 | 902 | 0 | 216 | 367 | 0 | 329 | 584 | 135 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 234 | 890 | 344 | 201 | 825 | 369 | 200 | 563 | 478 | 363 | 577 | 133 |
| Arrive On Green | 0.13 | 0.25 | 0.25 | 0.11 | 0.23 | 0.00 | 0.11 | 0.30 | 0.00 | 0.20 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3539 | 1369 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1464 | 338 |
| Grp Volume(v), veh/h | 205 | 726 | 18 | 174 | 902 | 0 | 216 | 367 | 0 | 329 | 0 | 719 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1369 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1802 |
| Q Serve(g_s), s | 14.1 | 24.0 | 1.2 | 12.0 | 29.0 | 0.0 | 14.0 | 21.3 | 0.0 | 22.5 | 0.0 | 49.0 |
| Cycle Q Clear(g_c), s | 14.1 | 24.0 | 1.2 | 12.0 | 29.0 | 0.0 | 14.0 | 21.3 | 0.0 | 22.5 | 0.0 | 49.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.19 |
| Lane Grp Cap(c), veh/h | 234 | 890 | 344 | 201 | 825 | 369 | 200 | 563 | 478 | 363 | 0 | 710 |
| V/C Ratio(X) | 0.88 | 0.82 | 0.05 | 0.86 | 1.09 | 0.00 | 1.08 | 0.65 | 0.00 | 0.91 | 0.00 | 1.01 |
| Avail Cap(c_a), veh/h | 314 | 939 | 363 | 257 | 825 | 369 | 200 | 563 | 478 | 585 | 0 | 710 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.0 | 43.9 | 35.3 | 54.2 | 47.7 | 0.0 | 55.2 | 37.7 | 0.0 | 48.3 | 0.0 | 37.7 |
| Incr Delay (d2), s/veh | 18.8 | 5.4 | 0.1 | 20.9 | 59.7 | 0.0 | 87.1 | 5.8 | 0.0 | 11.9 | 0.0 | 37.0 |
| 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 | 8.2 | 12.4 | 0.5 | 7.1 | 20.9 | 0.0 | 11.7 | 11.8 | 0.0 | 12.3 | 0.0 | 31.6 |
| LnGrp Delay(d),s/veh | 71.8 | 49.3 | 35.4 | 75.1 | 107.4 | 0.0 | 142.3 | 43.5 | 0.0 | 60.2 | 0.0 | 74.7 |
| LnGrp LOS | E | D | D | E | F | | F | D | | E | | F |
| Approach Vol, veh/h | | 949 | | | 1076 | | | 583 | | | 1048 | |
| Approach Delay, s/veh | | 53.9 | | | 102.2 | | | 80.1 | | | 70.2 | |
| Approach LOS | | D | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 29.4 | 41.6 | 18.1 | 35.3 | 18.0 | 53.0 | 20.4 | 33.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 41.0 | 22.0 | 18.0 | 33.0 | 14.0 | 49.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 24.5 | 23.3 | 14.0 | 26.0 | 16.0 | 51.0 | 16.1 | 31.0 |
| Green Ext Time (p_c), s | 0.9 | 0.0 | 0.2 | 5.2 | 0.0 | 0.0 | 0.3 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 77.0 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 14 | 535 | 304 | 3 | 346 | 370 |
| Future Volume (vph) | 14 | 535 | 304 | 3 | 346 | 370 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1595 | | 1860 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1595 | | 1860 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Adj. Flow (vph) | 16 | 629 | 358 | 4 | 407 | 435 |
| RTOR Reduction (vph) | 516 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 129 | 0 | 361 | 0 | 407 | 435 |
| Confl. Peds. (#/hr) | 1 | 1 | | 1 | 1 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 9.0 | | 13.8 | | 15.1 | 32.9 |
| Effective Green, g (s) | 9.0 | | 13.8 | | 15.1 | 32.9 |
| Actuated g/C Ratio | 0.18 | | 0.28 | | 0.30 | 0.66 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 287 | | 514 | | 535 | 1228 |
| v/s Ratio Prot | c0.08 | | c0.19 | | c0.23 | 0.23 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.45 | | 0.70 | | 0.76 | 0.35 |
| Uniform Delay, d1 | 18.2 | | 16.2 | | 15.8 | 3.8 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.1 | | 4.3 | | 6.3 | 0.2 |
| Delay (s) | 19.4 | | 20.5 | | 22.1 | 4.0 |
| Level of Service | B | | C | | C | A |
| Approach Delay (s) | 19.4 | | 20.5 | | | 12.7 |
| Approach LOS | B | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 16.6 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.67 | | |
| Actuated Cycle Length (s) | 49.9 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 79.3% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 266 | 83 | 137 | 435 | 104 | 136 |
| Future Vol, veh/h | 266 | 83 | 137 | 435 | 104 | 136 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 296 | 92 | 152 | 483 | 116 | 151 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 395 | 0 | 1144 | 356 |
| Stage 1 | - | - | - | - | 349 | - |
| Stage 2 | - | - | - | - | 795 | - |
| 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 | - | - | 1164 | - | 221 | 688 |
| Stage 1 | - | - | - | - | 714 | - |
| Stage 2 | - | - | - | - | 445 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1157 | - | 190 | 680 |
| Mov Cap-2 Maneuver | - | - | - | - | 302 | - |
| Stage 1 | - | - | - | - | 710 | - |
| Stage 2 | - | - | - | - | 384 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.1 | 24.9 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 441 | - | - | 1157 | - |
| HCM Lane V/C Ratio | 0.605 | - | - | 0.132 | - |
| HCM Control Delay (s) | 24.9 | - | - | 8.6 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 3.9 | - | - | 0.5 | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 197 | 204 | 10 | 10 | 357 | 220 | 30 | 150 | 20 | 270 | 200 | 249 |
| Future Volume (veh/h) | 197 | 204 | 10 | 10 | 357 | 220 | 30 | 150 | 20 | 270 | 200 | 249 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 216 | 224 | 6 | 11 | 392 | 223 | 33 | 165 | 0 | 297 | 220 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 253 | 972 | 820 | 19 | 433 | 247 | 54 | 285 | 149 | 363 | 362 | 0 |
| Arrive On Green | 0.14 | 0.52 | 0.52 | 0.01 | 0.39 | 0.39 | 0.09 | 0.09 | 0.00 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1571 | 1774 | 1112 | 633 | 571 | 3032 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 216 | 224 | 6 | 11 | 0 | 615 | 106 | 92 | 0 | 297 | 220 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1571 | 1774 | 0 | 1745 | 1834 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 11.2 | 6.2 | 0.2 | 0.6 | 0.0 | 31.4 | 5.3 | 4.7 | 0.0 | 15.1 | 10.7 | 0.0 |
| Cycle Q Clear(g_c), s | 11.2 | 6.2 | 0.2 | 0.6 | 0.0 | 31.4 | 5.3 | 4.7 | 0.0 | 15.1 | 10.7 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.36 | 0.31 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 253 | 972 | 820 | 19 | 0 | 680 | 172 | 166 | 149 | 363 | 362 | 0 |
| V/C Ratio(X) | 0.85 | 0.23 | 0.01 | 0.58 | 0.00 | 0.90 | 0.62 | 0.55 | 0.00 | 0.82 | 0.61 | 0.00 |
| Avail Cap(c_a), veh/h | 356 | 1103 | 931 | 75 | 0 | 757 | 330 | 318 | 285 | 507 | 505 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 39.6 | 12.3 | 10.9 | 46.6 | 0.0 | 27.2 | 41.2 | 41.0 | 0.0 | 35.9 | 34.2 | 0.0 |
| Incr Delay (d2), s/veh | 13.2 | 0.1 | 0.0 | 25.5 | 0.0 | 13.5 | 3.5 | 2.9 | 0.0 | 7.2 | 1.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.4 | 3.2 | 0.1 | 0.4 | 0.0 | 17.6 | 2.8 | 2.4 | 0.0 | 8.2 | 5.4 | 0.0 |
| LnGrp Delay(d),s/veh | 52.7 | 12.4 | 10.9 | 72.1 | 0.0 | 40.7 | 44.7 | 43.8 | 0.0 | 43.1 | 35.8 | 0.0 |
| LnGrp LOS | D | B | B | E | | D | D | D | | D | D | |
| Approach Vol, veh/h | | 446 | | | 626 | | | 198 | | | 517 | |
| Approach Delay, s/veh | | 31.9 | | | 41.2 | | | 44.3 | | | 40.0 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 12.9 | 5.0 | 53.3 | | 23.3 | 17.5 | 40.8 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 17.0 | 4.0 | 56.0 | | 27.0 | 19.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | | 7.3 | 2.6 | 8.2 | | 17.1 | 13.2 | 33.4 |
| Green Ext Time (p_c), s | | 0.7 | 0.0 | 7.5 | | 2.2 | 0.3 | 3.4 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.9 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 525 | 40 | 258 | 340 | 543 | 70 | 1210 | 574 | 528 | 320 | 300 |
| Future Volume (veh/h) | 220 | 525 | 40 | 258 | 340 | 543 | 70 | 1210 | 574 | 528 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 565 | 0 | 277 | 366 | 0 | 75 | 1301 | 0 | 568 | 344 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 93 | 1337 | 0 | 647 | 2206 | 0 |
| Arrive On Green | 0.06 | 0.22 | 0.00 | 0.09 | 0.26 | 0.00 | 0.06 | 0.37 | 0.00 | 0.20 | 0.51 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 565 | 0 | 277 | 366 | 0 | 75 | 1301 | 0 | 568 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 8.0 | 14.8 | 0.0 | 12.1 | 8.7 | 0.0 | 6.3 | 49.4 | 0.0 | 24.2 | 5.9 | 0.0 |
| Cycle Q Clear(g_c), s | 8.0 | 14.8 | 0.0 | 12.1 | 8.7 | 0.0 | 6.3 | 49.4 | 0.0 | 24.2 | 5.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 93 | 1337 | 0 | 647 | 2206 | 0 |
| V/C Ratio(X) | 1.30 | 0.54 | 0.00 | 0.93 | 0.30 | 0.00 | 0.81 | 0.97 | 0.00 | 0.88 | 0.16 | 0.00 |
| Avail Cap(c_a), veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 153 | 1337 | 0 | 1118 | 2206 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 66.0 | 48.2 | 0.0 | 63.0 | 41.8 | 0.0 | 65.2 | 43.5 | 0.0 | 54.1 | 17.9 | 0.0 |
| Incr Delay (d2), s/veh | 168.6 | 2.0 | 0.0 | 35.3 | 0.6 | 0.0 | 14.9 | 19.0 | 0.0 | 4.3 | 0.2 | 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 | 7.8 | 6.6 | 0.0 | 6.8 | 3.9 | 0.0 | 3.3 | 18.9 | 0.0 | 11.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 234.6 | 50.2 | 0.0 | 98.3 | 42.5 | 0.0 | 80.2 | 62.5 | 0.0 | 58.4 | 18.1 | 0.0 |
| LnGrp LOS | F | D | | F | D | | F | E | | E | B | |
| Approach Vol, veh/h | | 802 | | | 643 | | | 1376 | | | 912 | |
| Approach Delay, s/veh | | 104.7 | | | 66.5 | | | 63.5 | | | 43.2 | |
| Approach LOS | | F | | | E | | | E | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 32.4 | 55.6 | 17.0 | 35.0 | 11.9 | 76.0 | 12.0 | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 49.0 | 36.0 | 13.0 | 31.0 | 13.0 | 72.0 | 8.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 26.2 | 51.4 | 14.1 | 16.8 | 8.3 | 7.9 | 10.0 | 10.7 |
| Green Ext Time (p_c), s | 2.2 | 0.0 | 0.0 | 5.7 | 0.1 | 21.4 | 0.0 | 7.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 67.9 |
| HCM 2010 LOS | E |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 308 | 188 | 380 | 40 | 361 | 309 | 231 | 90 | 247 | 200 |
| Future Volume (veh/h) | 310 | 700 | 308 | 188 | 380 | 40 | 361 | 309 | 231 | 90 | 247 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 249 | 198 | 400 | 34 | 380 | 325 | 151 | 95 | 260 | 110 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 419 | 1203 | 401 | 237 | 1592 | 133 | 478 | 711 | 322 | 122 | 568 | 233 |
| Arrive On Green | 0.12 | 0.32 | 0.32 | 0.13 | 0.33 | 0.33 | 0.14 | 0.30 | 0.30 | 0.07 | 0.23 | 0.23 |
| Sat Flow, veh/h | 3442 | 3742 | 1247 | 1774 | 4776 | 400 | 3442 | 2343 | 1063 | 1774 | 2433 | 998 |
| Grp Volume(v), veh/h | 326 | 667 | 319 | 198 | 282 | 152 | 380 | 243 | 233 | 95 | 187 | 183 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1599 | 1774 | 1695 | 1786 | 1721 | 1770 | 1637 | 1774 | 1770 | 1662 |
| Q Serve(g_s), s | 8.5 | 15.4 | 15.7 | 10.1 | 5.6 | 5.7 | 9.9 | 10.3 | 10.7 | 4.9 | 8.4 | 8.8 |
| Cycle Q Clear(g_c), s | 8.5 | 15.4 | 15.7 | 10.1 | 5.6 | 5.7 | 9.9 | 10.3 | 10.7 | 4.9 | 8.4 | 8.8 |
| Prop In Lane | 1.00 | | 0.78 | 1.00 | | 0.22 | 1.00 | | 0.65 | 1.00 | | 0.60 |
| Lane Grp Cap(c), veh/h | 419 | 1090 | 514 | 237 | 1130 | 595 | 478 | 537 | 496 | 122 | 413 | 388 |
| V/C Ratio(X) | 0.78 | 0.61 | 0.62 | 0.84 | 0.25 | 0.25 | 0.80 | 0.45 | 0.47 | 0.78 | 0.45 | 0.47 |
| Avail Cap(c_a), veh/h | 706 | 1282 | 605 | 402 | 1355 | 714 | 781 | 860 | 796 | 249 | 707 | 664 |
| 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 | 39.4 | 26.5 | 26.6 | 39.1 | 22.4 | 22.5 | 38.6 | 26.1 | 26.2 | 42.4 | 30.4 | 30.6 |
| Incr Delay (d2), s/veh | 3.1 | 0.6 | 1.5 | 7.6 | 0.1 | 0.2 | 3.1 | 0.6 | 0.7 | 10.2 | 0.8 | 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 | 4.2 | 7.2 | 7.1 | 5.4 | 2.6 | 2.9 | 4.9 | 5.1 | 4.9 | 2.7 | 4.2 | 4.1 |
| LnGrp Delay(d),s/veh | 42.6 | 27.2 | 28.1 | 46.7 | 22.6 | 22.7 | 41.7 | 26.7 | 26.9 | 52.6 | 31.2 | 31.5 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | D | C | C |
| Approach Vol, veh/h | | 1312 | | | 632 | | | 856 | | | 465 | |
| Approach Delay, s/veh | | 31.2 | | | 30.2 | | | 33.4 | | | 35.7 | |
| Approach LOS | | C | | | C | | | C | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 10.4 | 32.1 | 16.4 | 33.8 | 16.8 | 25.6 | 15.3 | 34.9 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 13.0 | 45.0 | 21.0 | 35.0 | 21.0 | 37.0 | 19.0 | 37.0 |
| Max Q Clear Time (g_c+I1), s | 6.9 | 12.7 | 12.1 | 17.7 | 11.9 | 10.8 | 10.5 | 7.7 |
| Green Ext Time (p_c), s | 0.1 | 6.0 | 0.4 | 9.4 | 0.9 | 5.7 | 0.8 | 12.3 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2010 Ctrl Delay | | | 32.2 |
| HCM 2010 LOS | | | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 49 | 962 | 506 | 171 | 232 | 42 |
| Future Volume (veh/h) | 49 | 962 | 506 | 171 | 232 | 42 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 53 | 1034 | 544 | 0 | 249 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 83 | 2865 | 1995 | 0 | 333 | 298 |
| Arrive On Green | 0.05 | 0.56 | 0.39 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 53 | 1034 | 544 | 0 | 249 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.9 | 3.6 | 2.3 | 0.0 | 4.3 | 0.0 |
| Cycle Q Clear(g_c), s | 0.9 | 3.6 | 2.3 | 0.0 | 4.3 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 83 | 2865 | 1995 | 0 | 333 | 298 |
| V/C Ratio(X) | 0.64 | 0.36 | 0.27 | 0.00 | 0.75 | 0.00 |
| Avail Cap(c_a), veh/h | 276 | 4108 | 2686 | 0 | 882 | 787 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 15.1 | 3.8 | 6.7 | 0.0 | 12.3 | 0.0 |
| Incr Delay (d2), s/veh | 7.8 | 0.1 | 0.1 | 0.0 | 3.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 1.6 | 1.1 | 0.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 22.9 | 3.9 | 6.7 | 0.0 | 15.7 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 1087 | 544 | | 249 | |
| Approach Delay, s/veh | | 4.9 | 6.7 | | 15.7 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 22.1 | | 10.0 | 5.5 | 16.6 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 5.6 | | 6.3 | 2.9 | 4.3 | | |
| Green Ext Time (p_c), s | | 11.4 | | 0.5 | 0.0 | 8.3 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 6.8 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 178 | 955 | 199 | 127 | 600 | 200 | 138 | 434 | 152 | 200 | 334 | 191 |
| Future Volume (veh/h) | 178 | 955 | 199 | 127 | 600 | 200 | 138 | 434 | 152 | 200 | 334 | 191 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 200 | 1073 | 64 | 143 | 674 | 0 | 155 | 488 | 0 | 225 | 375 | 199 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 231 | 1076 | 480 | 172 | 957 | 428 | 182 | 599 | 509 | 247 | 410 | 218 |
| Arrive On Green | 0.13 | 0.30 | 0.30 | 0.10 | 0.27 | 0.00 | 0.10 | 0.32 | 0.00 | 0.14 | 0.36 | 0.36 |
| Sat Flow, veh/h | 1774 | 3539 | 1578 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1146 | 608 |
| Grp Volume(v), veh/h | 200 | 1073 | 64 | 143 | 674 | 0 | 155 | 488 | 0 | 225 | 0 | 574 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1578 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1755 |
| Q Serve(g_s), s | 12.7 | 34.9 | 3.4 | 9.1 | 19.8 | 0.0 | 9.9 | 27.7 | 0.0 | 14.4 | 0.0 | 36.0 |
| Cycle Q Clear(g_c), s | 12.7 | 34.9 | 3.4 | 9.1 | 19.8 | 0.0 | 9.9 | 27.7 | 0.0 | 14.4 | 0.0 | 36.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.35 |
| Lane Grp Cap(c), veh/h | 231 | 1076 | 480 | 172 | 957 | 428 | 182 | 599 | 509 | 247 | 0 | 628 |
| V/C Ratio(X) | 0.86 | 1.00 | 0.13 | 0.83 | 0.70 | 0.00 | 0.85 | 0.82 | 0.00 | 0.91 | 0.00 | 0.91 |
| Avail Cap(c_a), veh/h | 339 | 1076 | 480 | 247 | 957 | 428 | 185 | 599 | 509 | 247 | 0 | 628 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.1 | 40.0 | 29.1 | 51.1 | 37.9 | 0.0 | 50.8 | 35.9 | 0.0 | 48.9 | 0.0 | 35.3 |
| Incr Delay (d2), s/veh | 14.4 | 26.8 | 0.1 | 14.9 | 2.4 | 0.0 | 29.4 | 11.6 | 0.0 | 34.9 | 0.0 | 20.1 |
| 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 | 21.0 | 1.5 | 5.2 | 10.0 | 0.0 | 6.4 | 16.2 | 0.0 | 9.5 | 0.0 | 20.9 |
| LnGrp Delay(d),s/veh | 63.5 | 66.8 | 29.2 | 66.0 | 40.2 | 0.0 | 80.2 | 47.6 | 0.0 | 83.8 | 0.0 | 55.4 |
| LnGrp LOS | E | E | C | E | D | | F | D | | F | | E |
| Approach Vol, veh/h | | 1337 | | | 817 | | | 643 | | | 799 | |
| Approach Delay, s/veh | | 64.5 | | | 44.7 | | | 55.4 | | | 63.4 | |
| Approach LOS | | E | | | D | | | E | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 20.0 | 41.0 | 15.1 | 39.0 | 15.8 | 45.2 | 19.0 | 35.1 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 16.0 | 37.0 | 16.0 | 35.0 | 12.0 | 41.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 16.4 | 29.7 | 11.1 | 36.9 | 11.9 | 38.0 | 14.7 | 21.8 |
| Green Ext Time (p_c), s | 0.0 | 3.9 | 0.1 | 0.0 | 0.0 | 1.9 | 0.3 | 5.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 58.1 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 14 | 372 | 392 | 5 | 597 | 309 |
| Future Volume (vph) | 14 | 372 | 392 | 5 | 597 | 309 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.98 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1593 | | 1859 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1593 | | 1859 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 15 | 396 | 417 | 5 | 635 | 329 |
| RTOR Reduction (vph) | 349 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 62 | 0 | 421 | 0 | 635 | 329 |
| Confl. Peds. (#/hr) | | 3 | | 3 | 3 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 8.6 | | 21.3 | | 30.6 | 55.9 |
| Effective Green, g (s) | 8.6 | | 21.3 | | 30.6 | 55.9 |
| Actuated g/C Ratio | 0.12 | | 0.29 | | 0.42 | 0.77 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 188 | | 546 | | 747 | 1436 |
| v/s Ratio Prot | c0.04 | | c0.23 | | c0.36 | 0.18 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.33 | | 0.77 | | 0.85 | 0.23 |
| Uniform Delay, d1 | 29.3 | | 23.4 | | 18.9 | 2.3 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.0 | | 6.7 | | 9.1 | 0.1 |
| Delay (s) | 30.3 | | 30.1 | | 28.0 | 2.4 |
| Level of Service | C | | C | | C | A |
| Approach Delay (s) | 30.3 | | 30.1 | | | 19.3 |
| Approach LOS | C | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 24.3 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.75 | | |
| Actuated Cycle Length (s) | 72.5 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 88.1% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 4.6 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 539 | 73 | 113 | 311 | 66 | 131 |
| Future Vol, veh/h | 539 | 73 | 113 | 311 | 66 | 131 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 580 | 78 | 122 | 334 | 71 | 141 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 664 | 0 | 1208 | 631 |
| Stage 1 | - | - | - | - | 625 | - |
| Stage 2 | - | - | - | - | 583 | - |
| 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 | - | - | 925 | - | 202 | 481 |
| Stage 1 | - | - | - | - | 534 | - |
| Stage 2 | - | - | - | - | 558 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 920 | - | 173 | 476 |
| Mov Cap-2 Maneuver | - | - | - | - | 309 | - |
| Stage 1 | - | - | - | - | 531 | - |
| Stage 2 | - | - | - | - | 482 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.5 | 23.4 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 403 | - | - | 920 | - |
| HCM Lane V/C Ratio | 0.526 | - | - | 0.132 | - |
| HCM Control Delay (s) | 23.4 | - | - | 9.5 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 3 | - | - | 0.5 | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 223 | 462 | 10 | 30 | 314 | 200 | 10 | 230 | 80 | 310 | 130 | 210 |
| Future Volume (veh/h) | 223 | 462 | 10 | 30 | 314 | 200 | 10 | 230 | 80 | 310 | 130 | 210 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 228 | 471 | 3 | 31 | 320 | 175 | 10 | 235 | 0 | 316 | 133 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 272 | 864 | 724 | 44 | 379 | 207 | 15 | 374 | 170 | 375 | 374 | 0 |
| Arrive On Green | 0.15 | 0.46 | 0.46 | 0.02 | 0.34 | 0.34 | 0.11 | 0.11 | 0.00 | 0.21 | 0.21 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1561 | 1774 | 1132 | 619 | 141 | 3484 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 228 | 471 | 3 | 31 | 0 | 495 | 131 | 114 | 0 | 316 | 133 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1561 | 1774 | 0 | 1751 | 1856 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 10.4 | 15.0 | 0.1 | 1.4 | 0.0 | 21.7 | 5.6 | 5.1 | 0.0 | 14.2 | 5.3 | 0.0 |
| Cycle Q Clear(g_c), s | 10.4 | 15.0 | 0.1 | 1.4 | 0.0 | 21.7 | 5.6 | 5.1 | 0.0 | 14.2 | 5.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.35 | 0.08 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 272 | 864 | 724 | 44 | 0 | 587 | 199 | 190 | 170 | 375 | 374 | 0 |
| V/C Ratio(X) | 0.84 | 0.55 | 0.00 | 0.71 | 0.00 | 0.84 | 0.66 | 0.60 | 0.00 | 0.84 | 0.36 | 0.00 |
| Avail Cap(c_a), veh/h | 449 | 1056 | 884 | 128 | 0 | 676 | 425 | 405 | 363 | 471 | 469 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 34.1 | 16.0 | 11.9 | 40.1 | 0.0 | 25.6 | 35.5 | 35.3 | 0.0 | 31.4 | 27.9 | 0.0 |
| Incr Delay (d2), s/veh | 7.1 | 0.5 | 0.0 | 19.0 | 0.0 | 8.6 | 3.7 | 3.0 | 0.0 | 10.9 | 0.6 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.6 | 7.8 | 0.0 | 0.9 | 0.0 | 11.8 | 3.1 | 2.7 | 0.0 | 8.1 | 2.6 | 0.0 |
| LnGrp Delay(d),s/veh | 41.2 | 16.5 | 11.9 | 59.2 | 0.0 | 34.1 | 39.2 | 38.3 | 0.0 | 42.2 | 28.5 | 0.0 |
| LnGrp LOS | D | B | B | E | | C | D | D | | D | C | |
| Approach Vol, veh/h | | 702 | | | 526 | | | 245 | | | 449 | |
| Approach Delay, s/veh | | 24.5 | | | 35.6 | | | 38.8 | | | 38.2 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 12.9 | 6.0 | 42.5 | | 21.5 | 16.7 | 31.8 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 19.0 | 6.0 | 47.0 | | 22.0 | 21.0 | 32.0 |
| Max Q Clear Time (g_c+I1), s | | 7.6 | 3.4 | 17.0 | | 16.2 | 12.4 | 23.7 |
| Green Ext Time (p_c), s | | 1.0 | 0.0 | 7.9 | | 1.3 | 0.4 | 4.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 32.6 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 98 | 40 | 573 | 201 | 418 | 20 | 470 | 253 | 717 | 990 | 180 |
| Future Volume (veh/h) | 50 | 98 | 40 | 573 | 201 | 418 | 20 | 470 | 253 | 717 | 990 | 180 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1727 | 1727 | 1727 | 1727 | 1696 | 1439 | 1900 | 1727 | 1727 | 1900 |
| Adj Flow Rate, veh/h | 52 | 101 | 0 | 591 | 207 | 0 | 21 | 485 | 0 | 739 | 1021 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 32 | 32 | 10 | 10 | 10 |
| Cap, veh/h | 129 | 438 | 137 | 712 | 1300 | 405 | 37 | 827 | 0 | 852 | 2281 | 0 |
| Arrive On Green | 0.04 | 0.09 | 0.00 | 0.22 | 0.28 | 0.00 | 0.02 | 0.24 | 0.00 | 0.27 | 0.48 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1468 | 3191 | 4715 | 1468 | 1616 | 3742 | 0 | 3191 | 4871 | 0 |
| Grp Volume(v), veh/h | 52 | 101 | 0 | 591 | 207 | 0 | 21 | 485 | 0 | 739 | 1021 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1468 | 1596 | 1572 | 1468 | 1616 | 1152 | 0 | 1596 | 1572 | 0 |
| Q Serve(g_s), s | 1.4 | 1.8 | 0.0 | 15.9 | 3.0 | 0.0 | 1.2 | 11.2 | 0.0 | 19.9 | 12.9 | 0.0 |
| Cycle Q Clear(g_c), s | 1.4 | 1.8 | 0.0 | 15.9 | 3.0 | 0.0 | 1.2 | 11.2 | 0.0 | 19.9 | 12.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 129 | 438 | 137 | 712 | 1300 | 405 | 37 | 827 | 0 | 852 | 2281 | 0 |
| V/C Ratio(X) | 0.40 | 0.23 | 0.00 | 0.83 | 0.16 | 0.00 | 0.57 | 0.59 | 0.00 | 0.87 | 0.45 | 0.00 |
| Avail Cap(c_a), veh/h | 1098 | 1883 | 586 | 1275 | 1883 | 586 | 556 | 1571 | 0 | 1098 | 2281 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.2 | 37.9 | 0.0 | 33.4 | 24.7 | 0.0 | 43.6 | 30.3 | 0.0 | 31.5 | 15.3 | 0.0 |
| Incr Delay (d2), s/veh | 2.0 | 0.3 | 0.0 | 2.6 | 0.1 | 0.0 | 13.3 | 0.7 | 0.0 | 6.1 | 0.1 | 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 | 0.8 | 0.0 | 7.2 | 1.3 | 0.0 | 0.7 | 3.6 | 0.0 | 9.4 | 5.6 | 0.0 |
| LnGrp Delay(d),s/veh | 44.2 | 38.2 | 0.0 | 36.0 | 24.8 | 0.0 | 56.9 | 31.0 | 0.0 | 37.6 | 15.5 | 0.0 |
| LnGrp LOS | D | D | | D | C | | E | C | | D | B | |
| Approach Vol, veh/h | | 153 | | | 798 | | | 506 | | | 1760 | |
| Approach Delay, s/veh | | 40.2 | | | 33.1 | | | 32.1 | | | 24.8 | |
| Approach LOS | | D | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 28.1 | 25.6 | 24.1 | 12.4 | 6.0 | 47.6 | 7.6 | 28.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 31.0 | 41.0 | 36.0 | 36.0 | 31.0 | 41.0 | 31.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 21.9 | 13.2 | 17.9 | 3.8 | 3.2 | 14.9 | 3.4 | 5.0 |
| Green Ext Time (p_c), s | 2.2 | 8.0 | 2.2 | 2.3 | 0.0 | 13.2 | 0.1 | 2.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 28.7 |
| HCM 2010 LOS | C |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 260 | 458 | 205 | 440 | 30 | 432 | 300 | 105 | 50 | 260 | 160 |
| Future Volume (veh/h) | 180 | 260 | 458 | 205 | 440 | 30 | 432 | 300 | 105 | 50 | 260 | 160 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 | 1.00 | | 0.97 |
| 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 196 | 283 | 155 | 223 | 478 | 25 | 470 | 326 | 81 | 54 | 283 | 76 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 288 | 841 | 380 | 264 | 1548 | 80 | 570 | 974 | 238 | 79 | 624 | 164 |
| Arrive On Green | 0.08 | 0.25 | 0.25 | 0.15 | 0.31 | 0.31 | 0.17 | 0.35 | 0.35 | 0.04 | 0.23 | 0.23 |
| Sat Flow, veh/h | 3442 | 3390 | 1531 | 1774 | 4941 | 256 | 3442 | 2801 | 684 | 1774 | 2752 | 723 |
| Grp Volume(v), veh/h | 196 | 283 | 155 | 223 | 327 | 176 | 470 | 204 | 203 | 54 | 180 | 179 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1531 | 1774 | 1695 | 1807 | 1721 | 1770 | 1716 | 1774 | 1770 | 1705 |
| Q Serve(g_s), s | 4.2 | 5.2 | 6.4 | 9.3 | 5.6 | 5.6 | 10.0 | 6.5 | 6.7 | 2.3 | 6.6 | 6.9 |
| Cycle Q Clear(g_c), s | 4.2 | 5.2 | 6.4 | 9.3 | 5.6 | 5.6 | 10.0 | 6.5 | 6.7 | 2.3 | 6.6 | 6.9 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.14 | 1.00 | | 0.40 | 1.00 | | 0.42 |
| Lane Grp Cap(c), veh/h | 288 | 841 | 380 | 264 | 1062 | 566 | 570 | 615 | 597 | 79 | 401 | 387 |
| V/C Ratio(X) | 0.68 | 0.34 | 0.41 | 0.84 | 0.31 | 0.31 | 0.82 | 0.33 | 0.34 | 0.68 | 0.45 | 0.46 |
| Avail Cap(c_a), veh/h | 498 | 1561 | 705 | 303 | 1650 | 880 | 679 | 978 | 948 | 210 | 838 | 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) | 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 | 33.8 | 23.4 | 23.9 | 31.5 | 19.8 | 19.9 | 30.6 | 18.3 | 18.3 | 35.8 | 25.3 | 25.4 |
| Incr Delay (d2), s/veh | 2.8 | 0.2 | 0.7 | 17.4 | 0.2 | 0.3 | 7.0 | 0.3 | 0.3 | 9.8 | 0.8 | 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 | 2.1 | 2.5 | 2.8 | 5.8 | 2.6 | 2.8 | 5.3 | 3.2 | 3.2 | 1.3 | 3.3 | 3.3 |
| LnGrp Delay(d),s/veh | 36.6 | 23.7 | 24.6 | 48.8 | 20.0 | 20.2 | 37.7 | 18.6 | 18.7 | 45.5 | 26.1 | 26.3 |
| LnGrp LOS | D | C | C | D | B | C | D | B | B | D | C | C |
| Approach Vol, veh/h | | 634 | | | 726 | | | 877 | | | 413 | |
| Approach Delay, s/veh | | 27.9 | | | 28.9 | | | 28.8 | | | 28.7 | |
| Approach LOS | | C | | | C | | | C | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 7.4 | 30.4 | 15.3 | 22.9 | 16.6 | 21.2 | 10.4 | 27.8 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 9.0 | 42.0 | 13.0 | 35.0 | 15.0 | 36.0 | 11.0 | 37.0 |
| Max Q Clear Time (g_c+I1), s | 4.3 | 8.7 | 11.3 | 8.4 | 12.0 | 8.9 | 6.2 | 7.6 |
| Green Ext Time (p_c), s | 0.0 | 5.3 | 0.1 | 7.2 | 0.6 | 5.1 | 0.3 | 7.4 |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2010 Ctrl Delay | | | 28.6 |
| HCM 2010 LOS | | | C |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 31 | 374 | 658 | 214 | 212 | 37 |
| Future Volume (veh/h) | 31 | 374 | 658 | 214 | 212 | 37 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 37 | 451 | 793 | 0 | 255 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 62 | 2798 | 1966 | 0 | 342 | 305 |
| Arrive On Green | 0.04 | 0.55 | 0.39 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 37 | 451 | 793 | 0 | 255 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 0.6 | 1.4 | 3.5 | 0.0 | 4.2 | 0.0 |
| Cycle Q Clear(g_c), s | 0.6 | 1.4 | 3.5 | 0.0 | 4.2 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 62 | 2798 | 1966 | 0 | 342 | 305 |
| V/C Ratio(X) | 0.59 | 0.16 | 0.40 | 0.00 | 0.75 | 0.00 |
| Avail Cap(c_a), veh/h | 285 | 4245 | 2775 | 0 | 911 | 813 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.8 | 3.5 | 6.9 | 0.0 | 11.8 | 0.0 |
| Incr Delay (d2), s/veh | 8.7 | 0.0 | 0.1 | 0.0 | 3.2 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.5 | 0.6 | 1.6 | 0.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 23.5 | 3.5 | 7.1 | 0.0 | 15.1 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 488 | 793 | | 255 | |
| Approach Delay, s/veh | | 5.0 | 7.1 | | 15.1 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 21.1 | | 10.0 | 5.1 | 16.0 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 3.4 | | 6.2 | 2.6 | 5.5 | | |
| Green Ext Time (p_c), s | | 9.4 | | 0.5 | 0.0 | 6.3 | | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 7.7 |
| HCM 2010 LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 169 | 595 | 211 | 161 | 740 | 300 | 181 | 346 | 165 | 270 | 495 | 121 |
| Future Volume (veh/h) | 169 | 595 | 211 | 161 | 740 | 300 | 181 | 346 | 165 | 270 | 495 | 121 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.86 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 206 | 726 | 23 | 196 | 902 | 0 | 221 | 422 | 0 | 329 | 604 | 139 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 234 | 863 | 332 | 223 | 840 | 376 | 198 | 556 | 473 | 362 | 573 | 132 |
| Arrive On Green | 0.13 | 0.24 | 0.24 | 0.13 | 0.24 | 0.00 | 0.11 | 0.30 | 0.00 | 0.20 | 0.39 | 0.39 |
| Sat Flow, veh/h | 1774 | 3539 | 1363 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1465 | 337 |
| Grp Volume(v), veh/h | 206 | 726 | 23 | 196 | 902 | 0 | 221 | 422 | 0 | 329 | 0 | 743 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1363 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1802 |
| Q Serve(g_s), s | 14.3 | 24.4 | 1.6 | 13.6 | 29.7 | 0.0 | 14.0 | 25.7 | 0.0 | 22.7 | 0.0 | 49.0 |
| Cycle Q Clear(g_c), s | 14.3 | 24.4 | 1.6 | 13.6 | 29.7 | 0.0 | 14.0 | 25.7 | 0.0 | 22.7 | 0.0 | 49.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.19 |
| Lane Grp Cap(c), veh/h | 234 | 863 | 332 | 223 | 840 | 376 | 198 | 556 | 473 | 362 | 0 | 705 |
| V/C Ratio(X) | 0.88 | 0.84 | 0.07 | 0.88 | 1.07 | 0.00 | 1.11 | 0.76 | 0.00 | 0.91 | 0.00 | 1.05 |
| Avail Cap(c_a), veh/h | 312 | 932 | 359 | 255 | 840 | 376 | 198 | 556 | 473 | 581 | 0 | 705 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 53.4 | 45.0 | 36.4 | 53.9 | 47.8 | 0.0 | 55.6 | 39.8 | 0.0 | 48.7 | 0.0 | 38.1 |
| Incr Delay (d2), s/veh | 19.3 | 6.6 | 0.1 | 25.7 | 53.0 | 0.0 | 98.0 | 9.4 | 0.0 | 12.1 | 0.0 | 49.0 |
| 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 | 8.2 | 12.8 | 0.6 | 8.3 | 20.6 | 0.0 | 12.2 | 14.7 | 0.0 | 12.4 | 0.0 | 33.9 |
| LnGrp Delay(d),s/veh | 72.7 | 51.7 | 36.5 | 79.6 | 100.8 | 0.0 | 153.6 | 49.2 | 0.0 | 60.8 | 0.0 | 87.1 |
| LnGrp LOS | E | D | D | E | F | | F | D | | E | | F |
| Approach Vol, veh/h | | 955 | | | 1098 | | | 643 | | | 1072 | |
| Approach Delay, s/veh | | 55.8 | | | 97.0 | | | 85.1 | | | 79.1 | |
| Approach LOS | | E | | | F | | | F | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 29.6 | 41.4 | 19.7 | 34.5 | 18.0 | 53.0 | 20.5 | 33.7 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 41.0 | 22.0 | 18.0 | 33.0 | 14.0 | 49.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 24.7 | 27.7 | 15.6 | 26.4 | 16.0 | 51.0 | 16.3 | 31.7 |
| Green Ext Time (p_c), s | 0.9 | 0.0 | 0.1 | 4.1 | 0.0 | 0.0 | 0.3 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 79.4 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 14 | 572 | 318 | 3 | 364 | 381 |
| Future Volume (vph) | 14 | 572 | 318 | 3 | 364 | 381 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.99 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1595 | | 1860 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1595 | | 1860 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |
| Adj. Flow (vph) | 16 | 673 | 374 | 4 | 428 | 448 |
| RTOR Reduction (vph) | 506 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 183 | 0 | 377 | 0 | 428 | 448 |
| Confl. Peds. (#/hr) | 1 | 1 | | 1 | 1 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 10.4 | | 14.3 | | 15.6 | 33.9 |
| Effective Green, g (s) | 10.4 | | 14.3 | | 15.6 | 33.9 |
| Actuated g/C Ratio | 0.20 | | 0.27 | | 0.30 | 0.65 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 317 | | 508 | | 527 | 1207 |
| v/s Ratio Prot | c0.12 | | c0.20 | | c0.24 | 0.24 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.58 | | 0.74 | | 0.81 | 0.37 |
| Uniform Delay, d1 | 19.0 | | 17.3 | | 17.0 | 4.3 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 2.6 | | 5.8 | | 9.3 | 0.2 |
| Delay (s) | 21.5 | | 23.1 | | 26.3 | 4.5 |
| Level of Service | C | | C | | C | A |
| Approach Delay (s) | 21.5 | | 23.1 | | | 15.1 |
| Approach LOS | C | | C | | | B |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 18.9 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.73 | | |
| Actuated Cycle Length (s) | 52.3 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 83.4% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 6.2 | | | | | |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 284 | 83 | 135 | 472 | 104 | 135 |
| Future Vol, veh/h | 284 | 83 | 135 | 472 | 104 | 135 |
| Conflicting Peds, #/hr | 0 | 7 | 7 | 0 | 7 | 7 |
| 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 | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 316 | 92 | 150 | 524 | 116 | 150 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 415 | 0 | 1200 | 376 |
| Stage 1 | - | - | - | - | 369 | - |
| Stage 2 | - | - | - | - | 831 | - |
| 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 | - | - | 1144 | - | 204 | 670 |
| Stage 1 | - | - | - | - | 699 | - |
| Stage 2 | - | - | - | - | 428 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1137 | - | 175 | 662 |
| Mov Cap-2 Maneuver | - | - | - | - | 289 | - |
| Stage 1 | - | - | - | - | 695 | - |
| Stage 2 | - | - | - | - | 369 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 1.9 | 26.7 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 424 | - | - | 1137 | - |
| HCM Lane V/C Ratio | 0.626 | - | - | 0.132 | - |
| HCM Control Delay (s) | 26.7 | - | - | 8.6 | - |
| HCM Lane LOS | D | - | - | A | - |
| HCM 95th %tile Q(veh) | 4.2 | - | - | 0.5 | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 265 | 217 | 10 | 13 | 367 | 220 | 30 | 157 | 24 | 270 | 206 | 282 |
| Future Volume (veh/h) | 265 | 217 | 10 | 13 | 367 | 220 | 30 | 157 | 24 | 270 | 206 | 282 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 291 | 238 | 6 | 14 | 403 | 223 | 33 | 173 | 0 | 297 | 226 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 319 | 1013 | 855 | 23 | 424 | 234 | 51 | 282 | 146 | 353 | 352 | 0 |
| Arrive On Green | 0.18 | 0.54 | 0.54 | 0.01 | 0.38 | 0.38 | 0.09 | 0.09 | 0.00 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1572 | 1774 | 1125 | 622 | 550 | 3055 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 291 | 238 | 6 | 14 | 0 | 626 | 110 | 96 | 0 | 297 | 226 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1572 | 1774 | 0 | 1747 | 1835 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 16.9 | 7.0 | 0.2 | 0.8 | 0.0 | 36.6 | 6.1 | 5.5 | 0.0 | 16.9 | 12.3 | 0.0 |
| Cycle Q Clear(g_c), s | 16.9 | 7.0 | 0.2 | 0.8 | 0.0 | 36.6 | 6.1 | 5.5 | 0.0 | 16.9 | 12.3 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.36 | 0.30 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 319 | 1013 | 855 | 23 | 0 | 658 | 169 | 163 | 146 | 353 | 352 | 0 |
| V/C Ratio(X) | 0.91 | 0.23 | 0.01 | 0.62 | 0.00 | 0.95 | 0.65 | 0.59 | 0.00 | 0.84 | 0.64 | 0.00 |
| Avail Cap(c_a), veh/h | 321 | 1013 | 855 | 67 | 0 | 681 | 297 | 286 | 256 | 456 | 454 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 42.3 | 12.5 | 11.0 | 51.6 | 0.0 | 31.8 | 46.1 | 45.8 | 0.0 | 40.5 | 38.7 | 0.0 |
| Incr Delay (d2), s/veh | 28.8 | 0.1 | 0.0 | 24.3 | 0.0 | 22.9 | 4.2 | 3.3 | 0.0 | 10.7 | 2.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 10.9 | 3.6 | 0.1 | 0.6 | 0.0 | 21.7 | 3.3 | 2.8 | 0.0 | 9.4 | 6.2 | 0.0 |
| LnGrp Delay(d),s/veh | 71.1 | 12.7 | 11.0 | 76.0 | 0.0 | 54.7 | 50.3 | 49.1 | 0.0 | 51.2 | 40.6 | 0.0 |
| LnGrp LOS | E | B | B | E | | D | D | D | | D | D | |
| Approach Vol, veh/h | | 535 | | | 640 | | | 206 | | | 523 | |
| Approach Delay, s/veh | | 44.4 | | | 55.2 | | | 49.7 | | | 46.6 | |
| Approach LOS | | D | | | E | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 13.7 | 5.3 | 61.2 | | 24.9 | 22.9 | 43.6 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 17.0 | 4.0 | 56.0 | | 27.0 | 19.0 | 41.0 |
| Max Q Clear Time (g_c+I1), s | | 8.1 | 2.8 | 9.0 | | 18.9 | 18.9 | 38.6 |
| Green Ext Time (p_c), s | | 0.7 | 0.0 | 7.8 | | 2.0 | 0.0 | 1.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 49.2 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 220 | 533 | 40 | 271 | 345 | 589 | 70 | 1210 | 594 | 572 | 320 | 300 |
| Future Volume (veh/h) | 220 | 533 | 40 | 271 | 345 | 589 | 70 | 1210 | 594 | 572 | 320 | 300 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1727 | 1727 | 1652 | 1727 | 1727 | 1727 | 1727 | 1727 | 1900 | 1727 | 1570 | 1900 |
| Adj Flow Rate, veh/h | 237 | 573 | 0 | 291 | 371 | 0 | 75 | 1301 | 0 | 615 | 344 | 0 |
| Adj No. of Lanes | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 0 | 2 | 3 | 0 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 10 | 10 | 15 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 21 | 21 |
| Cap, veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 93 | 1281 | 0 | 695 | 2206 | 0 |
| Arrive On Green | 0.06 | 0.22 | 0.00 | 0.09 | 0.26 | 0.00 | 0.06 | 0.35 | 0.00 | 0.22 | 0.51 | 0.00 |
| Sat Flow, veh/h | 3191 | 4715 | 1404 | 3191 | 4715 | 1468 | 1645 | 4145 | 0 | 3191 | 4428 | 0 |
| Grp Volume(v), veh/h | 237 | 573 | 0 | 291 | 371 | 0 | 75 | 1301 | 0 | 615 | 344 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1596 | 1572 | 1404 | 1596 | 1572 | 1468 | 1645 | 1209 | 0 | 1596 | 1429 | 0 |
| Q Serve(g_s), s | 8.0 | 15.1 | 0.0 | 12.7 | 8.9 | 0.0 | 6.3 | 49.4 | 0.0 | 26.1 | 5.9 | 0.0 |
| Cycle Q Clear(g_c), s | 8.0 | 15.1 | 0.0 | 12.7 | 8.9 | 0.0 | 6.3 | 49.4 | 0.0 | 26.1 | 5.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 93 | 1281 | 0 | 695 | 2206 | 0 |
| V/C Ratio(X) | 1.30 | 0.55 | 0.00 | 0.98 | 0.31 | 0.00 | 0.81 | 1.02 | 0.00 | 0.88 | 0.16 | 0.00 |
| Avail Cap(c_a), veh/h | 182 | 1045 | 311 | 297 | 1213 | 378 | 153 | 1281 | 0 | 1118 | 2206 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 66.0 | 48.3 | 0.0 | 63.3 | 41.9 | 0.0 | 65.2 | 45.2 | 0.0 | 53.0 | 17.9 | 0.0 |
| Incr Delay (d2), s/veh | 168.6 | 2.1 | 0.0 | 47.0 | 0.7 | 0.0 | 14.9 | 29.0 | 0.0 | 5.3 | 0.2 | 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 | 7.8 | 6.7 | 0.0 | 7.5 | 3.9 | 0.0 | 3.3 | 19.8 | 0.0 | 12.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 234.6 | 50.3 | 0.0 | 110.3 | 42.5 | 0.0 | 80.2 | 74.3 | 0.0 | 58.3 | 18.1 | 0.0 |
| LnGrp LOS | F | D | | F | D | | F | F | | E | B | |
| Approach Vol, veh/h | | 810 | | | 662 | | | 1376 | | | 959 | |
| Approach Delay, s/veh | | 104.2 | | | 72.3 | | | 74.6 | | | 43.9 | |
| Approach LOS | | F | | | E | | | E | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 34.5 | 53.4 | 17.0 | 35.0 | 11.9 | 76.0 | 12.0 | 40.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 49.0 | 36.0 | 13.0 | 31.0 | 13.0 | 72.0 | 8.0 | 36.0 |
| Max Q Clear Time (g_c+I1), s | 28.1 | 51.4 | 14.7 | 17.1 | 8.3 | 7.9 | 10.0 | 10.9 |
| Green Ext Time (p_c), s | 2.4 | 0.0 | 0.0 | 5.7 | 0.1 | 21.4 | 0.0 | 7.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 72.8 |
| HCM 2010 LOS | E |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 310 | 700 | 378 | 193 | 380 | 40 | 424 | 325 | 237 | 90 | 267 | 200 |
| Future Volume (veh/h) | 310 | 700 | 378 | 193 | 380 | 40 | 424 | 325 | 237 | 90 | 267 | 200 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | | 0.97 | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 326 | 737 | 323 | 203 | 400 | 34 | 446 | 342 | 157 | 95 | 281 | 110 |
| Adj No. of Lanes | 2 | 3 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 412 | 1092 | 473 | 239 | 1587 | 133 | 535 | 749 | 337 | 121 | 577 | 220 |
| Arrive On Green | 0.12 | 0.32 | 0.32 | 0.13 | 0.33 | 0.33 | 0.16 | 0.32 | 0.32 | 0.07 | 0.23 | 0.23 |
| Sat Flow, veh/h | 3442 | 3446 | 1491 | 1774 | 4776 | 400 | 3442 | 2352 | 1057 | 1774 | 2491 | 950 |
| Grp Volume(v), veh/h | 326 | 725 | 335 | 203 | 282 | 152 | 446 | 255 | 244 | 95 | 197 | 194 |
| Grp Sat Flow(s),veh/h/ln | 1721 | 1695 | 1547 | 1774 | 1695 | 1786 | 1721 | 1770 | 1639 | 1774 | 1770 | 1672 |
| Q Serve(g_s), s | 9.1 | 18.4 | 18.7 | 11.1 | 6.0 | 6.2 | 12.5 | 11.4 | 11.8 | 5.2 | 9.6 | 10.0 |
| Cycle Q Clear(g_c), s | 9.1 | 18.4 | 18.7 | 11.1 | 6.0 | 6.2 | 12.5 | 11.4 | 11.8 | 5.2 | 9.6 | 10.0 |
| Prop In Lane | 1.00 | | 0.96 | 1.00 | | 0.22 | 1.00 | | 0.64 | 1.00 | | 0.57 |
| Lane Grp Cap(c), veh/h | 412 | 1075 | 490 | 239 | 1126 | 593 | 535 | 564 | 522 | 121 | 410 | 387 |
| V/C Ratio(X) | 0.79 | 0.67 | 0.68 | 0.85 | 0.25 | 0.26 | 0.83 | 0.45 | 0.47 | 0.78 | 0.48 | 0.50 |
| Avail Cap(c_a), veh/h | 659 | 1196 | 546 | 375 | 1264 | 666 | 728 | 803 | 743 | 232 | 660 | 623 |
| 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 | 42.5 | 29.4 | 29.5 | 41.9 | 24.1 | 24.2 | 40.7 | 26.9 | 27.1 | 45.5 | 33.0 | 33.1 |
| Incr Delay (d2), s/veh | 3.5 | 1.3 | 3.1 | 10.2 | 0.1 | 0.2 | 6.1 | 0.6 | 0.6 | 10.5 | 0.9 | 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 | 4.5 | 8.8 | 8.4 | 6.1 | 2.8 | 3.1 | 6.4 | 5.6 | 5.4 | 2.9 | 4.8 | 4.7 |
| LnGrp Delay(d),s/veh | 45.9 | 30.8 | 32.6 | 52.2 | 24.2 | 24.4 | 46.8 | 27.5 | 27.7 | 56.0 | 33.9 | 34.1 |
| LnGrp LOS | D | C | C | D | C | C | D | C | C | E | C | C |
| Approach Vol, veh/h | | 1386 | | | 637 | | | 945 | | | 486 | |
| Approach Delay, s/veh | | 34.8 | | | 33.2 | | | 36.6 | | | 38.3 | |
| Approach LOS | | C | | | C | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 10.8 | 35.6 | 17.4 | 35.4 | 19.4 | 27.0 | 15.9 | 37.0 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 13.0 | 45.0 | 21.0 | 35.0 | 21.0 | 37.0 | 19.0 | 37.0 |
| Max Q Clear Time (g_c+I1), s | 7.2 | 13.8 | 13.1 | 20.7 | 14.5 | 12.0 | 11.1 | 8.2 |
| Green Ext Time (p_c), s | 0.1 | 6.3 | 0.3 | 8.7 | 0.9 | 6.0 | 0.7 | 13.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 35.5 |
| HCM 2010 LOS | D |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 49 | 968 | 511 | 175 | 236 | 42 |
| Future Volume (veh/h) | 49 | 968 | 511 | 175 | 236 | 42 |
| Number | 5 | 2 | 6 | 16 | 7 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | | 1.00 | 1.00 | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 |
| Adj Flow Rate, veh/h | 53 | 1041 | 549 | 0 | 254 | 0 |
| Adj No. of Lanes | 1 | 3 | 3 | 0 | 1 | 1 |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 83 | 2857 | 1992 | 0 | 339 | 303 |
| Arrive On Green | 0.05 | 0.56 | 0.39 | 0.00 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1774 | 5253 | 5421 | 0 | 1774 | 1583 |
| Grp Volume(v), veh/h | 53 | 1041 | 549 | 0 | 254 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1695 | 1695 | 0 | 1774 | 1583 |
| Q Serve(g_s), s | 1.0 | 3.7 | 2.4 | 0.0 | 4.4 | 0.0 |
| Cycle Q Clear(g_c), s | 1.0 | 3.7 | 2.4 | 0.0 | 4.4 | 0.0 |
| Prop In Lane | 1.00 | | | 0.00 | 1.00 | 1.00 |
| Lane Grp Cap(c), veh/h | 83 | 2857 | 1992 | 0 | 339 | 303 |
| V/C Ratio(X) | 0.64 | 0.36 | 0.28 | 0.00 | 0.75 | 0.00 |
| Avail Cap(c_a), veh/h | 274 | 4079 | 2667 | 0 | 876 | 781 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 15.2 | 3.9 | 6.7 | 0.0 | 12.4 | 0.0 |
| Incr Delay (d2), s/veh | 7.9 | 0.1 | 0.1 | 0.0 | 3.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 1.7 | 1.1 | 0.0 | 2.4 | 0.0 |
| LnGrp Delay(d),s/veh | 23.0 | 4.0 | 6.8 | 0.0 | 15.7 | 0.0 |
| LnGrp LOS | C | A | A | | B | |
| Approach Vol, veh/h | | 1094 | 549 | | 254 | |
| Approach Delay, s/veh | | 4.9 | 6.8 | | 15.7 | |
| Approach LOS | | A | A | | B | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | | 4 | 5 | 6 | | |
| Phs Duration (G+Y+Rc), s | | 22.2 | | 10.2 | 5.5 | 16.7 | | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | |
| Max Green Setting (Gmax), s | | 26.0 | | 16.0 | 5.0 | 17.0 | | |
| Max Q Clear Time (g_c+I1), s | | 5.7 | | 6.4 | 3.0 | 4.4 | | |
| Green Ext Time (p_c), s | | 11.5 | | 0.5 | 0.0 | 8.3 | | |

| Intersection Summary | | |
|---|---|---|
| HCM 2010 Ctrl Delay | | 6.9 |
| HCM 2010 LOS | | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 180 | 955 | 215 | 200 | 600 | 200 | 155 | 481 | 223 | 200 | 396 | 192 |
| Future Volume (veh/h) | 180 | 955 | 215 | 200 | 600 | 200 | 155 | 481 | 223 | 200 | 396 | 192 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 202 | 1073 | 82 | 225 | 674 | 0 | 174 | 540 | 0 | 225 | 445 | 200 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Peak Hour Factor | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 232 | 1032 | 460 | 237 | 1042 | 466 | 177 | 574 | 488 | 237 | 416 | 187 |
| Arrive On Green | 0.13 | 0.29 | 0.29 | 0.13 | 0.29 | 0.00 | 0.10 | 0.31 | 0.00 | 0.13 | 0.34 | 0.34 |
| Sat Flow, veh/h | 1774 | 3539 | 1578 | 1774 | 3539 | 1583 | 1774 | 1863 | 1583 | 1774 | 1218 | 547 |
| Grp Volume(v), veh/h | 202 | 1073 | 82 | 225 | 674 | 0 | 174 | 540 | 0 | 225 | 0 | 645 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1578 | 1774 | 1770 | 1583 | 1774 | 1863 | 1583 | 1774 | 0 | 1766 |
| Q Serve(g_s), s | 13.4 | 35.0 | 4.7 | 15.1 | 19.9 | 0.0 | 11.7 | 33.9 | 0.0 | 15.1 | 0.0 | 41.0 |
| Cycle Q Clear(g_c), s | 13.4 | 35.0 | 4.7 | 15.1 | 19.9 | 0.0 | 11.7 | 33.9 | 0.0 | 15.1 | 0.0 | 41.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.31 |
| Lane Grp Cap(c), veh/h | 232 | 1032 | 460 | 237 | 1042 | 466 | 177 | 574 | 488 | 237 | 0 | 603 |
| V/C Ratio(X) | 0.87 | 1.04 | 0.18 | 0.95 | 0.65 | 0.00 | 0.98 | 0.94 | 0.00 | 0.95 | 0.00 | 1.07 |
| Avail Cap(c_a), veh/h | 325 | 1032 | 460 | 237 | 1042 | 466 | 177 | 574 | 488 | 237 | 0 | 603 |
| 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 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 51.2 | 42.5 | 31.8 | 51.6 | 36.9 | 0.0 | 53.9 | 40.4 | 0.0 | 51.6 | 0.0 | 39.5 |
| Incr Delay (d2), s/veh | 16.6 | 38.8 | 0.2 | 45.0 | 1.4 | 0.0 | 61.7 | 25.4 | 0.0 | 45.0 | 0.0 | 56.5 |
| 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 | 7.6 | 22.6 | 2.1 | 10.3 | 9.9 | 0.0 | 8.8 | 21.4 | 0.0 | 10.3 | 0.0 | 29.4 |
| LnGrp Delay(d),s/veh | 67.8 | 81.3 | 31.9 | 96.6 | 38.3 | 0.0 | 115.6 | 65.8 | 0.0 | 96.6 | 0.0 | 96.0 |
| LnGrp LOS | E | F | C | F | D | | F | E | | F | | F |
| Approach Vol, veh/h | | 1357 | | | 899 | | | 714 | | | 870 | |
| Approach Delay, s/veh | | 76.3 | | | 52.9 | | | 77.9 | | | 96.2 | |
| Approach LOS | | E | | | D | | | E | | | F | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 20.0 | 41.0 | 20.0 | 39.0 | 16.0 | 45.0 | 19.7 | 39.3 |
| Change Period (Y+Rc), s | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | 16.0 | 37.0 | 16.0 | 35.0 | 12.0 | 41.0 | 22.0 | 29.0 |
| Max Q Clear Time (g_c+I1), s | 17.1 | 35.9 | 17.1 | 37.0 | 13.7 | 43.0 | 15.4 | 21.9 |
| Green Ext Time (p_c), s | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 5.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 75.6 |
| HCM 2010 LOS | E |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 14 | 426 | 422 | 5 | 660 | 341 |
| Future Volume (vph) | 14 | 426 | 422 | 5 | 660 | 341 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Lane Util. Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frpb, ped/bikes | 0.98 | | 1.00 | | 1.00 | 1.00 |
| Flpb, ped/bikes | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Frt | 0.87 | | 1.00 | | 1.00 | 1.00 |
| Flt Protected | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (prot) | 1591 | | 1859 | | 1770 | 1863 |
| Flt Permitted | 1.00 | | 1.00 | | 0.95 | 1.00 |
| Satd. Flow (perm) | 1591 | | 1859 | | 1770 | 1863 |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 15 | 453 | 449 | 5 | 702 | 363 |
| RTOR Reduction (vph) | 403 | 0 | 1 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 65 | 0 | 453 | 0 | 702 | 363 |
| Confl. Peds. (#/hr) | | 3 | | 3 | 3 | |
| Turn Type | Prot | | NA | | Prot | NA |
| Protected Phases | 8 | | 2 | | 1 | 6 |
| Permitted Phases | | | | | | |
| Actuated Green, G (s) | 8.8 | | 22.9 | | 35.3 | 62.2 |
| Effective Green, g (s) | 8.8 | | 22.9 | | 35.3 | 62.2 |
| Actuated g/C Ratio | 0.11 | | 0.29 | | 0.45 | 0.79 |
| Clearance Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| Vehicle Extension (s) | 3.0 | | 3.0 | | 3.0 | 3.0 |
| Lane Grp Cap (vph) | 177 | | 538 | | 790 | 1466 |
| v/s Ratio Prot | c0.04 | | c0.24 | | c0.40 | 0.19 |
| v/s Ratio Perm | | | | | | |
| v/c Ratio | 0.37 | | 0.84 | | 0.89 | 0.25 |
| Uniform Delay, d1 | 32.5 | | 26.4 | | 20.0 | 2.2 |
| Progression Factor | 1.00 | | 1.00 | | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.3 | | 11.5 | | 11.9 | 0.1 |
| Delay (s) | 33.8 | | 37.8 | | 31.9 | 2.3 |
| Level of Service | C | | D | | C | A |
| Approach Delay (s) | 33.8 | | 37.8 | | | 21.8 |
| Approach LOS | C | | D | | | C |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 2000 Control Delay | 28.3 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.80 | | |
| Actuated Cycle Length (s) | 79.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 96.5% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.7 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 602 | 73 | 111 | 365 | 66 | 128 |
| Future Vol, veh/h | 602 | 73 | 111 | 365 | 66 | 128 |
| Conflicting Peds, #/hr | 0 | 6 | 6 | 0 | 6 | 6 |
| 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 | 93 | 93 | 93 | 93 | 93 | 93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 647 | 78 | 119 | 392 | 71 | 138 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 732 | 0 | 1330 | 699 |
| Stage 1 | - | - | - | - | 693 | - |
| Stage 2 | - | - | - | - | 637 | - |
| 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 | - | - | 873 | - | 171 | 440 |
| Stage 1 | - | - | - | - | 496 | - |
| Stage 2 | - | - | - | - | 527 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 869 | - | 146 | 436 |
| Mov Cap-2 Maneuver | - | - | - | - | 282 | - |
| Stage 1 | - | - | - | - | 494 | - |
| Stage 2 | - | - | - | - | 453 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 2.3 | 26.8 |
| HCM LOS | | | D |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 368 | - | - | 869 | - |
| HCM Lane V/C Ratio | 0.567 | - | - | 0.137 | - |
| HCM Control Delay (s) | 26.8 | - | - | 9.8 | - |
| HCM Lane LOS | D | - | - | A | - |
| HCM 95th %tile Q(veh) | 3.4 | - | - | 0.5 | - |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 337 | 498 | 10 | 42 | 351 | 200 | 10 | 252 | 92 | 310 | 152 | 339 |
| Future Volume (veh/h) | 337 | 498 | 10 | 42 | 351 | 200 | 10 | 252 | 92 | 310 | 152 | 339 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| 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 | | 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 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1900 | 1863 | 1863 | 1900 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 344 | 508 | 3 | 43 | 358 | 175 | 10 | 257 | 0 | 316 | 155 | 0 |
| Adj No. of Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 373 | 929 | 778 | 55 | 377 | 184 | 14 | 376 | 170 | 357 | 356 | 0 |
| Arrive On Green | 0.21 | 0.50 | 0.50 | 0.03 | 0.32 | 0.32 | 0.11 | 0.11 | 0.00 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1774 | 1863 | 1561 | 1774 | 1181 | 577 | 130 | 3496 | 1583 | 1774 | 1863 | 0 |
| Grp Volume(v), veh/h | 344 | 508 | 3 | 43 | 0 | 533 | 143 | 124 | 0 | 316 | 155 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1863 | 1561 | 1774 | 0 | 1759 | 1856 | 1770 | 1583 | 1774 | 1770 | 0 |
| Q Serve(g_s), s | 18.8 | 18.6 | 0.1 | 2.4 | 0.0 | 29.3 | 7.4 | 6.6 | 0.0 | 17.1 | 7.6 | 0.0 |
| Cycle Q Clear(g_c), s | 18.8 | 18.6 | 0.1 | 2.4 | 0.0 | 29.3 | 7.4 | 6.6 | 0.0 | 17.1 | 7.6 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.33 | 0.07 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 373 | 929 | 778 | 55 | 0 | 561 | 199 | 190 | 170 | 357 | 356 | 0 |
| V/C Ratio(X) | 0.92 | 0.55 | 0.00 | 0.79 | 0.00 | 0.95 | 0.72 | 0.65 | 0.00 | 0.88 | 0.43 | 0.00 |
| Avail Cap(c_a), veh/h | 377 | 929 | 778 | 108 | 0 | 569 | 357 | 340 | 304 | 395 | 394 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 38.2 | 17.1 | 12.5 | 47.6 | 0.0 | 32.9 | 42.7 | 42.4 | 0.0 | 38.4 | 34.6 | 0.0 |
| Incr Delay (d2), s/veh | 27.5 | 0.7 | 0.0 | 21.6 | 0.0 | 25.7 | 4.8 | 3.7 | 0.0 | 19.3 | 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 | 12.0 | 9.6 | 0.0 | 1.5 | 0.0 | 18.2 | 4.0 | 3.4 | 0.0 | 10.3 | 3.8 | 0.0 |
| LnGrp Delay(d),s/veh | 65.7 | 17.8 | 12.5 | 69.2 | 0.0 | 58.6 | 47.4 | 46.1 | 0.0 | 57.7 | 35.4 | 0.0 |
| LnGrp LOS | E | B | B | E | | E | D | D | | E | D | |
| Approach Vol, veh/h | | 855 | | | 576 | | | 267 | | | 471 | |
| Approach Delay, s/veh | | 37.0 | | | 59.4 | | | 46.8 | | | 50.4 | |
| Approach LOS | | D | | | E | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 2 | 3 | 4 | | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | | 14.6 | 7.0 | 53.3 | | 23.9 | 24.8 | 35.5 |
| Change Period (Y+Rc), s | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 19.0 | 6.0 | 47.0 | | 22.0 | 21.0 | 32.0 |
| Max Q Clear Time (g_c+I1), s | | 9.4 | 4.4 | 20.6 | | 19.1 | 20.8 | 31.3 |
| Green Ext Time (p_c), s | | 1.0 | 0.0 | 8.4 | | 0.8 | 0.0 | 0.2 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 47.1 |
| HCM 2010 LOS | D |

FEHR PEERS

# MEMORANDUM (REVISED)

Date: September 17, 2019

To: Craig Luke and Chris Nakamura, R.M. Towill Corporation

From: Andrew Scher and Sohrab Rashid

***Subject: Kalaeloa Roadway Master Plan Update and Hunt Parcel Consistency***

*SD15-0169.02*

This memorandum summarizes the internal roadway infrastructure that would be needed to support the proposed Kalaeloa development in the Ewa Region of Oahu, Hawaii. The purpose of this study update is to determine the street typology, intersection lane configurations, and anticipated traffic control devices for the primary roadways within Kalaeloa under Buildout Conditions of the proposed Master Plan. This study was originally completed in August 2010 to address the development proposal of Ford Island Ventures (FIV) within the greater Master Plan area under the jurisdiction of the Hawaii Community Development Authority (HCDA). The study identified the number of travel lanes and the presence of on-street parking and/or bicycle lanes on each facility, as well as the required lane configurations and storage pocket lengths at each major intersection within the plan area. The roadway plan for the 2010 study was based on a set of land use assumptions provided HCDA with input from FIV and Belt Collins Hawaii (BCH).

The need for this update is to identify the ultimate street sections surrounding three of the parcels (Parcels 1, 2, and 3) located in the northwest portion of the Master Plan area. These parcels are currently being developed by Hunt Development Group. The results of the study update are presented in the following sections:

- A brief **background**,
- A summary of our **assumptions and methods**, and
- **Recommended roadway improvements** describing the master roadway network.

The potential impacts of the proposed project on roadways outside the Kalaeloa development area (e.g., at the Kapolei Parkway intersections of Kamokila Boulevard, Fort Barrette Road and at Kualakai Parkway) will be addressed as part of a separate analysis. In addition, the project team reviewed and assessed alternate master plan roadway configurations and determined that the proposed network analyzed in this report is the preferred network.

## BACKGROUND

HCDA adopted the *Kalaeloa Master Plan* in March 2006, which lays out the framework for the redevelopment of Kalaeloa. The total Kalaeloa project area is approximately 3,700 acres and is bounded by the Campbell Industrial Park to the west, the City and Villages of Kapolei to the north, Ewa Villages, Ewa by Gentry and Ewa Beach residential communities and open spaces to the east, and the Pacific Ocean to the south. At this point, few specific projects with detailed site plans have been built or are identified for development within Kalaeloa, though proposed development is expected to include a mix of residential, retail, office, and other supporting commercial and public uses. Because this evaluation is at the Master Plan level, not all the local and sub-collector roadways have been identified within each parcel. As such, the roadway layouts may be modified in the future as specific development proposals are made and more detailed access plans are defined.

## ASSUMPTIONS AND METHODS

This section describes the land use and roadway network assumptions and includes a discussion of the project traffic estimate method.

### *Land Use Assumptions*

As noted in the introduction, HCDA (with input from FIV and BCH) provided a complete inventory of existing and proposed land uses for Kalaeloa by parcel, which we used to estimate future roadway and intersection volumes. **Figure 1** illustrates the Kalaeloa Master Plan area as presented in 2010 and the specific parcel locations. It is important to note that the 2010 Master Plan parcels 45, 46 and 47 on **Figure 1** correspond to Hunt Parcels 1, 2, and 3 for this 2019 study. HCDA staff has confirmed with R. M. Towill that the remaining land use assumptions from 2010 are still valid for this evaluation.

The land use inventory included the type of use (e.g., single-family dwelling unit vs. multi-family unit) and size (e.g., square feet of retail space or office space, number of hotel rooms, or school enrollment), as well as the land use context or transect (i.e., urban center, urban core, rural, etc.). Based on the information received, more than 4.6 million square feet of commercial/office/light industrial development and 6,852 residential units are estimated for full buildout of the area. The buildout land use summary is presented in **Table 1,** and the land use summary by anticipated development phase is presented in **Table 2**. Note that the development phase information was originally requested in the 2010 study and has not been updated for this study given that the focus is on the Master Plan's impact on roadways serving Parcels 1, 2, and 3.

**TABLE 1**
**LAND USE SUMMARY BY TRANSECT UNDER BUILDOUT CONDITIONS**

| Land Use Type | Land Use by Transect | | | | |
|---|---|---|---|---|---|
| | **Rural (T2)** | **General Urban (T3)** | **Urban Center (T4)** | **Urban Core (T5)** | **Special District (SD)** |
| ***Residential (Dwelling Units)*** | | | | | |
| ***Residential Total*** | ***328*** | ***3,092*** | ***2,392*** | ***890*** | ***150*** |
| ***Non-Residential (Square Feet)*** | | | | | |
| Civic | 188,975 | 103,528 | 0 | 0 | 0 |
| R&D | 111,068 | 438,354 | 0 | 0 | 0 |
| Light Industrial | 173,370 | 1,373,356 | 0 | 0 | 40,214 |
| Office | 103,416 | 534,163 | 114,927 | 209,229 | 0 |
| Retail | 253,203 | 389,414 | 317,307 | 271486 | 0 |
| ***Non-Residential Total*** | ***830,032*** | ***2,838,815*** | ***432,715*** | ***480,715*** | ***40,214*** |

Source: Hawaii Community Development Authority (HCDA), May 2010 except for Hunt Parcels 1, 2, and 3 from R. M. Towill Corporation (2019).

**TABLE 2**
**LAND USE SUMMARY BY DEVELOPMENT PHASE**

| Time Period | Land Use by Transect | | | | |
|---|---|---|---|---|---|
| | Rural (T2) | General Urban (T3) | Urban Center (T4) | Urban Core (T5) | Special District (SD) |
| ***Residential (Dwelling Units)*** | | | | | |
| Within 7 Years | 0 | 883 | 298 | 120 | 0 |
| 7 to 20 Years | 328 | 1,925 | 1,713 | 770 | 150 |
| More than 20 Years | 0 | 284 | 381 | 0 | 0 |
| ***Residential Buildout*** | ***328*** | ***3,092*** | ***2,392*** | ***890*** | ***150*** |
| ***Non-Residential (Square Feet)*** | | | | | |
| Within 7 Years | 282,903 | 375,622 | 22,690 | 180,000 | 0 |
| 7 to 20 Years | 327,720 | 2,213,441 | 366,216 | 300,715 | 40,214 |
| More than 20 Years | 219,409 | 249,751 | 43,328 | 0 | 0 |
| ***Non-Residential Buildout*** | ***830,032*** | ***2,838,815*** | ***432,234*** | ***480,715*** | ***40,214*** |

Source: Hawaii Community Development Authority (HCDA), May 2010 except for Hunt Parcels 1, 2, and 3 from R. M. Towill Corporation (2019).

### *Roadway Assumptions*

Since our evaluation is based on buildout of Kalaeloa that is expected to take at least 20 years to complete, the following planned roadway improvements were assumed to be in place included under Buildout Conditions:

- Extension of Kualaka`i Parkway as a 4-lane roadway between Kapolei Parkway and Saratoga Avenue
- Extension of Kualaka`i Parkway as a 2-lane roadway between Saratoga Avenue and Keoneula Boulevard
- Extension of Wakea Avenue as a 4-lane roadway from makai of Kapolei Parkway (across Roosevelt Avenue) to Saratoga Avenue (generally built along the existing Bennington Street alignment)
- Extension of Kamokila Boulevard as a 4-lane roadway from Roosevelt Avenue to a realigned Boxer Road

### *Trip Estimates*

Existing traffic volumes for intersections along Roosevelt Avenue were obtained from the Parcel 1, 2, and 3 TIAR and other available studies. Volumes were adjusted to 2019 conditions using a growth factor of 0.5% per year, and these factored volumes were re-distributed to account for the future connections at Wakea Street and Kualakai Parkway.

The amount of traffic added to the roadway system by the proposed Master Plan development was estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. The first step estimates the amount of added traffic to the roadway network. The second step estimates the direction of travel to and from the larger zones. The trips are assigned to specific street segments and intersection turning movements during the third step.

Trip Generation

The amount of traffic added to the surrounding roadway system by the proposed development was estimated by applying the applicable trip generation rates from the *Trip Generation (10th Edition)* published by the Institute of Transportation Engineers (2017).

In a mixed-use and integrated community such as Kalaeloa, a proportion of the total vehicle trips will be made internally within the development site, and some trips will be made by walking or bicycling to destinations due to their proximity. For example, people who live in the on-site residential units will drive to the retail or restaurant uses within the site, and then return home, and still others will walk instead of driving. Accordingly, their trip-making activity will never reach the external roadway system, but they will be accounted for within the site. By applying an internal capture reduction to the overall project trip generation, the number of estimated vehicle trips added to the surrounding roadway network is reduced.

To account for the interaction of land uses within the project area and the presence of transit, Fehr & Peers estimated an internal capture rate of 15 percent based on recent mixed-use (MXD) trip generation research we have conducted in association with the Federal Environmental Protection Agency (EPA). Our MXD research is based on data from approximately 15 sites in 6 major metropolitan areas and is proven to be statistically superior to other mixed-use trip reduction methods including those published by ITE. The MXD approach yields more realistic estimates of vehicle trip generation based on project design and the interaction of uses that allows more trips to be made internally by walking, bicycling, or transit. **Table 3** shows the trip generation estimates and mixed-use trip generation reduction under Buildout Conditions.

Trip Distribution

After trip generation estimates were determined for each zone, trip distribution patterns (the directions of approach and departure) were estimated. The directions of approach and departure were estimated based on prior studies in the area, existing travel patterns, and the relative location of complementary land uses (e.g., retail and jobs in the City of Kapolei and other areas outside Ewa).

Trip Assignment

Vehicle traffic was then assigned through the roadway network for each land use scenario based on the directions of approach and departure discussed above. The trip assignments were then added to the existing volumes to estimate buildout roadway and intersection volumes.

**TABLE 3**
**VEHICLE TRIP GENERATION ESTIMATES UNDER BUILDOUT CONDITIONS**

| Land Use Type | Daily[1] | AM Peak Period[1] | | | PM Peak Period[1] | | |
|---|---|---|---|---|---|---|---|
| | Total | In | Out | Total | In | Out | Total |
| ***Residential Land Use*** | | | | | | | |
| *Residential Total Gross Vehicle Trips [A]* | *55,076* | *884* | *2,769* | *3,653* | *2,824* | *1,674* | *4,498* |
| ***Non-Residential Land Use*** | | | | | | | |
| Civic[2] | 7,959 | 762 | 242 | 1,004 | 625 | 211 | 414 |
| R&D | 6,078 | 173 | 58 | 231 | 482 | 71 | 411 |
| Light Industrial | 11,148 | 592 | 79 | 671 | 552 | 73 | 479 |
| Office | 14,401 | 962 | 156 | 1,118 | 1,120 | 190 | 930 |
| Retail | 107,070 | 2,210 | 1,352 | 3,562 | 7,919 | 3803 | 4116 |
| *Non-Residential Total Gross Vehicle Trips [B]* | *124,950* | *4,699* | *1,887* | *6,586* | *4,348* | *6,350* | *10,698* |
| ***Buildout Land Use*** | | | | | | | |
| *Total Gross Trips [A + B]* | *180,026* | *5,583* | *4,656* | *10,239* | *7,172* | *8,024* | *15,196* |
| *15% Reduction[3]* | *(23,636)* | *(750)* | *(608)* | *(1,358)* | *(948)* | *(1,077)* | *(2,024)* |
| ***Total Net New Vehicle Trips*** | ***156,390*** | ***4,833*** | ***4,048*** | ***8,881*** | ***6,224*** | ***6,947*** | ***13,172*** |

Notes:

1. *Trip Generation Manual*, 10th Edition, Institute of Transportation Engineers. Trips generated by Hunt parcels 1, 2, and 3 were taken from the *Development of Parcels 1, 2, and 3 in Kalaeloa Transportation Impact Analysis Report* (Fehr & Peers, December 2017)
2. Civic land use rates developed by Fehr & Peers based on allowable land uses within the *Kalaeloa Master Plan* (March 2006).
3. To account for the interaction of land uses within the project area, Fehr & Peers estimated an internal capture rate of 15 percent based on recent mixed-use (MXD) trip generation research we have conducted in association with the Federal Environmental Protection Agency (EPA). This reduction does not include the internal capture for Hunt parcels 1, 2, and 3. Reductions were already considered in the source document *Development of Parcels 1, 2, and 3 in Kalaeloa Transportation Impact Analysis Report* (Fehr & Peers, December 2017)

Source: Fehr & Peers, September 2019.

**RECOMMENDED ROADWAY IMPROVEMENTS**

We used the TRAFFIX software package to build a model of the Master Plan roadway system to track the vehicle trips generated by each land use travelling within the Kalaeloa project site, as well as travelling externally to other areas of Ewa and beyond. The model was used to define the street typology including number of travel lanes, intersection configurations, and anticipated traffic control devices within the project area for the proposed roadways. Smaller two-lane local and sub-collector roadways will be developed as more detailed plans for each parcel are prepared. **Figure 2** presents the required street typology and cross-sections under Buildout Conditions for all primary roadways within the Master Plan area, which includes the number of travel lanes, where on-street parking is expected to be permitted at a minimum, and type of bicycle facility expected to be provided. The required rights-of-way shown on **Figure 2** are based on two-and four-lane street sections illustrated in the *Subdivision Street Standards (DPP, December 2000)* or were agreed to by DPP staff and R.M. Towill (e.g., the 80-foot ROW on Roosevelt Avenue). The roadway sections proposed for Hunt Parcels 1, 2 and 3 are consistent with these ultimate sections required for the buildout of the Kalaeloa Master Plan.

Overall, the traffic demand under Buildout Conditions would generally require a total of six lanes of roadway capacity in the Ewa-Diamond Head direction at the far western and eastern extents of the plan area, with an additional two lanes of capacity desirable within the central core area. East of Enterprise Street, either Roosevelt Avenue or Saratoga Avenue would need to be a continuous four-lane roadway with the other operating as a two-lane street. The final layout should be determined based on future refinement of the land use plan and supporting street network. For this study Roosevelt Avenue is assumed to be a two-lane roadway with an additional westbound through lane provided at the Fort Barrette Road-Enterprise Avenue intersection. Roosevelt Avenue between Kamokila Boulevard and Enterprise Street would be a four-lane roadway allowing Boxer Road to be operated as a two-lane roadway along its entire length with the Master Plan buildout. A four-lane “ring road” was previously proposed around the downtown core area to minimize street widths within the core comprising Lexington, Yorktown and Shangri-La Streets.

The volume of traffic expected to use the mauka-makai streets across Franklin D. Roosevelt Avenue (e.g., Kamokila Boulevard, Wakea Avenue, Fort Barrette Road, and Kualakai Parkway) will warrant four-lane roadways (i.e., two through lanes in each direction). It is possible that buildout of the Kalaeloa area will result in impacts to off-site intersections mauka of the site (e.g., along Kapolei Parkway) that have not previously been anticipated in previous Ewa planning studies. However, as noted previously, that detailed analysis will be conducted as part of a separate study.

The overall street layout is based on the desire of HCDA to establish Saratoga Avenue as a “main street” between Wakea Street and Enterprise Street. We expect that the proposed two-lane section of Saratoga Avenue will be congested during peak hours because it will be a desirable destination within the Kalaeloa area and will also serve some through traffic across the area because it is the most direct connection between Boxer Road and Enterprise Street. However, peak period congestion should be anticipated and is a sustainable approach to transportation planning; that is, increased use of roadways over the course of the day is a better utilization of the investment in the transportation system and avoids overbuilding of roadways to serve a limited number of hours over a 24-hour period.

All roadways on **Figure 2** are proposed to have turn lane/median lanes except the following:

- Copahee Avenue between Saratoga Avenue and Franklin D. Roosevelt Avenue
- Yorktown Street between Lexington Street and Enterprise Street
- West Perimeter Road between the future Malakole Street and Olai Street extensions
- Local driveway makai from West Perimeter Road toward the Pacific Ocean
- Coral Sea Street makai of Tripoli Street toward the Pacific Ocean

**Figure 3** presents the recommended intersection configurations, intersection control, and standard turn lane storage pocket lengths under Buildout Conditions. These proposed intersection turn-lane configurations and control devices were developed based on the number of travel lanes for each roadway. Dual left-turn lanes are recommended where two four-lane roadways intersect or where volumes are expected to exceed 300 to 350 vehicles per hour (vph) during either peak period. Similarly, separate right-turn lanes are provided at intersections with higher right-turn volumes, typically on the order of 150 vph. Shared-through right turn lanes are proposed at multiple locations to minimize pedestrian crossing distances.

To assist with intersection design and defining right-of-way requirements, **Figure 3** assumes standard storage pocket lengths for left- and right-turn lanes. Because this evaluation is at the Master Plan level, the standard pocket lengths may be modified in the future as specific development proposals are made and more detailed access plans are defined for local and sub-collector roadways within each parcel. Unless noted otherwise on **Figure 3**, the standard length for a left-turn lane is 200 feet for arterial roadways and 125 feet for collector roadways. The standard right-turn lane storage pocket length is 125 feet for arterial and collector roadways.

**Table 4** presents the intersection levels of service calculated using the TRAFFIX software, the projected turning movement volumes,  and the lane configurations required to provide desired operating levels (i.e., LOS D or better) at buildout of the Master Plan area.

**BICYCLE FACILITIES**

The proposed bicycle network is generally consistent with the current *Oahu Bike Plan 2018 Update* web map (address is: http://hhf.maps.arcgis.com/apps/View/index.html?appid=edb13f5208314d94842bf0380bff4cf6&extent=-158.3866,21.2813,-157.5076,21.6813), but the map does not have enough detail in the study area for all Master Plan roadways.  Accordingly, additional facilities are recommended to provide a comprehensive and connected network across the entire plan area.  Additional and/or modified facilities may be proposed as more detailed planning occurs over time within the Master Plan area.

**TRANSIT**

The land use density proposed for many of the development parcels will be conducive to transit as a primary travel mode. The proposed Honolulu Rail project is currently constructing the Minimum Operating Segment (MOS) between East Kapolei and Ala Moana, which is scheduled to operate in 2025 with an initial segment between East Kapolei and the Aloha Stadium Station in late 2020.  The closest station will be at East Kapolei located approximately ½-mile from the closest point to Kalaeloa and approximately three (3) miles from the downtown core in Kalaeloa.

A future extension of the line is planned to be constructed to West Kapolei near the Kalaeloa Boulevard/Kapolei Parkway intersection with a station planned in the downtown Kalaeloa core area. While a schedule and funding for the planned extension through Kalaeloa have not been identified at this time, the general alignment of the rail line would follow the Kualakai Parkway extension, Saratoga Avenue, Enterprise Street, Midway Street, and the Wakea Street extension into the City of Kapolei. It is anticipated that piers supporting the proposed elevated rail line could be located within the center medians of the roadways within the “Transit Corridor” shown conceptually on **Figure 1**.

The specific location of the future rail station has not been identified and several factors will determine the appropriate location. Based purely on walking distance and proximity to the highest density and majority of land uses a station within the downtown is ideal for attracting potential riders and promoting transit ridership (i.e., reducing vehicle trips), and is expected to be supported by continuous sidewalks on both sides of all downtown core streets to maximize accessibility to the future station. Provision of a rail station will provide residents, employees and visitors with an excellent alternative to making an automobile trip and help to reduce vehicle demand within the study area. Prior to completion of the West Kapolei extension and to the extent operationally feasible, a public or private local bus circulator should be provided linking Kalaeloa land uses with the East Kapolei rail station. This service would allow travel to and from Kalaeloa without requiring a car and still provide a convenient form of transportation.

**FUTURE STUDIES**

The results of this analysis are based on a set of general land use assumptions provided by HCDA. Upon further refinement of proposed uses and more detailed information on individual parcel access, additional studies should be completed to revise the planned roadway network including the identification of specific driveway/vehicle access points, minor street connections, etc. In addition, a comprehensive transportation impact analysis is expected to be required to satisfy other planning and environmental requirements including the identification of off-site and regional traffic impacts.

**TABLE 4**
**KALAELOA MASTER PLAN BUILDOUT INTERSECTION LEVELS OF SERVICE**

| Intersection | Intersection Control | Buildout AM Peak Hour | | Buildout PM Peak Hour | |
|---|---|---|---|---|---|
| | | Delay[1] | LOS[2] | Delay[1] | LOS[2] |
| 1. Kamokila Blvd / Roosevelt Ave | Signalized | 32.7 | C | 27.3 | C |
| 2. Copahee Ave / Roosevelt Ave | TWSC[3,4] | 13.8 | B | 11.8 | B |
| 3. Wakea Ave / Roosevelt Ave | Signalized | 43.6 | D | 44.3 | D |
| 4. Lexington St / Roosevelt Ave | Signalized | 26.4 | C | 21.0 | C |
| 5. Fort Barrette Rd - Enterprise St / Roosevelt Ave | Signalized | 34.7 | C | 32.0 | C |
| 6. Midway St / Roosevelt Ave | Signalized | 15.3 | B | 29.0 | C |
| 7. Coral Sea St / Roosevelt Ave | Signalized | 22.6 | C | 25.8 | C |
| 8. Kualaka'i Pkwy / Roosevelt Ave | Signalized | 48.6 | D | 34.8 | C |
| 9. Kamokila Blvd / Boxer Rd | Signalized | 25.8 | C | 38.9 | D |
| 10. Copahee Ave / Boxer Rd | Signalized | 22.2 | C | 35.8 | D |
| 11. Boxer Rd / Saratoga Ave | Signalized | 18.4 | B | 30.8 | C |
| 12. Wakea Ave / Saratoga Ave | Signalized | 24.3 | C | 46.5 | D |
| 13. Lexington St / Saratoga Ave | Signalized | 32.5 | C | 38.4 | D |
| 14. Enterprise St / Saratoga Ave | Signalized | 43.2 | D | 29.2 | C |
| 15. Midway St / Saratoga Ave | Signalized | 15.1 | B | 28.2 | C |
| 16. Coral Sea St / Saratoga Ave | Signalized | 25.4 | C | 30.4 | C |
| 17. Kualaka'i Pkwy / Saratoga Ave | Signalized | 43.4 | D | 38.3 | D |
| 18. Saratoga Ave - Geiger Rd / Roosevelt Ave | Signalized | 17.1 | B | 20.3 | C |
| 19. W. Perimeter Rd / Malakole St | Signalized | 18.7 | B | 34.5 | C |
| 20. Boxer Rd-Midway Rd / Wakea Ave-Malakole St | Roundabout | 2.1 | A | 3.5 | A |
| 21. Lexington St / Midway Rd | Signalized | 21 | C | 37.5 | D |
| 22. Lexington St / Yorktown St | Signalized | 16.3 | B | 28 | C |
| 23. Lexington St / Shangrila St | Signalized | 27.2 | C | 28.4 | C |
| 24. Enterprise St / Yorktown St | Signalized | 27.1 | C | 33.4 | C |
| 25. Enterprise St / Shangrila St | Signalized | 13 | B | 19.7 | B |
| 26. W. Perimeter Rd / Olai St | TWSC[3] | 4.6 | A | 4 | A |
| 27. Coral Sea St / Tripoli Rd | TWSC[3] | 5.6 | B | 4.2 | B |

Notes:

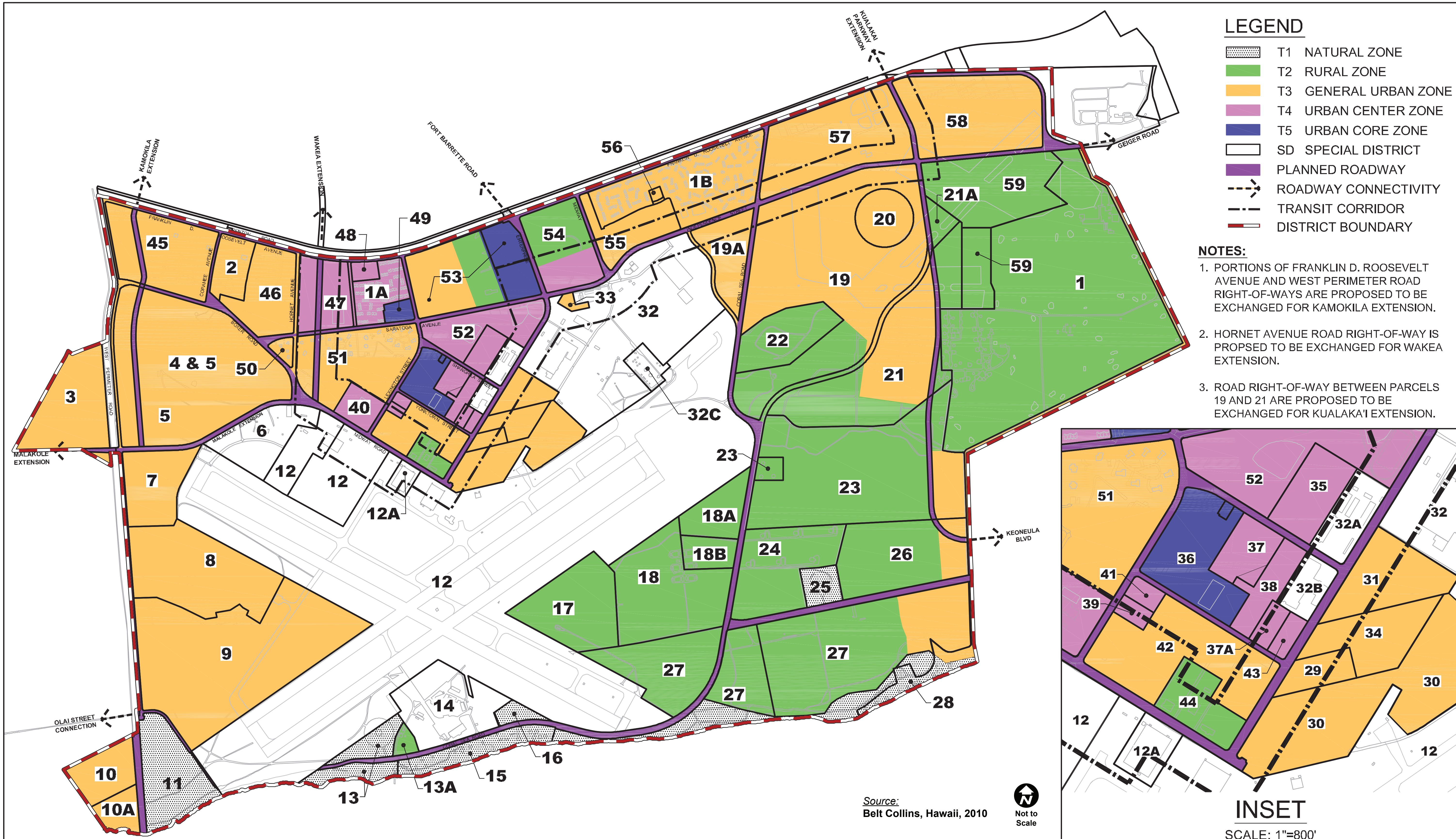
1 Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections using methodology described in the 2000 *Highway Capacity Manual*. For two-way stop controlled unsignalized intersections, total control delay for the worst movement, expressed in seconds per vehicle, is presented. Federal Highway Administration analytical methodology used for roundabout analysis. LOS calculations conducted using the TRAFFIX level of service analysis software package.

2 LOS = Level of service

3 TWSC = Two Way Stop Control

4 Includes channelized refuge lane for northbound left-turns and separate left-turn for westbound approach.

Source: Fehr & Peers, September 2019

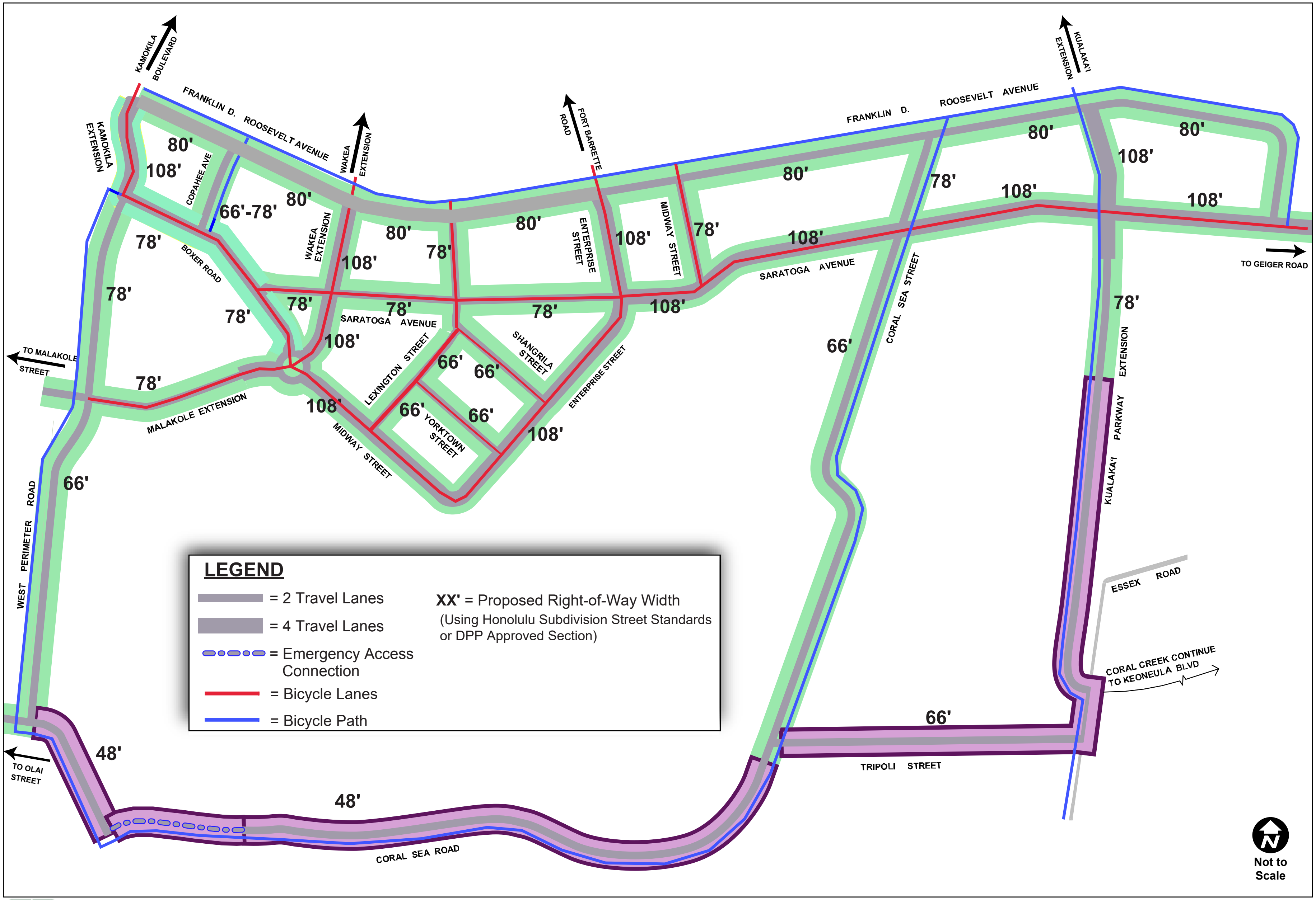



**Kalaeloa Roadway Master Plan Study**

**Kalaeloa Parcel Map**

Figure 1

September 2019
SD15-0169

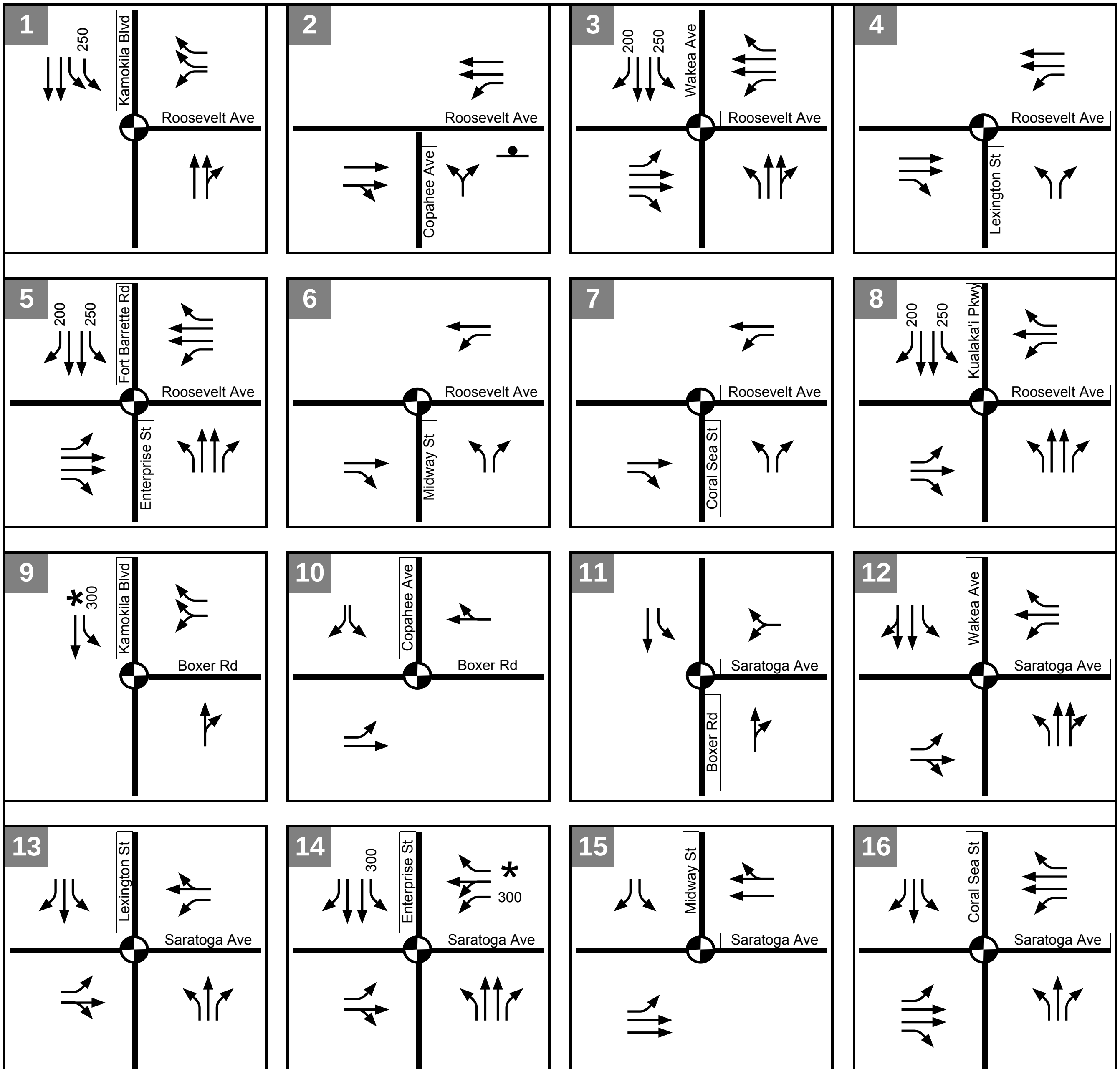



Kalaeloa Roadway Master Plan Study

## Proposed Street Typology and Bicycle Facilities

Figure 2

September 2019
SD15-0169.02




*Note:*
Unless noted standard length for a left turn storage pocket is 200 feet for arterial roadways and 125 feet for collectors. Standard right turn lane storage pocket length is 125 feet for arterial and collector roadways.

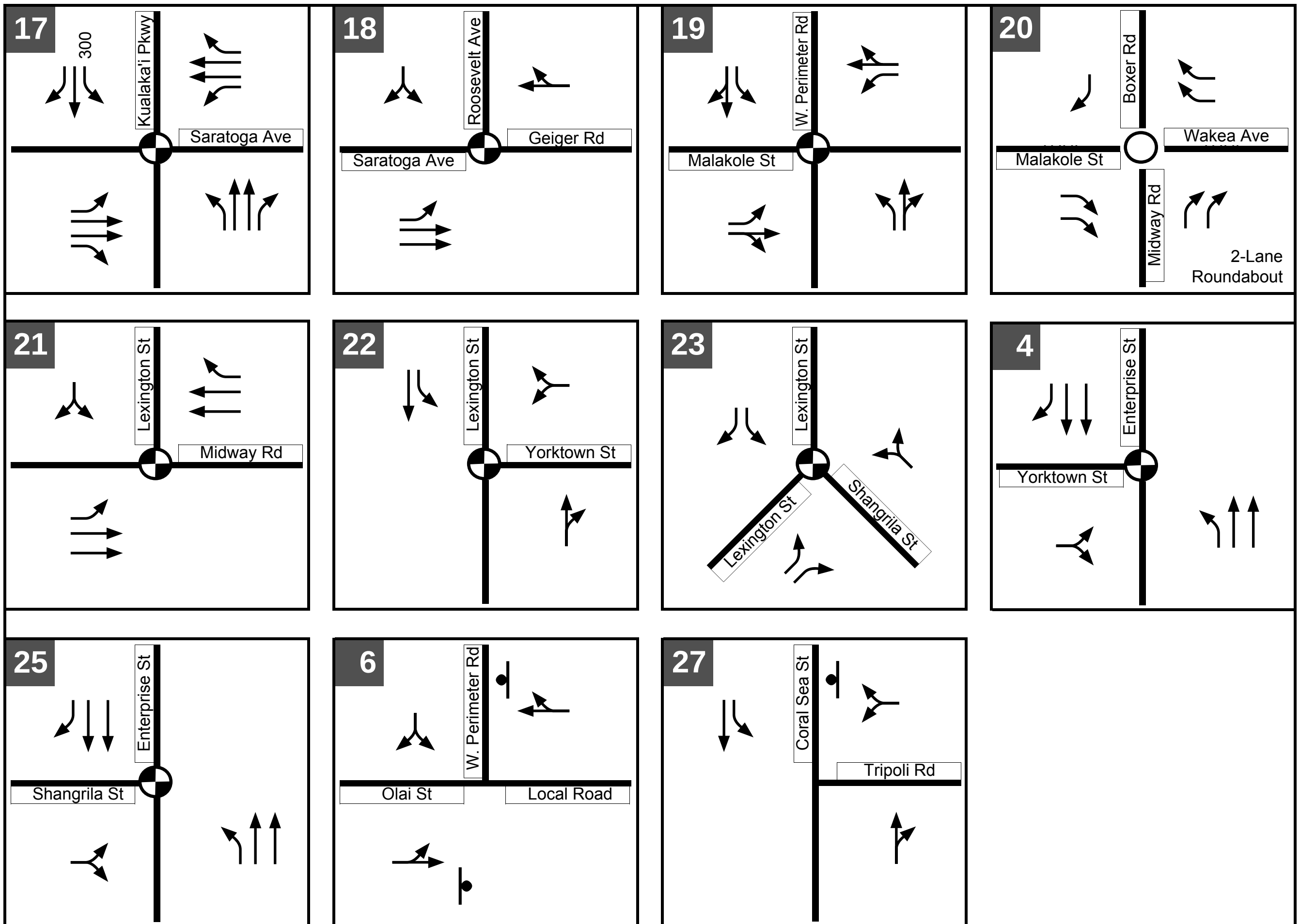
**KEY:**
- ◐ = Signalized Intersection
- ○ = Roundabout
- = Stop Sign
- YYY = Storage Pocket Length in Feet
- * = Trap Turn Lane

**Kalaeloa Roadway Master Plan Study**

**Proposed Intersection Configuration and Standard Turn Lane Storage Pocket Lengths Under Buildout Conditions**

September 2019
SD15-0169

**FIGURE 3A**




*Note:*
Unless noted standard length for a left turn storage pocket is 200 feet for arterial roadways and 125 feet for collectors. Standard right turn lane storage pocket length is 125 feet for arterial and collector roadways.

**KEY:**

- = Signalized Intersection
- = Roundabout
- = Stop Sign
- YYY = Storage Pocket Length in Feet
- * = Trap Turn Lane

**Kalaeloa Roadway Master Plan Study**

**Proposed Intersection Configuration and Standard Turn Lane Storage Pocket Lengths Under Buildout Conditions**

September 2019
SD15-0169

**FIGURE 3B**

## *Appendix F*

*Early Consultation: Comments Received during the First Draft Environmental Assessment Comment Periods from December 28, 2018 to March 9, 2020 and Responses*

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

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 19-13

January 9, 2019

Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

Subject: Draft Environmental Assessment (DEA) for Hunt Kalaeloa Subdivision Roads Project

Thank you for the opportunity to review and comment on the subject project.

Our comments are as follows:

- Once construction phase commence, install approved Best Management Practices fronting all City drainage facilities.
- During construction and upon completion of project; any damages/deficiencies within the City right-of-way along all affected City roads shall be repaired to City Standards and accepted by the City and at no cost to the City and County of Honolulu.
- Our records indicate that Franklin D. Roosevelt Avenue is under the jurisdiction of the State of Hawaii, Department of Transportation.
- Division of Road Maintenance recommends that the Developer or others maintain their basins.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

Ross S. Sasamura, P.E.
Director and Chief Engineer

cc: R.M. Towill Corporation - Brian Takeda

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
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eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Ross S. Sasamura, P.E.
Director and Chief Engineer
City and County of Honolulu
Department of Facility Maintenance
1000 Uluohia Street, Suite 215
Kapolei, Hawaiʻi 96707

Dear Mr. Sasamura:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated January 9, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *Once construction phase commences, install approved Best Management Practices fronting all City drainage facilities.*

HCDA will require that all design drawing submittals for the project include detailed, proven and effective Best Management Practices (BMPs) for review and approval by City and County of Honolulu (City) and State agencies as part of project grading and construction permit process. As an example of how City drainage facilities would be protected from construction-related storm water runoff, the BMPs Plan will consist of erosion control measures such as planting or hydromulching grass seedling, erecting silt fencing/curtains, berms, and/or other applicable erosion control devices to prevent construction-related soils and silt from mixing with storm water runoff.

2. *During construction and upon completion of project: any damages/deficiencies within the City right-of-way along all affected City roads shall be repaired to City standards and accepted by the city and at no cost to the City and County of Honolulu.*

HCDA concurs with DFM such that any inadvertent damage resulting during construction and upon completion of the project within the City right-of-way along all affected City roads shall be returned to pre-construction condition at no cost to the City.

3. *Our records indicate that Franklin D. Roosevelt Avenue is under the jurisdiction of the State of Hawaii, Department of Transportation.*

HCDA concurs that Franklin D. Roosevelt Avenue is under HDOT jurisdiction and is expected to be turned over to HCDA for a pilot project before it is then turned over to the City, in accordance with the 2016 Memorandum of Understanding.

4. *Division of Road Maintenance recommends that the Developer or others maintain their basins.*

The proposed basins will be maintained by a future association of property and/or business owners of the planned community.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DFM-final_013020.doc

cc: Ms. Tesha Mālama, HCDA

# OFFICE OF PLANNING
# STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
PLANNING PROGRAM ADMINISTRATOR II
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DTS20190114094NA

January 14, 2019

Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

Subject: Draft Environmental Assessment for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, Ewa, Oahu, Hawaii

Thank you for the opportunity to provide comments on the Draft Environmental Assessment (Draft EA), received December 19, 2018, for Hunt Kalaeloa Subdivision Roads Project.

According to the subject Draft EA, Hunt Communities Hawaii LLC proposes to develop Kalaeloa Subdivision Roadway System Project within the former Barbers Point Naval Air Station property located in Ewa, Oahu, Hawaii. The entire 35-acre project area encompasses land and roadways on portions of multiple tax maps keys. The proposed project involves the subdivision of three parcels in the Kalaeloa Community Development District (Kalaeloa CDD), and infrastructure improvements that will consist of regional flood control and roadway drainage systems, private portable water and sewer systems, electrical power systems, street lighting, and telecommunications systems. The proposed infrastructure improvements will support the future Hunt residential community within the Kalaeloa CDD.

The project site is about 1.3 miles mauka of the shoreline, and is located outside the special management area as designated under the Hawaii Coastal Zone Management Act, Hawaii Revised Statutes (HRS) Chapter 205A. The use of state land and/or funds from the proposed action triggers the subject EA to meet the requirements of HRS Chapter 343.

The project cost is estimated at $50,000,000, and construction is scheduled in the second half of 2019 with a duration of approximately two years.

The Office of Planning (OP) has reviewed the Draft EA and has the following comments to offer:

1. Pages 25-26, the Draft EA states that contaminants of potential concern were identified in soil to a depth of 4 feet below ground surface at concentrations that exceed State of Hawaii Department of Health (DOH) environmental action levels for unrestricted land use. The OP recommends that the State DOH Hazard Evaluation and Emergency Response Office be consulted as to whether an environmental hazard management plan shall be prepared to mitigate potential impacts of soil and groundwater contaminants, and their exposure risk to human health.

2. The Draft EA, pages 29-30, discusses the climate change and sea level rises. The OP suggests that the Final EA refer to the findings of the Hawaii Sea Level Rise Vulnerability and Adaptation Report 2017, accepted by the Hawaii Climate Change Mitigation and Adaptation Commission. The Hawaii Sea Level Rise Viewer at climateadaptation.hawaii.gov particularly identifies 3.2-foot sea level rise exposure areas across the main Hawaiian Islands including Oahu, which may occur in the mid to latter half of the 21st century.

3. The Draft EA states that early consultation with the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD) is recommended to determine if any further archaeological study is indicated. The Final EA should provide a determination from the SHPD as to whether an archaeological inventory survey is necessary for the project area. Should any archaeological or cultural resources, or burials be discovered during ground excavation, all construction work shall be ceased immediately. Subsequent work shall proceed only upon an archaeological clearance from the SHPD.

4. The OP concurs that exterior lighting and lamp posts associated with the proposed construction and facilities shall be cut-off luminaries to provide the necessary shielding to mitigate potential light pollution in the coastal areas, and lessen possible seabird strikes. No artificial light, except as provided in HRS § 205A-71(b) shall be directed to travel across property boundaries toward the shoreline and ocean waters.

5. Act 120, Session Laws of Hawaii (SLH) 2013, made permanent Act 160, SLH 2010. **9. Beach Protection**, page 65, should be referred to HRS § 205A-2(c)(9), as amended, for discussion.

6. The permits and approved listed on the Draft EA is incomplete. The Final EA should provide a list of all permits and approvals (state, federal, and county) required for the construction and operation of the proposed subdivision roads project.

If you have any questions regarding this comment letter, please contact Shichao Li of our office at (808) 587-2841.

Sincerely,

Leo R. Asuncion
Planning Program Administrator II

c: Mr. Brian Takeda ✓

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R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Leo R. Asuncion
Planning Program Administrator II
Office of Planning
State of Hawaiʻi
P. O. Box 2359
Honolulu, Hawaiʻi 96804

Dear Mr. Asuncion:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated January 14, 2019 (DTS20190114094NA) concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

1. *Pages 25-26, the Draft EA states that contaminants of potential concern were identified in soil to a depth of 4 feet below ground surface at concentrations that exceed State of Hawaii Department of Health (DOH) environmental action levels for unrestricted land use. The OP recommends that the State DOH Hazard Evaluation and Emergency Response Office be consulted as to whether an environmental hazard management plan shall be prepared to mitigate potential impacts of soil and groundwater contaminants, and their exposure risk to human health.*

The State DOH shall continue to be consulted as the planning and design of the project proceeds. As stated in reissued Draft EA Section 5.5, Soils and Potential Hazardous Materials, the recommended next steps in the Phase I Environmental Site Assessment (ESA) will include:

(1) The completion of a Phase II ESA. The purpose of the Phase II ESA is to characterize soil within the subject property to evaluate potential environmental hazards, associated risks, and potential construction/trench worker exposure. Soil sample results will also be used to characterize soil for on/off-site reuse and/or disposal.

(2) If Contaminants of Potential Concern (COPCs) are detected in the soil at concentrations exceeding State DOH Exposure Action Levels (EALs), then an Environmental Hazard

Evaluation (EHE) will be completed to evaluate potential environmental hazards, associated risks, and construction/trench worker exposure.

(3) If potential environmental hazards, associated risks, and/or construction/trench worker exposure are identified by the EHE, an Environmental Hazard Management Plan will be prepared to manage contaminated soil and mitigate potential environmental hazards and exposure risks.

2. *The Draft EA, pages 29-30, discusses the climate change and sea level rises. The OP suggests that the Final EA refer to the findings of the Hawaii Sea Level Rise Vulnerability and Adaptation Report 2017, accepted by the Hawaii Climate Change Mitigation and Adaptation Commission. The Hawaii Sea Level Rise Viewer at climateadaptation.hawaii.gov particularly identifies 3.2-foot sea level rise exposure areas across the main Hawaiian Islands including Oahu, which may occur in the mid to latter half of the 21st century.*

HCDA acknowledges this comment. The reissued Draft EA, Section 5.3, Climate, and Section 5.7, Natural Hazards, presents the findings of the Hawaii Sea Level Rise Vulnerability and Adaptation Report 2017. The project site elevation is 52 feet above sea level and direct inundation due to sea-level rise is not expected in the context of 21st-century sea-level rise projections. Furthermore, according to the Hawaiʻi Sea Level Rise (SLR) Viewer (accessed 2019), the project site is not within the 3.2-feet SLR Exposure Area.

3. *The Draft EA states that early consultation with the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD) is recommended to determine if any further archaeological study is indicated. The Final EA should provide a determination from the SHPD as to whether an archaeological inventory survey is necessary for the project area. Should any archaeological or cultural resources, or burials be discovered during ground excavation, all construction work shall be ceased immediately. Subsequent work shall proceed only upon an archaeological clearance from the SHPD.*

HCDA acknowledges this comment. The project's Archaeological Literature Review and Field Inspection (ALRFI) Report has been submitted to the SHPD for review. Based on the results of the ALRFI, the recommendation is to undertake a combination of on-site and on-call monitoring due to the potential for historic surface and subsurface sites to be encountered within areas previously utilized by the Barbers Point Naval Air Station. Due to the heavily disturbed nature at the intersections, it is unlikely that historic properties would be encountered. Accordingly, HDCA intends to comply with SHPD's review and comments regarding the next steps required to appropriately protect and preserve historic resources in accordance with Hawaiʻi Revised Statutes, Chapter 6E. This would include any requirements should an Archaeological Inventory Survey be required.

4. *The OP concurs that exterior lighting and lamp posts associated with the proposed construction and facilities shall be cut-off luminaries to provide the necessary shielding to mitigate potential light pollution in the coastal areas, and lessen possible seabird strikes. No artificial light, except as provided in HRS § 205A-71 (b) shall be directed to travel across property boundaries toward the shoreline and ocean waters.*

HCDA acknowledges this comment and thanks the OP for its guidance. The design of this project will be in accordance with all applicable State and City and County of Honolulu standards. See the reissued Draft EA Section 5.8.2.2 and Table 10-1 for proposed mitigation measures and Best Management Practices to mitigate against the potential for light pollution in coastal areas, and reduce the possibility of seabird strikes.

5. *Act 120, Session Laws of Hawaii (SLH) 2013, made permanent Act 160, SLH 2010.* ***9. Beach Protection,*** *page 65, should be referred to HRS § 205A-2(c)(9), as amended, for discussion.*

The Draft EA includes a discussion of the project's consistency with HRS § 205A-2(c)(9), as amended.

6. *The permits and approved listed on the Draft EA is incomplete. The Final EA should provide a list of all permits and approvals (state, federal, and county) required for the construction and operation of the proposed subdivision roads project.*

HCDA acknowledges this comment. See the reissued Draft EA Section 8, Permits and Approvals that May be Required for an updated list of all permits and approvals that may be required for the proposed project. As the project is further developed, more information may be provided regarding the required permits in the Final EA.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to OP 01-30-20.doc

cc: Ms. Tesha Mālama, HCDA

DAVID Y. IGE
GOVERNOR

DR. CHRISTINA M. KISHIMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

January 15, 2019

TO: Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority

FROM: Kenneth G. Masden II
Public Works Manager, Planning Section
Facilities Development Branch

SUBJECT: **Draft Environmental Assessment for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, Ewa, Oahu, Hawaii**

The Hawaii State Department of Education (HIDOE) has the following comments for the Draft Environmental Assessment (DEA) for the proposed Hunt Kalaeloa Subdivision Roads (Project). According to the DEA, the Project consists of the subdivision of three parcels and the construction of roadway and infrastructure improvements on approximately 35 acres of land located at Kalaeloa, Ewa, Island of Oahu, Hawaii at various TMKs.

The DEA identifies Barbers Point Elementary School, Tax Map Key 9-1-013:003 (School) as one of the properties that are part of the Project. However, the DEA does not identify which Project elements will utilize School lands. This is essential in order to identify and mitigate all impacts to the School. The Final Environmental Assessment should state exactly how the proposed Project affects the School.

For DEA review purposes, the HIDOE will assume that School lands are part of the proposed Project.

The following improvements identified in the DEA will directly impact the School:

1. Roosevelt Avenue roadway improvements to include 10-foot widening and a 14-foot setback for a future 108-foot Right-of-Way (ROW) reserve;
2. Copahee Avenue roadway improvements to include 11-foot widening and 11-foot setback for a future 66-foot ROW;
3. Boxer Road roadway improvements to include 18-foot widening, 6-foot setback for a future 108-foot ROW, and realignment with Saratoga Avenue; and

4. Intersection improvements at Roosevelt and Copahee Avenues to include the widening of Roosevelt Avenue to provide a refuge island median for the mauka-bound left-turn storage and ewa-bound merge lane.

As part of the overall redevelopment of Kalaeloa, Hunt Communities Hawaii, LLC (Applicant) has discussed with HIDOE preliminary development plans and the desire to acquire School land to implement roadway improvements for Roosevelt and Copahee Avenues to meet City and County of Honolulu Standards. School lands identified in these discussions were a ten foot wide strip along Roosevelt Avenue and an 11 foot wide strip along Copahee Avenue.

School land acquisition along Roosevelt and Copahee Avenues will have long term impacts to the School. Impacts to grounds and facilities along Roosevelt Avenue are the existing school fence with a gated vehicular access, play area, baseball field with a backstop, and large mature trees. Impacts to grounds and facilities along Copahee Avenue are the existing school fence, school walkways, school bus pull in for loading and unloading, driveway access to and from School, internal transportation patterns, and large mature trees.

Schools lands were transferred to the State of Hawaii from the federal government, by quitclaim deed dated July 7, 2000, after the closure of Barber's Point Naval Air Station. The following conditions as taken from the executed quitclaim deed that will affect potential land acquisition are:

1. For a period of thirty (30) years from the date of this Deed, the Property will be used solely and continuously for the educational purposes set forth in accordance with the proposed program and plan of GRANTEE described in its Application, and for no other purposes. Grantor reserves the right to enter and inspect Property during said period.

2. During the above period of thirty (30) years GRANTEE will not sell, resell, lease, rent, mortgage, encumber, or otherwise transfer any interest in any part of the Property except as GRANTOR may authorize in advance in writing.

If the Applicant pursues the acquisition School lands, HIDOE needs to be informed as soon as possible of the location and amount.

The School has a main driveway access to and from Boxer Avenue. This driveway access will be permanently eliminated with the proposed realignment of Boxer Avenue with Saratoga Avenue. The elimination of this driveway will have a long term impact to the Schools internal and external traffic patterns.

There will be upgrades to all existing utilities; however specific locations for these upgrades have not been identified in the DEA. We request consultation and coordination with the Facilities Development Branch, Public Works Administrator, as early as possible to identify and minimize impacts to School facilities and operations during these upgrades.

The School's student enrollment for the 2018-19 school year is 518.

The School will be subject to long term impact of the elimination of one of two driveways due to the Boxer Avenue realignment. A mutually agreed upon second driveway, over Applicants land, will be required to mitigate this impact. At this time HIDOE cannot identify long term impacts nor propose mitigation measures for roadway improvements to Roosevelt and Copahee Avenues. Once the HIDOE knows how the Project will affect School lands, further review can be made to identify the presence or absence of additional long term impacts.

The School will be subject to short-term construction related impacts from noise and fugitive dust, especially for improvements along Roosevelt and Copahee Avenues. Driveway access to and from the School and student transportation services will be impacted from temporary changes to traffic patterns. The HIDOE currently has seven school buses transporting students to and from the School. There are four buses for regular students and three for special education students.

We request consultation and coordination with the School prior to and during construction in order to further identify and minimize impacts in general and during school hours. We also request consultation and coordination with HIDOE Student Transportation Services Branch Manager, James Kauhi, to identify and minimize impacts to existing HIDOE transportation services.

For the reasons provided HIDOE does not agree with the DEA determination that there are no long term, secondary, and cumulative effects from the proposed Project to school facilities. Nor does HIDOE agree with the DEA determination that that there will be no substantial impacts or effects on public facilities.

Thank you for the opportunity to comment. Should you have questions, please contact Robyn Loudermilk, School Lands and Facilities Specialist of the Facilities Development Branch, Planning Section at 784-5093 or via email at robyn_loudermilk@notes.k12.hi.us.

KGM:rll

c: Sean Tajima, Complex Area Superintendent, Campbell-Kapolei Complex
Jaclyn Riel, Principal, Barber's Point Elementary School
John Chung, Facilities Development Branch
James Kauhi, Student Transportation Services Branch
✓ Brian Takeda, R.M. Towill Corporation.
Office of Environmental Quality Control

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Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Kenneth G. Masden II
Public Works Manager, Planning Section
Facilities Development Branch
State of Hawaiʻi
Department of Education
P. O. Box 2360
Honolulu, Hawaiʻi  96804

Dear Mr. Masden:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated January 15, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment on this reissued document.

The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *The DEA identifies Barbers Point Elementary School, Tax Map Key 9-1-013:003 (School) as one of the properties that are part of the Project. However, the DEA does not identify which Project elements will utilize School lands. This is essential in order to identify and mitigate all impacts to the School. The Final Environmental Assessment should state exactly how the proposed Project affects the School*

HCDA acknowledges this comment. The reissued Draft EA Sections 5.14.1 Roads and Transportation, and Section 5.14.7, Schools and Libraries addresses the existing conditions and anticipated project impact on the Barbers Point Elementary School. However, we add that the design of the project is not yet final and our expectation is that HCDA, Hunt, and the State of Hawaiʻi Department of Education (HIDOE) would continue to have future discussions on how we can maintain a healthy and viable school campus while providing for future transportation improvement of the area.

2. *The School will be subject to long term impact of the elimination of one of two driveways due to the Boxer Avenue realignment. A mutually agreed upon second driveway, over Applicants land, will be required to mitigate this impact. At this time HIDOE cannot identify long term impacts nor propose mitigation measures for roadway improvements to Roosevelt and Copahee Avenues. Once the HIDOE knows how the Project will affect School lands, further review can be made to identify the presence or absence of additional long term impacts.*

As stated above, consultation between HCDA, Hunt, and the HIDOE will continue through the design process to ensure that an alternative access is provided and that adverse impacts can be minimized or avoided.

3. *The School will be subject to short-term construction related impacts from noise and fugitive dust, especially for improvements along Roosevelt and Copahee Avenues. Driveway access to and from the School and student transportation services will be impacted from temporary changes to traffic patterns. The HIDOE currently has seven school buses transporting students to and from the School. There are four buses for regular students and three for special education students.*

HCDA acknowledges this comment. The reissued Draft EA Section 10.1, Short Term Effects, outlines mitigation measures that will be implemented to address the generation of short-term construction-related impacts.

Noise will be temporarily generated from construction activities and the related mobilization of equipment. To mitigate impacts from noise the contractor shall follow the mitigation measures outlined in the reissued Draft EA Section 5.10, Noise, including muffling all internal combustion powered equipment in accordance with standard engine operating practices. Upon the completion of work, noise levels will return to preexisting ambient levels.

Fugitive dust may be generated during construction. The contractor will be required to control fugitive dust through the regular wetting of soils and ground areas susceptible to the generation of dust during work activities. Only enough water to wet the surface of the ground will be used to prevent the generation of runoff.

The major source of disturbance to traffic is anticipated from construction activities during deliveries and transit of vehicles to and from the job site. Occasional increases in construction traffic may also result from the periodic movement of vehicles to and from the job site to dispose of demolition debris. To minimize traffic circulation problems throughout the Kalaeloa neighborhood, the contractor will prepare and implement a traffic safety and control plan. As described in the reissued Draft EA, Section 5.14.7, Schools and Libraries, mitigative measures will include the planning of construction activities during the daytime hours with no night work anticipated to be required, and the use of flagmen and/or traffic controls to maintain accessibility for businesses and residents who may use the surrounding area roads. As recommended by City and County of Honolulu, Department of Transportation Services, construction materials and equipment will be transferred to and from the project site during off-peak traffic hours (8:30 AM to 3:30 PM) to minimize any possible disruption to traffic on the local streets, and after the morning school rush to minimize impacts to schools in the area.

4. *We request consultation and coordination with the School prior to and during construction in order to further identify and minimize impacts in general and during school hours. We also request consultation and coordination with HIDOE Student Transportation Services Branch Manager, James Kauhi, to identify and minimize impacts to existing HIDOE transportation services.*

As stated in response to comment No. 2 above, HCDA and Hunt will continue to consult and coordinate with HIDOE staff as the design and construction phase plans progress.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DOE 013020.doc

cc: Ms. Tesha Mālama, HCDA

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

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

January 16, 2019

Ms. Tesha Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

Subject: Draft Environmental Assessment
Hunt Kalaeloa Subdivision Roads Project
Kalaeloa, Hawaii

In response to a letter from Mr. Brian Takeda of R. M. Towill Corporation dated December 17, 2018, 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 from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)

   A fire department access road shall extend to within 50 feet 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 from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; 2012 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

Socrates D. Bratakos

SOCRATES D. BRATAKOS
Assistant Chief

SDB/CM:bh

cc: Brian Takeda, R. M. Towill Corporation

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Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Socrates D. Bratakos
Assistant Chief
Honolulu Fire Department
City and County of Honolulu
636 South Street
Honolulu, Hawaiʻi 96813-5007

Dear Assistant Chief Bratakos:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated January 16, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

The following has been prepared in response to your comments (your comments are *italicized* for reference):

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 from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)*

   *A fire department access road shall extend to within 50 feet 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.)*

HCDA acknowledges this comment. The proposed project roadway improvements will comply with Kalaeloa Community Development Plan (KCDP) and all applicable City and County of Honolulu (CCH) design standards to meet health and fire safety requirements as cited in your comment above.

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 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.)*

HCDA acknowledges this comment. The water supply and routing systems for the proposed project are being designed in accordance with all applicable KCDP and CCH standards.

3. *The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)*

As stated in the responses to Comments 1 and 2 above, all applicable KCDP and CCH standards to meet health and fire safety requirements will be incorporated in the project design.

4. *Submit civil drawings to the HFD for review and approval.*

HFD will continue to be consulted during the review and approval process for the proposed project, including the developer's submittal of design plans for the department's review and comments.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to Fire Dept 013020.doc

cc: Ms. Tesha Mālama, HCDA

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 1423
STP 8.2580

January 23, 2019

Mr. Aedward Los Banos
Executive Director
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Attention: Ms. Tesha H. Malama

Dear Ms. Malama:

Subject: Hunt Kalaeloa Subdivision Roads Project
Draft Environmental Assessment (DEA)
Kalaeloa, Ewa, Oahu, Hawaii
TMK: (1) 9-1-Various Plats and Parcels

The State Department of Transportation (DOT) understands the applicant proposes to construct improvements to roadways, intersections and utility systems within the Hunt Kalaeloa Subdivision. DOT comments on the subject project are as follows:

<u>Airports Division (DOT-AIR)</u>

1. The subject project site is approximately 2,928 feet from Runway 11 at Kalaeloa Airport (JRF). All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf.

2. Section 2 and Section 3 of the subject DEA states that the subject project will involve approximately five acres for off-site drainage facilities. Standing water creates a potential wildlife attractant and therefore creates a bird-strike risk to aircrafts flying over the property proximity.

   The design and landscaping for the drainage improvements shall not create conditions to attract wildlife. Federal Aviation Administration (FAA) Advisory Circular150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, provides guidance for developments and wildlife management near airports.

If wildlife is attracted to the project site and poses a potential hazard to aircrafts, Hunt Communities Hawaii LLC (Hunt) or the responsible subdivision property owner shall take appropriate measures to ensure the proper mitigation of the potential wildlife hazard, upon notification by DOT-AIR.

3. Section 2 and 3 of the subject DEA also indicate: The project will support the future development of public and residential land uses, schools and commercial uses within Kalaeloa Community Development District (Kalaeloa CDD); the proposed action involves the subdivision of three parcels (1, 2 and 3) in the Kalaeloa CDD. Based on Hunt's potential future development plans, DOT-AIR provides the following comments:

   a. JRF Runway 22 Right/4 Left is 8,000 feet in length and Runway 11/29 is 6,000 feet long. FAA regulation requires the submittal of FAA Form 7460-1, Notice of Proposed Construction or Alteration pursuant to the Code of Federal Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet. The form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portal.jsp.

   b. If the proposed residential and commercial development near JRF includes photovoltaic (PV) panel installations, the responsible solar installation proponent shall conduct a glint and glare analysis to ensure that the solar energy installation does not create hazardous conditions to JRF and Daniel K. Inouye International Airport (HNL) flights. Please see the following website for more information: www.sandia.gov/glare. Large-scale solar energy installations also have the potential to emit radio frequency interference (RFI).

   c. Glint, glare, RFI, PV panels and tall equipment (such as cranes that may be used during construction) can create hazardous conditions to pilots. Any such PV system, construction equipment, and/or other structure that creates such a hazardous condition for pilots, shall be immediately mitigated by the owner upon notification by the DOT-AIR and/or FAA.

   d. Due to the development proximity to JRF, there is a potential for fumes, smoke, vibrations, odors, etc., from aircraft flight operations over the proposed development. The project may also be subject to single event noise from aircraft operations.

4. Hunt Communities Hawaii LLC shall grant assurances of flight safety over the proposed site to DOT-AIR via an avigation easement.

Highways Division (DOT-HWY)

1. Any work on the roads and intersections under DOT jurisdiction will require approval by DOT. This includes, Franklin D. Roosevelt Avenue (between West Perimeter Road and Enterprise Avenue) and West Perimeter Road (between Franklin D. Roosevelt Avenue and Saratoga Avenue) which have not yet been conveyed from DOT to the Hawaii Community Development Authority (HCDA) in accordance with the July 25, 2016 Memorandum of Understanding.

2. While the proposed action (transportation improvements) is being treated as the primary action under Hawaii Revised Statutes (HRS) Chapter 343, it is typically treated as the secondary action to the development, which is typically the primary action. Please explain the reason for this action.

3. The DOT-HWY has not been consulted prior to the DEA publication, which is a concern due to having jurisdiction and responsibility for the aforementioned DOT roads.

4. The proposed action is in DOT jurisdiction; therefore, the DOT-HWY should be consulted on other State environmental regulations, such as HRS Chapter 6E and 195D.

5. The DOT-HWY also has not been consulted on other matters besides the DEA, such as jurisdiction, planning, design, construction, use and transfer of DOT roads.

6. HCDA is notified that work in the Oahu Railway and Land Company right-of-way triggers federal environmental regulations.

7. Related to the HCDA Infrastructure Masterplan Updates dated October 2010 draft:

    a. The proposed action is not consistent with the masterplan, describe the differences and explain the reason and justification for the differences.

    b. Provide phasing of masterplan and proposed action.

8. Related to the informally submitted Traffic Impact Analysis Report (TIAR) dated 12/12/17:

    a. The proposed action identified in said TIAR is not consistent with the October 2010 masterplan, describe the differences and explain the reason and justification for it.

    b. The proposed action phasing is not provided.

    c. The 2020 buildout year is not reasonable, explain how the buildout can be implemented in less than two years.

If there are any questions, please contact Mr. Blayne Nikaido of the DOT Statewide Transportation Planning Office at (808) 831-7979 or by email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

c: Brian Takeda, R. M. Towill Corporation

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Jade T. Butay
Director
State of Hawai‘i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai‘i 96813-5097

Dear Mr. Butay:

Subject: **Response to Comments for Hawai‘i Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ‘Ewa, O‘ahu, Hawai‘i**

On behalf of the State of Hawai‘i, Community Development Authority (HCDA), we thank you for your letter dated January 23, 2019 (DIR 1423 STP 8.2580) concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

The following has been prepared in response to your comments (your comments are *italicized* for reference):

*Airports Division (DOT-AIR)*

1. *The subject project site is approximately 2,928 feet from Runway 11 at Kalaeloa Airport (JRF). All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link:http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016. pdf.*

HCDA acknowledges this comment and thanks DOT-AIR for its guidance. The reissued Draft EA Section 7.1.1, Federal Aviation Administration (FAA) Order 5190.6B, now includes a discussion of the proposed Hunt Kalaeloa roadways project’s relationship to FAA Order 5190.6B, per the State of Hawai‘i Office of Planning TAM issued in August 2016. This TAM is also included in the References section of the reissued Draft EA.

2. *Section 2 and Section 3 of the subject DEA states that the subject project will involve approximately five acres for off-site drainage facilities. Standing water creates a*

*potential wildlife attractant and therefore creates a bird-strike risk to aircrafts flying over the property proximity.*

*The design and landscaping for the drainage improvements shall not create conditions to attract wildlife. Federal Aviation Administration (FAA) Advisory Circular 150/5200-33B, Hazardous Wildlife Attractants on or Near Airports, provides guidance for developments and wildlife management near airports.*

*If wildlife is attracted to the project site and poses a potential hazard to aircrafts, Hunt Communities Hawaii LLC (Hunt) or the responsible subdivision property owner shall take appropriate measures to ensure the proper mitigation of the potential wildlife hazard, upon notification by DOT-AIR.*

The design of roadway and related off-site drainage facilities shall be in accordance with all applicable Federal, State, and City and County of Honolulu standards and regulations, including avoidance of potential adverse effects on wildlife in the area. The reissued Draft EA <u>Section 7.1.1, Federal Aviation Administration (FAA) Order 5190.6B</u>, notes that the design and landscaping of the drainage improvements would not create conditions to attract wildlife. If wildlife is attracted to the project site, the applicant shall take appropriate measures to ensure proper mitigation of the potential wildlife hazard. Further, Hunt will continue to consult with HDOT-Airports regarding appropriate mitigation measures to ensure that the proposed project and future subdivision may not attract hazardous wildlife, glint/glare hazard, or aerial obstructions.

3. *Section 2 and 3 of the subject DEA also indicate: The project will support the future development of public and residential land uses, schools and commercial uses within Kalaeloa Community Development District (Kalaeloa CDD); the proposed action involves the subdivision of three parcels (1, 2 and 3) in the Kalaeloa CDD. Based on Hunt's potential future development plans, DOT-AIR provides the following comments:*

   a. *JRF* [Kalaeloa Airport or John Rodgers Field] *Runway 22 Right/4 Left is 8,000 feet in length and Runway 11/29 is 6,000 feet long. FAA regulation requires the submittal of FAA Form 7460-1, Notice of Proposed Construction or Alteration pursuant to the Code of Federal Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet. The form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portalJsp.*

   b. *If the proposed residential and commercial development near JRF includes photovoltaic (PV) panel installations, the responsible solar installation proponent shall conduct a glint and glare analysis to ensure that the solar energy installation does not create hazardous conditions to JRF and Daniel K. Inouye International Airport (HNL) flights. Please see the following website for more information: www.sandia.gov/glare. Large-scale solar energy installations also have the potential to emit radio frequency interference (RFI).*

c. *Glint, glare, RFI, PV panels and tall equipment (such as cranes that may be used during construction) can create hazardous conditions to pilots. Any such PV system, construction equipment, and/or other structure that creates such a hazardous condition for pilots, shall be immediately mitigated by the owner upon notification by the DOT-AIR and/or FAA.*

d. *Due to the development proximity to JRF, there is a ·potential for fumes, smoke, vibrations, odors, etc., from aircraft flight operations over the proposed development. The project may also be subject to single event noise from aircraft operations.*

HCDA acknowledges the references and information provided and will review them for regulatory applicability to this project. The subdivision roadways project does not include the installation of photovoltaic panels or tall equipment; therefore, a glint and glare analysis is not required for the subject project. However, Hunt will continue to consult with DOT-AIR regarding appropriate mitigation measures to ensure that the proposed project and future subdivision not create hazardous conditions that attract wildlife, cause a glint/glare hazard, or result in aerial obstructions. See the reissued Draft EA Section 7.1.1, Federal Aviation Administration (FAA) Order 5190.6B.

4. *Hunt Communities Hawaii LLC shall grant assurances of flight safety over the proposed site to DOT-AIR via a navigation easement.*

As stated above, consultation with DOT-AIR shall take place as the design of the Hunt Kalaeloa roadways project proceeds. This would include discussions concerning the need for an avigation easement.

Highways Division (DOT-HWY)

1. *Any work on the roads and intersections under DOT jurisdiction will require approval by DOT. This includes, Franklin D. Roosevelt Avenue (between West Perimeter Road and Enterprise Avenue) and West Perimeter Road (between Franklin D. Roosevelt Avenue and Saratoga Avenue) which have not yet been conveyed from DOT to the Hawaii Community Development Authority (HCDA) in accordance with the July 25, 2016 Memorandum of Understanding.*

HCDA acknowledges this comment and will consult with DOT-HWY as required to address regulatory, and land use and ownership requirements. This will include obtaining the necessary authorizations and permits to conduct work in DOT-HWY right-of-ways.

2. *While the proposed action (transportation improvements) is being treated as the primary action under Hawaii Revised Statutes (HRS) Chapter 343, it is typically treated as the secondary action to the development, which is typically the primary action. Please explain the reason for this action.*

The subject roadways project is being developed first to facilitate and support the development of the future residential, commercial and public facilities envisioned in the master planned documents cited and discussed in the Draft EA. These land uses that will support the Kalaeloa and Hunt Master Plans will follow the roadways project and will be further analyzed in a Development Permit application, as required, in accordance with Hawaiʻi Administrative Rules (HAR), Chapter 15-215, Kalaeloa Community Development District Rules.

3. *The DOT-HWY has not been consulted prior to the DEA publication, which is a concern due to having jurisdiction and responsibility for the aforementioned DOT roads.*

DOT-HWY was consulted in various forms as a part of consulation; first as documented in two Memoranda of Understanding (MOUs), which includes DOT-HWY as a jurisdictional agency in both MOUs. Jurisdictional assignments are summarized below.

The former Barbers Point Naval Air Station (BPNAS) Redevelopment Commission, DOT-HWY, and the City and County of Honolulu (CCH) entered into an MOU on February 27, 2001, which transferred the ownership of various roadways at Kalaeloa to DOT-HWY and CCH. Under this MOU, the DOT-HWY and CCH both accepted ownership and the responsibility to construct, operate, and maintain roadways, associated drainage systems, and future roadway rights. Once roads were constructed to CCH standards, it was intended that roadways transferred to DOT-HWY would be dedicated to the CCH.

Commencing in 2014, at the request of Councilmember Kymberly Marcos Pine, quarterly meetings were held with the HCDA, DOT-HWY, the CCH Department of Planning and Permitting (DPP), the CCH Department of Transportation Services (DTS), and the CCH Department of Facility Maintenance (DFM) to discuss the status of the roadways in Kalaeloa. On July 25, 2016, a second MOU was executed between HCDA, DOT-HWY, and CCH to initiate a demonstration project to improve Franklin D. Roosevelt (FDR) Avenue. The MOU stipulated that DOT-HWY would transfer their ownership of FDR Avenue from West Perimeter Road to Enterprise Avenue (referred to in the MOU as "FDR-West") and a portion of West Perimeter Road (referred to in the MOU as "WPR-Mauka) to HCDA.

4. *The proposed action is in DOT jurisdiction; therefore, the DOT-HWY should be consulted on other State environmental regulations, such as HRS Chapter 6E and 195D.*

HCDA acknowledges the references provided and will review them for regulatory applicability to this project. This will include consultations as required to address HRS, Chapter 6E, <u>Historic Preservation</u> and HRS, Chapter 195D, <u>Conservation of Aquatic Life, Wildlife and Land Plants</u>.

5. *The DOT-HWY also has not been consulted on other matters besides the DEA, such as jurisdiction, planning, design, construction, use and transfer of DOT roads.*

As indicated in response to Item No. 3 above, early consultation has been taking place prior to the signing of the 2001 MOU. Additionally, more recent discussions and communications were initiated which ultimately resulted in the signing of the 2016 MOU. HCDA intends to continue consultation with DOT-HWY throughout the EA process, during the subsequent preparation of the design and construction documents of the proposed project, and during the implementation of the MOU.

6. *HCDA is notified that work in the Oahu Railway and Land Company right-of-way triggers federal environmental regulations.*

Preliminary plans are to limit project improvements outside the limits of the former OR&L ROW. Hunt and HCDA will continue consultation with DOT-HWY and the affected parties as the design and construction plans for the proposed project proceed.

7. *Related to the HCDA Infrastructure Masterplan Updates dated October 2010 draft:*
   a. *The proposed action is not consistent with the masterplan, describe the differences and explain the reason and justification for the differences.*
   b. *Provide phasing of masterplan and proposed action.*

As HCDA's masterplan update proceeds, any inconsistencies between the proposed project shall be mitigated in the updated master plan. The reissued Draft EA Section 7.1.8, HCDA Kalaeloa Master Plan – Draft Infrastructure Master Plan Updates (2010) includes a discussion on the proposed project's consistency with the HCDA Infrastructure Master Plan. As noted in the Draft EA, the HCDA is currently updating the Infrastructure Master Plan which is anticipated to include the master plan phasing.

8. *Related to the informally submitted Traffic Impact Analysis Report (TIAR) dated 12/12/17:*
   a. *The proposed action identified in said TIAR is not consistent with the October 2010 masterplan, describe the differences and explain the reason and justification for it.*
   b. *The proposed action phasing is not provided.*
   c. *The 2020 buildout year is not reasonable, explain how the buildout can be implemented in less than two years.*

The reissued Draft EA, Section 7.1.8, HCDA Kalaeloa Master Plan – Draft Infrastructure Master Plan Updates (2010), has been updated to discuss the differences between the 2010 masterplan and 2017 TIAR. Additionally, as the project's design and construction plans are developed and finalized, the DOT-HWY will continue to be consulted to discuss any changes to the targeted buildout year.

We appreciate your review of the subject document and this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DOT 013020.doc

cc: Ms. Tesha Mālama, HCDA

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)1900.4

JAN 24 2019

**MEMORANDUM**

TO: Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority

FROM: Curt T. Otaguro
Comptroller

SUBJECT: Draft Environmental Assessment (DEA) for
Hunt Kalaeloa Subdivision Roads Project
Kalaeloa, Ewa, Island of Oahu, Hawaii

Thank you for the opportunity to provide comments for the subject project. We have no comments to offer at this time, as the subject project does not appear to directly impact any Department of Accounting and General Services' managed facilities. 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, your staff may call Mr. Dennis Chen of the Public Works Division at 586-0491, or at dennis.yk.chen@hawaii.gov.

c: Mr. Brian Takeda, R. M. Towill Corporation

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Curt T. Otaguro
Comptroller
State of Hawaiʻi
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaiʻi 96810-0119

Dear Mr. Otaguro:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated January 24, 2019 (File No. (P)1900.4) concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

HCDA acknowledges that the Department of Accounting and General Services has no comments on the proposed action at this time.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

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cc: Ms. Tesha H. Mālama, HCDA

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

January 29, 2019

Hawaii Community Development Agency
Attention: Ms. Tesha H. Malama
Kalaeloa Director of Planning
547 Queen Street
Honolulu, Hawaii 96813

via email: tesha.malama@hawaii.gov

Dear Ms. Malama:

SUBJECT: Draft Environmental Assessment (DEA) for **Hunt Kalaeloa Subdivision Roads** located in Kalaeloa, Ewa, Island of Oahu; TMK: (1) Various

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division and (b) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to call Barbara Lee at (808) 587-0453. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: R. M. Towill Corporation (w/copies)
Attn: Mr. Brian Takeda (via email: briant@rmtowill.com)
Planning Project Manager
Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2019 JAN 16 AM 10: 42
DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

2018 DEC 24 PM01:28 ENGINEERING

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

December 24, 2018

# MEMORANDUM

~~TO:~~ FROM

**DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

~~FROM:~~ To
Russell Y. Tsuji, Land Administrator

SUBJECT: Draft Environmental Assessment (DEA) for **Hunt Kalaeloa Subdivision Roads**
LOCATION: Kalaeloa, Ewa, Island of Oahu; TMK Nos. (1) various
APPLICANT: Hunt Communities Hawaii LLC

Transmitted for your review and comment is information on the above-referenced project. Please submit any comments by **January 18, 2019.**

*The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on the Current Environmental Notice in the middle of the page.)*

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]

Print Name: Carty S. Chang, Chief Engineer
Date: 1/15/19

Attachments
cc: Central Files

**DEPARTMENT OF LAND AND NATURAL RESOURCES**
**ENGINEERING DIVISION**

**LD/Russell Y. Tsuji**
**Ref: Draft Environmental Assessment (DEA) for Hunt Kalaeloa Subdivision Roads, Kalaeloa, Ewa, Island of Oahu; TMK Nos. (1) various**

## 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) 241-4846.

Signed: ______________________
CARTY S. CHANG, CHIEF ENGINEER

Date: 1/15/19

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

RECEIVED
LAND DIVISION
2018 DEC 27 AM 6:23
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

December 24, 2018

**MEMORANDUM**

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
_X_Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
_X_Commission on Water Resource Management
__Office of Conservation & Coastal Lands
_X_Land Division – Oahu District
_X_Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment (DEA) for **Hunt Kalaeloa Subdivision Roads**
LOCATION: Kalaeloa, Ewa, Island of Oahu; TMK Nos. (1) various
APPLICANT: Hunt Communities Hawaii LLC

Transmitted for your review and comment is information on the above-referenced project. Please submit any comments by **January 18, 2019.**

*The DEA can be found on-line at: http://health.hawaii.gov/oeqc/ (Click on the Current Environmental Notice in the middle of the page.)*

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( x ) We have no comments.
( ) Comments are attached.

Signed: Darlene Bryant Takamatsu
Print Name: Darlene Bryant-Takamatsu
Date: 12/24/18

Attachments
cc: Central Files

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Mr. Russell Y. Tsuji
Land Administrator
State of Hawaiʻi
Department of Land and Natural Resources
Land Division – Oʻahu District
P.O. Box 621
Honolulu, Hawaiʻi 96809

Attention: Carty S. Chang, Chief Engineer, Engineering Division Darlene J. Bryant-Takamatsu, Land Agent, Land Division- Oʻahu District

Dear Mr. Tsuji:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated January 29, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

The following has been prepared in response to comments received from the following DLNR Divisions: (a) Engineering Division and (b) Land Division – Oʻahu District (DLNR comments have been *italicized* for reference):

(a) Engineering Division

*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 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 (FRAT) (http://gis.hawaiinfip.org/FHAT).*

HCDA acknowledges the above comment. Section 5.4.1, Surface Water of the reissued Draft EA identifies the project site is within flood hazard Zone D, defined as areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted in Zone D as reflected in FEMA-FIRM Map No. 15003C0310G (HI-NFIP, 2011). There are no streams or surface water features in or near the subject lots that could cause potential flood hazards. Potential impacts of the project are related to construction and will be mitigated through the use of erosion control measures and Best Management Practices. Once constructed, the project is not expected to exacerbate flooding conditions.

(b) Land Division – Oʻahu District

HCDA acknowledges that the State Department of Land and Natural Resources, Land Division – Oʻahu District has no comments to offer at this time.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response DLNR Land Div_013020.doc

cc: Ms. Tesha H. Mālama, HCDA

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
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KIRK CALDWELL
MAYOR

KATHY K. SOKUGAWA
ACTING DIRECTOR

TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

2018/ELOG-2487 (FH)

January 30, 2019

Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

SUBJECT: Comments on the Draft Environmental Assessment (DEA) for the Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, District of Ewa, Oahu, Hawaii

Thank you for the opportunity to comment on the above referenced project. The Department of Planning and Permitting (DPP) offers the following comments on the DEA:

1. The Final Environmental Assessment (FEA) should include a more complete description of how the proposed project conforms to the Ewa Development Plan (DP).

2. The FEA should note that the Historic Oahu Rail and Land (OR&L) rail line corridor is identified as a significant historic resource in the Ewa DP, which contains guidelines (Section 3.4.2.3) for its protection and preservation. These include a minimum 50-foot setback on either side of the OR&L right-of-way (ROW); adaptive reuse which calls for the development of a parallel paved pedestrian path/bikeway either within or adjacent to the ROW, as part of the Pearl Harbor Historic Trail; and landscaping along the pedestrian path/bikeway.

   In light of the proposed project's proximity to the OR&L, the FEA should note if and where the proposed improvements affect the 50-foot setback, and include a discussion on how the proposal relates to the above guidelines.

3. The DEA references a December 2017 Traffic Impact Analysis Report (TIAR) in the roadway descriptions. Prior to approval of construction plans, the TIAR should be updated to include the following:

a) A schedule of current ownership and proposed future ownership, including timing as to when roads will be developed to City and County of Honolulu roadway standards.

b) A list of the current ROW and road sections with future road setbacks, if any, as well as the proposed and final build-out ROW and road sections. Also, indicate whether the roadway is planned to remain or be abandoned. All roadways should be coordinated with the Kalaeloa Master Plan (March 2006) to minimize the amount of reconstruction or abandonment of roadways being built with this project.

c) A phasing plan of all roadways and intersection improvements.

d) An analysis of left/right turn lane storage lengths.

5. The project's compliance with the City's Storm Drainage Standards and Rules Relating to Water Quality will be verified during the review of the construction plans.

6. For the FEA, list all of the required City permits and approvals, e.g., grading permits, subdivision approvals, etc.

7. The Department of Facility Maintenance (DFM) was not listed as an agency consulted with during the environmental review process. If the proposed roadways are to be maintained by the City and County, the DFM should be an agency consulted during the FEA for their review and comment.

Should you have any questions, please contact Frank Hall, of our staff, at 768-8862.

Very truly yours,

Kathy K. Sokugawa
Acting Director

KKS:ah

cc: Mr. Brian Takeda
R. M. Towill Corporation

2024 North King Street
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Honolulu Hawaii 96819-3470
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R. M. TOWILL CORPORATION
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Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

February 6, 2020

Ms. Kathy Sokugawa
Acting Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaiʻi 96813

Dear Ms. Sokugawa:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter (2018/ELOG-2487 (FH)) dated January 30, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *The Final Environmental Assessment (FEA) should include a more complete description of how the proposed project conforms to the Ewa Development Plan (DP).*

Section 7.2.2, ʻEwa Development Plan, of the reissued Draft EA, has been expanded to provide a more complete description of how the proposed project conforms to the ʻEwa DP.

2. *The FEA should note that the Historic Oahu Rail and Land (OR&L) rail line corridor is identified as a significant historic resource in the Ewa DP, which contains guidelines (Section 3.4.2.3) for its protection and preservation. These include a minimum 50-foot setback on either side of the OR&L right-of-way (ROW); adaptive reuse which calls for the development of a parallel paved pedestrian path/bikeway either within or adjacent to the ROW, as part of the Pearl Harbor Historic Trail; and landscaping along the pedestrian path/bikeway.*

   *In light of the proposed project's proximity to the OR&L, the FEA should note if and where the proposed improvements affect the 50-foot setback, and include a discussion on how the proposal relates to the above guidelines.*

HCDA acknowledges the references provided and will review them for regulatory applicability to this project. In the vicinity of the project area, the historic OR&L railroad corridor alignment runs parallel to Franklin D. Roosevelt (FDR) Avenue, and is identified as a significant historic resource in the ‘Ewa DP, which includes guidelines for its protection and preservation, including a minimum 50-foot setback on either side of the OR&L ROW. Section 7.2.2, ‘Ewa Development Plan, of the reissued Draft EA, has been expanded to include discussion of the OR&L railroad corridor alignment that runs parallel to Franklin D. Roosevelt (FDR) Avenue.

3. *The DEA references a December 2017 Traffic Impact Analysis Report (TIAR) in the roadway descriptions. Prior to approval of construction plans, the TIAR should be updated to include the following:*

   a) *A schedule of current ownership and proposed future ownership, including timing as to when roads will be developed to City and County of Honolulu roadway standards.*

   b) *A list of the current ROW and road sections with future road setbacks, if any, as well as the proposed and final build-out ROW and road sections. Also, indicate whether the roadway is planned to remain or be abandoned. All roadways should be coordinated with the Kalaeloa Master Plan (March 2006) to minimize the amount of reconstruction or abandonment of roadways being built with this project.*

   c) *A phasing plan of all roadways and intersection improvements.*

   d) *An analysis of left/right turn lane storage lengths.*

Section 5.14.1, Roads and Transportation; Section 5.14.2, Utilities; and Section 7.2.2, ‘Ewa Development Plan, of the reissued Draft EA have been updated to include the current ownership of the affected ROW and expected transfer to the City and County of Honolulu (CCH), proposed improvements for the ROW, roadways, intersections, and utilities, coordination with the Kalaeloa Master Plan, phasing, and discussion of left/right turn lanes.

5. *The project's compliance with the City's Storm Drainage Standards and Rules Relating to Water Quality will be verified during the review of the construction plans.*

Construction plans will be submitted to CCH for review and approval. The reissued Draft EA Section 8, Permits and Approvals That May Be Required lists specific permits and approvals for the proposed project.

6. *For the FEA, list all of the required City permits and approvals, e.g., grading permits, subdivision approvals, etc.*

As stated above, Section 8, Permits and Approvals That May Be Required of the reissued Draft EA contains a list of the permits and approvals anticipated for the proposed project.

7. *The Department of Facility Maintenance (DFM) was not listed as an agency consulted with during the environmental review process. If the proposed roadways are to be maintained by the City and County, the DFM should be an agency consulted during the FEA for their review and comment.*

The reissued Draft EA has been reviewed by DFM and the department's comments and a response letter have been included in the reissued Draft EA. HCDA will continue to consult with DFM throughout the design and construction phases.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DPP 013020.doc

cc: Ms. Tesha Mālama, HCDA

DEPARTMENT OF PARKS & RECREATION

**CITY AND COUNTY OF HONOLULU**

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KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

February 4, 2019

Mr. Brian Takeda
Planning Project Manager
R. M. Towill Corporation
2024 North King Street
Honolulu, Hawaii 96819

Dear Mr. Takeda:

SUBJECT: Draft Environmental Assessment
Hunt Kalaeloa Subdivision Roads Project

Thank you for the opportunity to review and comment on the subject Draft Environmental Assessment.

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the Department, you may remove us as a consulted party to the balance of the EIS process.

Should you have any questions, please contact John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(754641)

2024 North King Street
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February 6, 2020

Ms. Michele K. Nekota
Director
Department of Parks and Recreation
City and County of Honolulu
1000 Uluohia Street, Suite 309
Kapolei, Hawaiʻi  96707

Dear Ms. Nekota:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated February 4, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA.

We acknowledge that the Department of Parks and Recreation has no comments and that you have requested to be removed as a consulted party for the balance of the environmental review process.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DPR 013020.doc

cc:  Ms. Tesha Mālama, HCDA

**DEPARTMENT OF DESIGN AND CONSTRUCTION**
**CITY AND COUNTY OF HONOLULU**
650 SOUTH KING STREET, 11TH FLOOR
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KIRK CALDWELL
MAYOR

ROBERT J. KRONING, P.E.
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

February 7, 2019

Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama,

Subject: Draft Environmental Assessment for Hunt Kalaeloa Subdivision Roads Project Kalaeloa, Ewa, Oahu, Hawaii

Thank you for the opportunity to review and comment. The Department of Design and Construction's Civil Division had the following comments.

The City recently paved the following streets in the Hunt Kalaeloa Development Subdivision in 2018. 1) Kapolei Parkway (Kalaeloa Blvd. to Kamokila Blvd.), 2) Boxer Road, 3)Hornet Street and 4) Saratoga Avenue.

Should you have any further questions regarding this comment, please contact Howard Koza at 768-8836.

Sincerely,

Robert J. Kroning, P.E.
Director

RJK:ms (754499)

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2019 FEB 12 PM 1:49
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DEVELOPMENT
AUTHORITY

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February 6, 2020

Mr. Robert Kroning, P.E.
Director
Department of Design and Construction
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, Hawaiʻi 96813

Dear Mr. Kroning:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter dated February 7, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

Your appreciated receiving information regarding the City and County of Honolulu's work in 2018 involving the paving of Kapolei Parkway (Kalaeloa Blvd. to Kamokila Blvd.), Boxer Road, Hornet Street and Saratoga Avenue in the Hunt Kalaeloa Development Subdivision, and by reference have noted this for the EA record.

Thank you for allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DDC 013020.doc

cc: Ms. Tesha Mālama, HCDA

**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
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KIRK CALDWELL, MAYOR

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JADE T. BUTAY, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

February 19, 2019

Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

Subject: Your Letter Dated December 17, 2018, Requesting Comments on the Draft Environmental Assessment Addressing the Hunt Kalaeloa Subdivision Roads Project in Kalaeloa, Ewa, Island of Oahu, Hawaii

Thank you for the opportunity to comment on the proposed roadway project.

The Honolulu Board of Water Supply does not have any water system located within the project area. All water services shall be provided by the private system.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Brian Takeda, R. M. Towill Corporation

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February 6, 2020

Mr. Ernest Y. W. Lau, P.E.
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawai‘i 96843

Dear Mr. Lau:

Subject: **Response to Comments for Hawai‘i Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ‘Ewa, O‘ahu, Hawai‘i**

On behalf of the State of Hawai‘i, Community Development Authority (HCDA), we thank you for your letter dated February 19, 2019, concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

We acknowledge that the Board of Water Supply does not have any water system within the project area and that all services are to be provided by the private system.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to BWS_013020.doc

cc: Ms. Tesha Mālama, HCDA

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
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KIRK CALDWELL
MAYOR

WES FRYSZTACKI
DIRECTOR

JON Y. NOUCHI
DEPUTY DIRECTOR

TP12/18-755262R

January 31, 2019

Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

SUBJECT: Draft Environmental Assessment (DEA) for the Hunt Kalaeloa Subdivision Roads Project in Kalaeloa, Oahu

Thank you for the opportunity to provide comments on the DEA for the Hunt Kalaeloa Subdivision Roads Project. In response to your letter dated December 17, 2018 we have the following comments:

1. **Traffic Impact.** The following comments are related to transportation impacts:

    a. **Transportation Assessment.** A TA has not been provided with the DEA. Provide a Transportation Assessment (TA) that analyzes the need for street typologies, traffic control devices, streetscape and intersection improvements that encourage walking, bicycling, and transit use as the primary access modes for the proposed project.

        i. Use person trips instead of vehicle trip rates from the ITE Trip Generation Manual and assign these trips to the transportation system. This will require analysis of crossing treatments using NCHRP 562 methodology for pedestrian measures.

        ii. The following performance measures still need to be addressed in this study:

            1. V/C ratio targets that are >1 for 1$^{st}$ and/or 2$^{nd}$ highest peak hours

2. Identify where vehicle Level of Service (LOS) will not be used
3. Pedestrian Level-of-Service (LOS)
4. Bicycle Level of Traffic Stress (LTS)
5. Transit Capacity and Quality of Service (TCQSM)

iii. In addition to the calculated LOS, the observational LOS should be provided.

iv. Please provide observed bicycle and pedestrian counts to Department of Transportation Services (DTS) in the Department's standard format. Contact Byron Nakamura, Traffic Technician of the Special Plans Branch at bnakamura@honolulu.gov to obtain the Traffic Count Summary Reporting instructions and template.

v. Please contact Nicola Szibbo of the Regional Planning Branch at nicola.szibbo@honolulu.gov to obtain the above multimodal transportation assessment tools.

vi. Please contact David Wade of the OahuMPO at david.wade@oahumpo.org for access to the latest Regional Travel Demand Model (Version 6, 2015) for the transportation assessment.

2. **Complete Streets.** The following comments are related to Complete Streets:

a. **Consistency with Complete Streets Policies.** The EA should contain a discussion of compliance with County and State Complete Streets policies, pursuant to Act 54, Session Laws of Hawaii 2009, HRS §264-20.5 and ROH 12-15. The Project should elaborate on how it will comply with Complete Streets policies, including specific adherence to the following key Complete Streets principles: 1) safety; 2) Context Sensitive Solutions; 3) accessibility and mobility for all; 4) use and comfort of all users; 5) consistency of design guidelines and standards; 6) energy efficiency; 7) health; and 8) green infrastructure.

b. **Complete Streets Improvements.** The EA should evaluate whether improvements and facilities are needed to aid vehicular, pedestrian, bicycle and public transportation circulation by implementing Complete Streets principles. To the extent practicable, the design of the project should be consistent with the City's Complete Streets ordinance, assign street typologies, and include features to encourage walking, bicycling and public transit.

c. **Sidewalk Zone.** The applicant shall provide both plans and sections how the streetscape meets the requirements of the Complete Streets Sidewalk Zone as per page 175-176 of the Complete Streets Manual. Delineate in section the 1) curb zone; 2) the furniture zone; 3) the pedestrian zone; and 4) the frontage zone and include the dimensions for each zone.

d. **Bike Lanes.** Bike lanes shall be implemented along Saratoga Avenue and Roosevelt Avenue to conform to the Oahu Bike Plan. Please contact Chris Sayers at csayers@honolulu.gov for information on bike lane design.

3. **Roads and Transportation.** The following comments are related to roads and transportation:

   a. In Section 15-14.1, the jurisdiction of the roadways should be added to the discussion of the description of the existing roadways in the area.

   b. The speed along Kalaeloa Boulevard should be verified.

4. **Construction Impacts.** The following comments are related to short-term construction impacts:

   a. **Traffic Management Plan (TMP).** The EA should include a Traffic Management Plan, which discusses traffic impacts the project may have on any surrounding City roadways, including short-term impacts during construction and long-term impacts after construction with corresponding measures to mitigate these impacts by applying Complete Streets principles.

b. **Best Practice TMPs.** Best practice TMPs provide the City with information by which to monitor construction areas. The City will require cameras where sidewalks are closed to help assess effectiveness of management.

c. **Joint TMP Review.** The TMP shall be jointly reviewed and accepted by the City's Department of Transportation Services and the Department of Planning and Permitting.

d. **Construction Materials and Equipment.** Construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets, and after the morning school rush to minimize impacts to schools in the area.

e. **Safety Measures for Existing Access.** Any existing pedestrian, bicycle and vehicle access/crossing will be maintained with the highest safety measures during construction. Pedestrian detour routes should be established around construction activities situated within the sidewalk area. These detour routes should be located adjacent to or near the property line and near to the bus stop. For example, if a water or sewer line installation takes place within the sidewalk area, then the pedestrian detour route can be located within the project's property. In this way, the pedestrian does not have to travel a far distance or round-about path to get to the bus stop. Pedestrian detour plans shall be submitted to the DTS for review and approval.

f. **Best Management Practice Controls.** Best Management Practice controls should be included at construction site to prevent trailing of dirt and debris on City roadways.

g. **Americans with Disabilities Act (ADA) Requirements.** Any damage to the existing roadway that is caused by the project should be repaired to current City standards as well as meet Americans with Disabilities Act requirements.

h. **Neighborhood Impacts.** The area Neighborhood Board, as well as the area businesses, emergency personnel (fire, ambulance and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details of the proposed project and the impacts that the project may have on the adjoining local street area network.

i. **Street Usage Permits.** A street usage permit from the City's Department of Transportation Services should be obtained for any construction-related work that may require the temporary closure of any traffic lane on a City street.

j. **Public Transit Service Area.** The project is in an existing public transit service area. To ensure that the project development does not affect public transit services (bus operations, bus routes, bus stops and para-transit operations); submit project plans to DTS – Public Transit Division (PTD) for review and approval. Contact DTS-PTD at 768-8396, 768-8370, 769-8374 or TheBusStop@honolulu.gov.

5. **Disability and Communication Access Board.** Project plans (interior and exterior layouts, vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, reduced-width traffic lanes, etc.) should be reviewed and approved by the Disability and Communication Access Board to ensure full compliance with the ADA.

6. **Sea Level Rise and Resilience**. Infrastructure improvements located within areas potentially exposed to chronic flooding with sea level rise shall be subject to an in-depth analysis of the potential impacts of sea level rise on elevation, tolerance for risk, and the lifetime of the proposed structure or infrastructure. Any significant improvements within existing footprints should be dependent on established, resilient design guidelines, or otherwise be subject to relocation to a more suitable area.

   The potential for chronic flooding with 3.2 feet of sea level rise (SLR-XA) shall be used as the vulnerability zone for planning purposes. Maps of the project area shall be provided for both the SLR-XA and flooded highways. The applicant shall recommend strategies and designs that increase the flood resiliency for new development or improvements within the SLR-XA that cannot be relocated, or seek opportunities to plan new development or projects well landward of the SLR-XA. See the following to determine vulnerability: http://www.pacioos.hawaii.edu/shoreline/slr-hawaii.

We reserve the right to further comment pending review of the EA.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Nicola Szibbo of my staff at 768-8359.

Very truly yours,

Wes Frysztacki
Director

cc: Brian Takeda, R.M. Towill Corporation

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Planning
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February 6, 2020

Mr. Wes Fryszlacki, Director
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawaiʻi  96813

Dear Mr. Fryszlacki:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the State of Hawaiʻi, Community Development Authority (HCDA), we thank you for your letter (TP12/18-755262R) dated January 31, 2019 concerning the subject project. The HCDA is reissuing the subject Draft EA and will incorporate by reference your comments and this letter into the preparation of a new reissued Draft EA. As with any Draft EA, you will be provided the opportunity to comment to this reissued document.

The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *Traffic Impact. The following comments are related to transportation impacts:*
   a. *Transportation Assessment. A TA has not been provided with the DEA. Provide a Transportation Assessment (TA) that analyzes the need for street typologies, traffic control devices, streetscape and intersection improvements that encourage walking, bicycling, and transit use as the primary access modes for the proposed project.*
      i. *Use person trips instead of vehicle trip rates from the ITE Trip Generation Manual and assign these trips to the transportation system. This will require analysis of crossing treatments using NCHRP 562 methodology for pedestrian measures.*
      ii. *The following performance measures still need to be addressed in this study:*
         1. *V/C ratio targets that are >1 for 1st and/or 2nd highest peak hours*
         2. *Identify where vehicle Level of Service (LOS) will not be used*
         3. *Pedestrian Level-of-Service (LOS)*
         4. *Bicycle Level of Traffic Stress (LTS)*
         5. *Transit Capacity and Quality of Service (TCQSM)*
      iii. *In addition to the calculated LOS, the observational LOS should be provided.*

iv. *Please provide observed bicycle and pedestrian counts to Department of Transportation Services (DTS) in the Department's standard format. Contact Byron Nakamura, Traffic Technician of the Special Plans Branch at bnakamura@honolulu.gov to obtain the Traffic Count Summary Reporting instructions and template.*
v. *Please contact Nicola Szibbo of the Regional Planning Branch at nicola.szibbo@honolulu.gov to obtain the above multimodal transportation assessment tools.*
vi. *Please contact David Wade of the OahuMPO at david.wade@oahumpo.org for access to the latest Regional Travel Demand*

HCDA acknowledges the references provided and will review them for regulatory applicability to this project. Section 5.14.1, Roads and Transportation, of the reissued Draft EA summarizes the Hunt Kalaeloa roadway, public transit, bicycle, and pedestrian system as described in a Traffic Impact Analysis Report (TIAR) conducted by Fehr and Peers in December 2017. The full TIAR is provided in its entirety in Appendix E of the reissued Draft EA.

2. *Complete Streets. The following comments are related to Complete Streets:*
   a. *Consistency with Complete Streets Policies. The EA should contain a discussion of compliance with County and State Complete Streets policies, pursuant to Act 54, Session Laws of Hawaii 2009, HRS §264-20.5 and ROH 12-15. The Project should elaborate on how it will comply with Complete Streets policies, including specific adherence to the following key Complete Streets principles: 1) safety;2) Context Sensitive Solutions; 3) accessibility and mobility for all;4) use and comfort of all users; 5) consistency of design guidelines and standards; 6) energy efficiency; 7) health; and 8) green infrastructure.*
   b. *Complete Streets Improvements. The EA should evaluate whether improvements and facilities are needed to aid vehicular, pedestrian, bicycle and public transportation circulation by implementing Complete Streets principles. To the extent practicable, the design of the project should be consistent with the City's Complete Streets ordinance, assign street typologies, and include features to encourage walking, bicycling and public transit.*
   c. *Sidewalk Zone. The applicant shall provide both plans and sections how the streetscape meets the requirements of the Complete Streets Sidewalk Zone as per page 175-176 of the Complete Streets Manual. Delineate in section the 1) curb zone; 2) the furniture zone; 3) the pedestrian zone; and 4) the frontage zone and include the dimensions for each zone.*
   d. *Bike Lanes. Bike lanes shall be implemented along Saratoga Avenue and Roosevelt Avenue to conform to the Oahu Bike Plan. Please contact Chris Sayers at csayers@honolulu.gov for information on bike lane design.*

The reissued Draft EA will include a discussion of the proposed project's consistency with Act 54, Session Laws of Hawaiʻi 2009, HRS §264-20.5 and ROH 12-15 in Section 7.1.6, Act 54, Session Laws of Hawai‘i (SLH), Complete Streets. A few of the key points in reference to the above comment includes:

- Improvements are needed to aid vehicular, pedestrian, bicycle and public transportation circulation as the existing roadways on the project site are dilapidated and have not been subject to major repairs since closure of the Barbers Point Naval Air Station in 1999.
- The proposed improvements incorporate the Complete Streets design principles as promulgated in Honolulu City Council Ordinance No. 12-15 (2012) which includes the consideration for the use of the sidewalk zone per the Honolulu Complete Streets Design Manual (2012 and finalized in 2016).
- The incorporation of bike lanes, planter strips, and sidewalks to create a pedestrian-friendly environment. This would include the incorporation of bike lanes on Saratoga Avenue and Roosevelt Avenue consistent with the TIAR (2017).
- The proposed improvements to the roadway system will be designed to City and County of Honolulu standards.

We further expect our participation in an on-going process of review to accomplish the objectives of Complete Streets as the roadway designs are reviewed and finalized by governmental agencies such as DTS. This will occur, however, following the completion of the HRS, Chapter 343 Environmental Assessment review process.

3. *Roads and Transportation. The following comments are related to roads and transportation:*
   a. *In Section 15-14.1, the jurisdiction of the roadways should be added to the discussion of the description of the existing roadways in the area.*
   b. *The speed along Kalaeloa Boulevard should be verified.*

The Draft EA does not have a Section 15-14.1. We therefore understand this to be a reference to Section 5.14.1. Accordingly, a discussion on the jurisdiction of the roadways under study will be provided in the Final EA under preparation for this project. This will include a verification of the posted speed limit along Kalaeloa Boulevard.

4. *Construction Impacts. The following comments are related to short-term construction impacts:*
   a. *Traffic Management Plan (TMP). The EA should include a Traffic Management Plan, which discusses traffic impacts the project may have on any surrounding City roadways, including short-term impacts during construction and long-term impacts after construction with corresponding measures to mitigate these impacts by applying Complete Streets principles.*
   b. *Best Practice TMPs. Best practice TMPs provide the City with information by which to monitor construction areas. The City will require cameras where sidewalks are closed to help assess effectiveness of management.*

c. *Joint TMP Review. The TMP shall be jointly reviewed and accepted by the City's Department of Transportation Services and the Department of Planning and Permitting.*
d. *Construction Materials and Equipment. Construction materials and equipment should be transferred to and from the project site during off peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets, and after the morning school rush to minimize impacts to schools in the area.*
e. *Safety Measures for Existing Access. Any existing pedestrian, bicycle and vehicle access/crossing will be maintained with the highest safety measures during construction. Pedestrian detour routes should be established around construction activities situated within the sidewalk area. These detour routes should be located adjacent to or near the property line and near to the bus stop. For example, if a water or sewer line installation takes place within the sidewalk area, then the pedestrian detour route can be located within the project's property. In this way, the pedestrian does not have to travel a far distance or round-about path to get to the bus stop. Pedestrian detour plans shall be submitted to the DTS for review and approval.*
f. *Best Management Practice Controls. Best Management Practice controls should be included at construction site to prevent trailing of dirt and debris on City roadways.*
g. *Americans with Disabilities Act (ADA) Requirements. Any damage to the existing roadway that is caused by the project should be repaired to current City standards as well as meet Americans with Disabilities Act requirements.*
h. *Neighborhood Impacts. The area Neighborhood Board, as well as the area businesses, emergency personnel (fire, ambulance and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details of the proposed project and the impacts that the project may have on the adjoining local street area network.*
i. *Street Usage Permits. A street usage permit from the City's Department of Transportation Services should be obtained for any construction-related work that may require the temporary closure of any traffic lane on a City street.*
j. *Public Transit Service Area. The project is in an existing public transit service area. To ensure that the project development does not affect public transit services (bus operations, bus routes, bus stops and para-transit operations); submit project plans to DTS - Public Transit Division {PTO) for review and approval. Contact DTS-PTD at 768-8396, 768-8370, 769-8374 or TheBusStop@honolulu.gov.*

We offer the following response to the above list of traffic impacts:

- A TMP will be prepared by the project's construction contractor as part of the construction plan review process as required. The TMP will be review and approved by the appropriate State and CCH agencies and entitles. This may include the joint review of the TMP by the DTS and Department of Planning and Permitting (DPP), as required.
- Best Practice TMPs will be prepared the project's construction contractor as part of the construction plan review process as required. Specified measures such as the use of

cameras will be provided based on the appropriate State and CCH agency review comments.

- The recommended handling and transportation of construction materials and equipment shall be in accordance with Federal, State and City regulatory requirements.
- Safety measures to maintain existing access including pedestrian detour plans shall be reviewed as required by the appropriate State and City agencies.
- Best Management Practices (BMPs) relating to NPDES construction storm water permits as regulated and managed by the State Department of Health, Clean Water Branch and CCH shall be provided as required by law.
- The repair of damage to existing State and CCH roadways caused by the project shall be to current standards including Americans with Disabilities Act requirements.
- The project's construction contractor and owner, in accordance with law, shall provide for notice to the area neighborhood, including appropriate public and private groups, organizations, and individuals.
- Street usage and other required construction permits shall be obtained for the proposed project.
- Other public notifications, coordination, and/or submittal of documents including permits to government agencies shall be undertaken as required by law. This shall include ensuring that the project development does not affect public transit services such as bus operations, bus routes, bus stops and para-transit operations, as managed or coordinated by the DTS, Public Transit Division.

5. *Disability and Communication Access Board. Project plans (interior and exterior layouts, vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, reduced-width traffic lanes, etc.) should be reviewed and approved by the Disability and Communication Access Board to ensure full compliance with the ADA.*

The comment is acknowledged. The project construction plans will be prepared and submitted to State, CCH agencies, utility companies, and the Disability and Communication Access Board, for review and approval.

6. *Sea Level Rise and Resilience. Infrastructure improvements located within areas potentially exposed to chronic flooding with sea level rise shall be subject to an in-depth analysis of the potential impacts of sea level rise on elevation, tolerance for risk, and the lifetime of the proposed structure or infrastructure. Any significant improvements within existing footprints should be dependent on established, resilient design guidelines, or otherwise be subject to relocation to a more suitable area.*

   *The potential for chronic flooding with 3.2 feet of sea level rise (SLR-XA) shall be used as the vulnerability zone for planning purposes. Maps of the project area shall be provided for both the SLR-XA and flooded highways. The applicant shall recommend*

> *strategies and designs that increase the flood resiliency for new development or improvements within the SLR-XA that cannot be relocated, or seek opportunities to plan new development or projects well landward of the SLR-XA. See the following to determine vulnerability: http://www.pacioos.hawaii.edu/shoreline/slr-hawaii.*

This comment is acknowledged. The reissued Draft EA, Section 5.3, Climate, and Section 5.7, Natural Hazards, presents the findings of the Hawaii Sea Level Rise Vulnerability and Adaptation Report 2017. The project site elevation is 52 feet above sea level and direct inundation due to sea-level rise is not expected in the context of 21st-century sea-level rise projections. Furthermore, according to the Hawaiʻi Sea Level Rise (SLR) Viewer (accessed 2019), the project site is not within the 3.2-feet SLR Exposure Area.

We appreciate your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the reissued Draft EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

\\rmtc-fs\1project\plan\23105-00 HUNT Kalaeloa Roads\Narrative\FEA\DEA Comment Letters\DEA Response letters-CS\Response to DTS 013020.doc

cc: Ms. Tesha Mālama, HCDA

*COMMENTS RECEIVED FEBRUARY-MARCH 2020*
*AND RESPONSES*

POLICE DEPARTMENT
**CITY AND COUNTY OF HONOLULU**
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

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2020 MAR -3 PM 2:26
HAWAII COMMUNITY DEVELOPMENT AUTHORITY

KIRK CALDWELL
MAYOR

SUSAN BALLARD
CHIEF

JOHN D. McCARTHY
CLYDE K. HO
DEPUTY CHIEFS

OUR REFERENCE EO-TS

February 24, 2020

Ms. Tesha Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
Department of Business, Economic
Development & Tourism
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Malama:

This is in response to your letter of February 6, 2020, requesting comments on the Draft Environmental Assessment for the proposed project to construct roadways, intersections, and utility systems within the former Barbers Point Naval Air Station property located in Ewa.

The Honolulu Police Department (HPD) would like to recommend that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor during the construction phase of the project, as well as adequate notification to any affected areas. The HPD also recommends that the contractor take precautionary measures to secure their heavy equipment and machinery, as the district has experienced thefts from unsecured construction sites.

If there are any questions, please call Acting Major Stason Tanaka of District 8 (Kapolei) at 723-8400.

Thank you for the opportunity to review this project.

Sincerely,

ALLAN T. NAGATA
Assistant Chief
Support Services Bureau

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

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Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Allan T. Nagata, Assistant Chief
Police Department
Support Services Bureau
City and County of Honolulu
801 South Beretania Street
Honolulu, Hawai‘i 96813

Dear Assistant Chief Nagata:

Subject: **Response to Comments for Hawai‘i Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ‘Ewa, O‘ahu, Hawai‘i**

On behalf of the Hawai‘i Community Development Authority (HCDA), we acknowledge receipt of your letter dated February 24, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *The Honolulu Police Department (HPD) would like to recommend that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor during the construction phase of the project, as well as adequate notification to any affected areas.*

This comment is acknowledged. As required, the project contractor will provide appropriate safety equipment and notification to area residents as necessary to maintain public safety during construction.

2. *The HPD also recommends that the contractor take precautionary measures to secure their heavy equipment and machinery, as the district has experienced thefts from unsecured construction sites.*

Thank you for this advisement concerning the need to ensure against heavy equipment and machinery theft. The project construction contractor will be advised to take appropriate measures to guard against theft as well as vandalism.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the project’s Final EA.

Should you have any questions or further comments, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

(P) 20.005

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

FEB 27 2020

Ms. Tesha Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96843

Dear Ms. Malama:

Subject: Public Review of the Revised Draft Environmental Assessment (DEA) for the Hunt Kalaeloa Subdivision Roads Project
Ewa, Island of Oahu, Hawaii
Tax Map Key (TMK) Parcels: (1) 9-1-013:002, 003, 004, 010, 026, 093, 107, 128, 129;
(1) 9-1-015:013, 028, 029, 032;
(1) 9-1-016: 027, 035;
(1) 9-1-118:013, 014;
(1) 9-1-148:011, 031;
(1) 9-1-160:006, 009, 012, 013, 015, 018, 036

As with the original issuance of the DEA, we have no comments to offer at this time, as the subject project does not appear to directly impact any Department of Accounting and General Services-managed facilities. We request to be informed of any progress and review of future developments.

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

Sincerely,

CURT T. OTAGURO
Comptroller

DYKC:jl
c: Mr. Brian Takeda, Planning Project Manager, R. M. Towill Corporation

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

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Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Curt T. Otaguro, Comptroller
Department of Accounting and General Services
State of Hawaiʻi
P. O. Box 119
Honolulu, Hawaiʻi 96810-0119

Dear Mr. Otaguro:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your letter dated February 27, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

> *As the subject project does not appear to directly impact any Department of Accounting and General Services-managed facilities. We request to be informed of any progress and review of future developments.*

HCDA acknowledges that the State Department of Accounting and General Services (DAGS) has no comments to offer at this time. The HCDA and/or Hunt will provide additional information on any further development as it may affect DAGS.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the project's Final EA. Should you have any questions or further comments, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

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

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

March 2, 2020

Mr. Brian Takeda
Planning Project Manager
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda,

Subject: Revised Draft Environmental Assessment
Hunt Kalaeloa Subdivision Roads Project
Ewa, Oahu, Hawaii
Tax Map Keys: 9-1-013: 002, 003, 004, 010, 026, 093, 107, 128, and 129
9-1-015: 013, 028, 029, and 032
9-1-016: 027 and 035
9-1-118: 013 and 014
9-1-148: 011 and 031
9-1-160: 006, 009, 012, 013, 015, 018, and 036

In response to your letter dated February 6, 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 (45 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)

   A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2012 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45,720 millimeters) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; 2012 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

JASON SAMALA
Assistant Chief

JS/TC:bh

2024 North King Street
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eMail rmtowill@hawaii.rr.com

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August 22, 2020

Jason Samala
Assistant Chief
Fire Department
City and County of Honolulu
636 South Street
Honolulu, HI  96813-5007

Dear Assistant Chief Samala:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 2, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

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 (45 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)*

   *A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2012 Edition, Section 18.2.3.2.1.)*

Hunt acknowledges that the fire safety requirements cited above will be available for use by the Honolulu Fire Department per *Sections 18.2.3.2.2, 18.2.3.2.2.1, and 18.2.3.2.1* per the *NFPA 1; 2012 Edition*.

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.)*

All project associated facilities and buildings are intended to be provided with, or will be in the vicinity to be provided with, the required supply of water to meet fire protection requirements per *NFPA 1; 2012 Edition, Section 18.3.1, as amended.*

3. *The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1and18.2.3.4.1.2, as amended.)*

Hunt will ensure that during and after the completion of the project that a fire apparatus access road shall be constructed to county standards as required by the *NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended*.

4. *Submit civil drawings to the HFD for review and approval.*

The HFD will receive copies of the civil drawings for this project before the start of construction for review and approval.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

**E-mail Record**

Cab.General@doh.hawaii.gov
Received: Tuesday, March 3, 2020

Barry Ching, Clean Air Branch
Hawaiʻi Department of Health
2827 Waimano Home Road #130
Pearl City, Hawaii 96782

**Standard Comments for Land Use Reviews**
**Clean Air Branch**
**Hawaii State Department of Health**

If your proposed project:

Requires an Air Pollution Control Permit

You must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.

s

Includes construction or demolition activities that involve asbestos

You must contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch.

Has the potential to generate fugitive dust

You must control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near to existing residences, business, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does *not* require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems.

Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential nuisance complaints.

You should provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

a) Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Providing an adequate water source at the site prior to start-up of construction activities;
c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimizing airborne, visible fugitive dust from shoulders and access roads;
e) Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Controlling airborne, visible fugitive dust from debris being hauled away from the project site.

If you have questions about fugitive dust, please contact the Enforcement Section of the Clean Air Branch

| | |
|---|---|
| Clean Air Branch<br>(808) 586-4200<br>cab@doh.hawaii.gov | Indoor Radiological Health Branch<br>(808) 586-4700 |

April 1, 2019

2024 North King Street
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R. M. TOWILL CORPORATION
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Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Barry Ching
Clean Air Branch
Department of Health
State of Hawaiʻi
E-mail: Cab.General@doh.hawaii.gov

Dear Mr. Ching:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 3, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *If your proposed project:*
    a. *Requires an Air Pollution Control Permit you must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.*

The proposed project does not involve the construction or operation of a covered or noncovered source of air pollution. An Air Pollution Control Permit from the DOH Clean Air Branch will therefore not be required.

2. *If your proposed project:*
    a. *Includes construction or demolition activities that involve asbestos you must contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch.*

    b. *Has the potential to generate fugitive dust,*
        - *You must control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near to existing residences, business, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does not require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems.*
        - *Construction activities must comply with the provisions of Hawaii Administrative Rules, §11- 60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be*

*established, wherever possible, in order to alleviate potential nuisance complaints.*

- *You should provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:*
- *Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;*
- *Providing an adequate water source at the site prior to start-up of construction activities;*
- *Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;*
- *Minimizing airborne, visible fugitive dust from shoulders and access roads;*
- *Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and*
- *controlling airborne, visible fugitive dust from debris being hauled away from the project site.*

All construction activities will be governed and conducted per the applicable regulations in Hawaiʻi Administrative Rules (HAR), Chapters 11-59, Ambient Air Quality Standards, 11-60, Air Pollution Control, and 11-60.1-33, Fugitive Dust. Please refer to Section 5.11.2 of the reissued DEA.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

**Brian Takeda**

**From:** Kraska, Johnathon L <johnathon_kraska@fws.gov>
**Sent:** Friday, March 06, 2020 7:47 AM
**To:** Tesha.malama@hawaii.gov
**Cc:** Brian Takeda
**Subject:** Comments on DEA for Hunt Kalaeloa Subdivision Roads Project

Ms. Malama,

After reviewing the Draft EA for the subject project, the Service recommends you follow your proposed conservation measures. Since there is no federal nexus to require you to consult with the Service for Section 7 Endangered Species Act compliance, no action pursuant to the ESA is Necessary. We appreciate your early coordination and commitment to minimizing or avoiding impacts to listed species in your project area. If you have any further questions please do not hesitate to contact us.

Thank you,

Johnathon Kraska
Endangered Species Biologist
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850
Office: (808) 792-9427, Mobile: (808) 853-8073
johnathon_kraska@fws.gov

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Johnathon Kraska
Endangered Species Biologist
U. S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaiʻi 96805
E-mail: Johnathon_kraska@fws.gov

Dear Mr. Kraska:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your e-mailed comments dated March 6, 2020. The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *The Service recommends you follow your proposed conservation measures.*

This comment is acknowledged. Hunt shall follow the proposed conservation measures as referenced in the DEA, *Section 5.8 Flora and Fauna*, throughout the progress of the project.

2. *Since there is no federal nexus to require you to consult with the Service for Section 7 Endangered Species Act compliance, no action pursuant to the ESA is Necessary.*

Thank you for this advisement and confirmation that no action under the Section 7, Endangerd Species Act, is required.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the project's Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

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

March 06, 2020

LD 198

Ms. Tesha Mālama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, HI 96813

*via email: tesha.malama@hawaii.gov*

Dear Ms. Mālama:

SUBJECT: Revised Draft Environmental Assessment for the Hunt Kalaeloa Subdivision Roads Project

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 the enclosed request for comments, received from R.M. Towill Corporation, to DLNR's various Divisions for their review and comments.

Enclosed are responses from our (a) Engineering Division and (b) Land Division–Oahu District. Should you have any questions about the attached responses, please feel free to contact Barbara Lee at (808) 587-0453 or barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

LD 299

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2020 MAR -2 AM 10:51
DEPT. OF LAND & NATURAL RESOURCES
STATE 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

February 14, 2020

LD 198

'20 FEB 18 AM 10:39 ENGINEERING

**MEMORANDUM**

~~TO:~~ FROM | **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
_X_Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Oahu District
_X_Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

~~FROM:~~ TO | Russell Y. Tsuji, Land Administrator
SUBJECT: **Revised Draft Environmental Assessment (DEA) for the Hunt Kalaeloa Subdivision Roads Project**
LOCATION: Ewa, Island of Oahu; TMK: (1) 9-1-013:002, 003, 004, 010, 026 093, 107 128, 129; and others.
APPLICANT: **R.M. Towill Corporation** on behalf of **Hunt Communities Hawaii LLC**

Transmitted for your review and comment is information on the above-referenced subject. Please submit any comments to Land Division by **March 4, 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 at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
(✓) We have no additional comments.
( ) Comments are attached.

Signed: ____________________

Attachments
Cc: Central Files

Print Name: Carty S. Chang, Chief Engineer
Date: ____________________

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

February 14, 2020

LD 198

# MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
_X_ Engineering Division
_X_ Div. of Forestry & Wildlife
__Div. of State Parks
_X_ Commission on Water Resource Management
__Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District
_X_ Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Revised Draft Environmental Assessment (DEA) for the Hunt Kalaeloa Subdivision Roads Project**
LOCATION: Ewa, Island of Oahu; TMK: (1) 9-1-013:002, 003, 004, 010, 026 093, 107 128, 129; and others.
APPLICANT: **R.M. Towill Corporation** on behalf of **Hunt Communities Hawaii LLC**

Transmitted for your review and comment is information on the above-referenced subject. Please submit any comments to Land Division by **March 4, 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 at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
(✓) We have no comments. at this time
( ) Comments are attached.

Signed: [signature]
Print Name: Paul E. Miyashiro
Date: 2/21/2020

Attachments
Cc: Central Files

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Russell Y. Tsuji, Administrator
Land Division
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaiʻi 96809

Dear Mr. Tsuji:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), thank you for your letter dated March 6, 2020, concerning the subject project. We have prepared the following in response to comments from the Engineering Division and Land Division, Oʻahu District (the comments are *italicized* for reference):

1. *Engineering Division - We have no additional comments.*
2. *Land Division, Oʻahu District – We have no comments at this time.*

We acknowledge that the Engineering and Land Division, Oʻahu District, has no comments concerning the subject revised Draft EA. The comments and this letter will be incorporated into the preparation of the project's Final EA for this project.

We appreciated your review of the subject document and allowing us this opportunity to respond. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at briant@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

DAVID Y. IGE
GOVERNOR

DR. CHRISTINA M. KISHIMOTO
SUPERINTENDENT

**STATE OF HAWAIʻI**

DEPARTMENT OF EDUCATION

P.O. BOX 2360

HONOLULU, HAWAIʻI 96804

OFFICE OF FACILITIES AND OPERATIONS

March 6, 2020

TO: Ms. Tesha H. Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority

FROM: Kenneth G. Masden II
Public Works Manager, Planning Section
Facilities Development Branch

SUBJECT: **Revised Draft Environmental Assessment for Hunt Kalaeloa Subdivision Roads Project Kalaeloa, Ewa, Oahu, Hawaii**

The Hawaii State Department of Education (HIDOE) has the following comments for the Revised Draft Environmental Assessment (DEA) for the proposed Hunt Kalaeloa Subdivision Roads (Project). According to the DEA, the Project consists of the subdivision of three parcels and the construction of roadway and infrastructure improvements on approximately 42 acres of land located at Kalaeloa, Ewa, Island of Oahu, Hawaii at various TMKs.

The DEA addresses a majority of HIDOE's comments provided in our January 15, 2019 Memorandum on the Project.

The HIDOE does have concerns regarding the conclusions in Table 10-1, Hunt Kalaeloa Subdivision Roads Project Impact Summary for Schools and Libraries. There will be direct short-term and long-term Impacts to Barbers Point Elementary School with the loss of one driveway access and loss of school property along Franklin D. Roosevelt and Copahee Avenues. Discussions between HIDOE and Hunt Communities Hawaii LLC are ongoing to identify appropriate mitigation measures to address impacts.

Thank you for the opportunity to comment. Should you have questions, please contact Robyn Loudermilk, Acting Land Planner of the Facilities Development Branch, Planning Section at 784-5093 or via email at robyn.loudermilk@k12.hi.us.

KGM:rll

c: Sean Tajima, Complex Area Superintendent, Campbell-Kapolei Complex
Sandy Calio, Principal, Barber's Point Elementary School
✓Brian Takeda, R.M. Towill Corporation.
Office of Environmental Quality Control

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Kenneth G. Masden II
Public Works Manager, Planning Section
Facilities Development Branch
Department of Education
State of Hawaiʻi
P. O. Box 2360
Honolulu, Hawaiʻi 96804

Dear Mr. Masden:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your memorandum dated March 6, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *The DEA addresses a majority of HIDOE's comments provided in our January 15, 2019 Memorandum on the Project.*

HCDA acknowledges HIDOE's statement that the majority of comments provided in HIDOE's Memorandum are addressed in the February 2020 DEA.

2. *The HIDOE does have concerns regarding the conclusions in Table 10-1, Hunt Kalaeloa Subdivision Roads Project Impact Summary for Schools and Libraries. There will be direct short-term and long-term Impacts to Barbers Point Elementary School with the loss of one driveway access and loss of school property along Franklin D. Roosevelt and Copahee Avenues. Discussions between HIDOE and Hunt Communities Hawaii LLC are ongoing to identify appropriate mitigation measures to address impacts.*

The summary of anticipated long-term impacts on the Barbers Point Elementary School's potential loss of one driveway in Table 10-1 will be revised to be consistent with the potential impacts and mitigation measures conclusion in Section 5.14.7.2 of the DEA. In particular, during the planning and design of the project, Hunt intends to work with the DOE to ensure the provision of alternative access to avoid the potential for adverse impacts to the school.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

# OFFICE OF PLANNING
# STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

MARY ALICE EVANS
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/


DTS 202002280835LI

March 7, 2020

Ms. Tesha H. Mālama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96813

Dear Ms. Mālama:

Subject: Revised Draft Environmental Assessment for the Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, Ewa, Oahu, Hawaii

Thank you for the opportunity to provide comments on the revised Draft Environmental Assessment (Draft EA), received February 10, 2020, for the Hunt Kalaeloa Subdivision Roads Project.

According to the revised Draft EA, Hunt Communities Hawaii LLC proposes to develop the Hunt subdivision roadway system by constructing improvements to roadways, intersections and utility systems within the former Barbers Point Naval Air Station property located in Ewa, Oahu, Hawaii. The proposed improvements will involve an area of approximately 42.73 acres comprised of the following:

- approximately 32.31 acres for improvements to the existing road right-of-way;
- approximately 0.56 acres for installation of an onsite sewer line;
- approximately 9.86 acres for the construction offsite improvements including drainage facilities and left turn lanes, and installation or modification of traffic signals.

The purpose of the proposed infrastructure improvements is to support the future development of public, residential, and commercial uses within the Kalaeloa Community Development District.

The project site is located outside the special management area as designated under the Hawaii Coastal Zone Management Act, Hawaii Revised Statutes (HRS) Chapter 205A. The use of State land and/or funds from the proposed action triggers the subject EA to meet the requirements of HRS Chapter 343. This reissued Draft EA is to address the requirements of HRS Chapter 343, and Hawaii Administrative Rules (HAR) Chapter 11-200.1.

The Office of Planning (OP) has reviewed the reissued Draft EA and has the following comments to offer:

1. The reissued Draft EA has made individual responses to each of OP's comments, dated January 14, 2019, on the Draft EA. OP concurs that the State Department of Health (DOH) shall continue to be consulted as the planning and design of the project proceeds regarding soil contaminants of potential concern during construction. OP further concurs that a National Pollutant Discharge Elimination System construction stormwater permit shall be obtained from the DOH to mitigate potential impacts on State waters as a result of stormwater runoff from the proposed construction.

2. The Hawaii Community Development Authority is the approving agency for the subject EA pursuant to HAR Chapter 11-200.1. OP suggests that the term "Accepting agency" from the Draft EA be changed to "Approving agency".

3. The Final EA should approximately adjust the project schedule as stated in the reissued Draft EA that construction is tentatively scheduled in the second half of the 2019 timeframe.

4. HAR Chapter 11-200.1 has been in effect since August 8, 2019. The Final EA should update the statement of "HAR Chapter 11-200.1-13, anticipated to be signed into law on July 30, 2019" on page 104 of the reissued Draft EA.

If you have any questions regarding this comment letter, please contact Shichao Li of our office at (808) 587-2841.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

c: Mr. Brian Takeda ✓

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
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Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Mary Alice Evans, Director
Office of Planning
State of Hawai'i
P. O. Box 2359
Honolulu, Hawai'i 96804

Dear Ms. Evans:

Subject: **Response to Comments for Hawai'i Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, 'Ewa, O'ahu, Hawai'i**

On behalf of the Hawai'i Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 7, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *The reissued Draft EA has made individual responses to each of OP's comments, dated January 14, 2019, on the Draft EA. OP concurs that the State Department of Health (DOH) shall continue to be consulted as the planning and design of the project proceeds regarding soil contaminants of potential concern during construction. OP further concurs that a National Pollutant Discharge Elimination System construction stormwater permit shall be obtained from the DOH to mitigate potential impacts on State waters as a result of stormwater runoff from the proposed construction.*

This comment is acknowledged. The HCDA concurs regarding consultation with DOH and that an NPDES construction stormwater permit will be prepared and filed for this project.

2. *The Hawaii Community Development Authority is the approving agency for the subject EA pursuant to HAR Chapter 11-200.1. OP suggests that the term "Accepting agency" from the Draft EA be changed to "Approving agency".*

This comment is acknowledged. The reference to HCDA as the "Accepting agency" will be revised to "Approving agency" in the FEA.

3. *The Final EA should approximately adjust the project schedule as stated in the reissued Draft EA that construction is tentatively scheduled in the second half of the 2019 timeframe.*

This comment is acknowledged. The FEA will include a revised start of construction timeframe as mid-2021.

4. *HAR Chapter 11-200.l has been in effect since August 8, 2019. The Final EA should update the statement of "HAR Chapter 11-200.1-13, anticipated to be signed into law on July 30, 2019" on page 104 of the reissued Draft EA.*

The FEA will include the revised date of effect of HAR, Chapter 11-200.1, as August 8, 2019.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

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 0142
STP 8.2867

March 9, 2020

Ms. Tesha Malama
Kalaeloa Director of Planning
Hawaii Community Development Authority
547 Queen Street
Honolulu, Hawaii 96816

Dear Ms. Malama:

Subject: Public Review of the Revised Draft Environmental Assessment (DEA)
Hunt Kalaeloa Subdivision Roads Project
Ewa, Oahu, Hawaii
Tax Map Key: (1) 9-1-013:002-004, 010, 026, 093, 107, 128, 129;
(1) 9-1-015:013, 028, 029, 032;
(1) 9-1-016:027, 035;
(1) 9-1-118:013, 014;
(1) 9-1-148:011, 031;
(1) 9-1-160:006, 009, 012, 013, 015, 018, 036

The Hawaii Department of Transportation (HDOT) understands that Hunt Communities Hawaii LLC (Hunt) proposes to construct new access roadways, improve existing roadways, intersections and utility systems to support a future residential community on its Parcels 1, 2, and 3 within the Hawaii Community Development Authority (HCDA) Kalaeloa Community Development District (CDD). Roadway improvements are proposed within and beyond the CDD boundaries and some roadways are under State jurisdiction.

The HDOT provides the following comments on the revised DEA:

Airports Division (HDOT-A)

1. HDOT-A confirms that on Section 7.1.1, DEA page 67 (PDF view p. 81), the HCDA acknowledges HDOT-A's previous comments.

2. HDOT-A acknowledges that HCDA in a February 6, 2020 response letter to our prior DEA comments, reiterated assurances of compliance with applicable regulations. The letter further states that during the design stage of the proposed project, HDOT-A will be

consulted to discuss the need for an avigation easement. HDOT-A recommends that discussions for an avigation easement be initiated at the earliest convenient time for Hunt.

<u>Highways Division</u>

1. Summarize the current status of the conditions listed in the following Memoranda of Understanding (MOU):

   2001 Signatories: NAS Barbers Point Redevelopment Commission; HDOT Highways, and City and County of Honolulu (CCH). Transfers existing roadways to HDOT (temporarily) and CCH. The HDOT roadways would be designed to CCH standards and dedicated to CCH. The HDOT roads would be: Franklin D. Roosevelt Road (FDR), West Perimeter Road, Enterprise Road, Coral Sea Road, and a right-of-way (ROW) for a future connection with the North-South Road.

   2016 Signatories: HDOT, HCDA, and CCH. Requires a roadway demonstration project.
   1) HDOT will transfer the portion of FDR, between West Perimeter Road and Enterprise Avenue to HCDA. HCDA will construct improvements and convey land to CCH.
   2) HDOT transfer portion of West Perimeter Road between Saratoga Avenue and FDR to HCDA, and it will likely be abandoned.

2. Section 3.1, Description of Proposed Project: Offsite improvements are as described in the 2018 DEA. The Copahee Avenue-FDR intersection is not specified in the Page 10 text but is mentioned elsewhere in the DEA. Review the text and edit as necessary.

3. The Project Schedule and Costs are outdated. Include the development schedule for the proposed action and anticipated near term (Hunt) development.

4. We appreciate the inclusion of multimodal improvements.

5. Include the jurisdiction (current and future) of roadways in the vicinity of the proposed action on one of the DEA figures.

6. The Traffic Impact Analysis Report (TIAR), dated December 2017, included as 2020 DEA Appendix E, is the same TIAR the HDOT commented on during our 2018 DEA review. Comments on the TIAR are as follows:

   a. Typically, a TIAR is intended to assess potential impacts (and recommend mitigation for these impacts) due to the DEA proposed action. The DEA and the TIAR would be based on the same proposed action. In this case, the DEA proposed action is limited to infrastructure for the Hunt development, but the TIAR proposed action is the Hunt development under two scenarios: residential and mixed use. The TIAR identifies significant adverse impacts to traffic conditions in the region due to either Hunt development scenarios and

recommends mitigation measures. The DEA proposed action includes the TIAR recommended mitigation measures for the Hunt development impacts. The DEA impact analysis is an assessment of implementing Hunt development traffic impact mitigation before assessing other impacts of the Hunt development. It is not surprising that the proposed action would have a beneficial impact on traffic conditions.
We understand the proposed infrastructure improvements need to be completed prior to the Hunt development, but there is a risk of segmenting the environmental impact analysis when the two actions are phases of a larger project.

In the Final Environmental Assessment (EA), 1) describe the rationale for limiting the DEA proposed action to the roadway and other infrastructure improvements, rather than preparing a DEA for the larger project, Hunt development; 2) identify Hawaii Revised Statute (HRS) Chapter 343 compliance that may be required for the Hunt master plan permit from HCDA; and 3) explain how the TIAR is used in the DEA traffic impact assessment and contributed to the DEA proposed action.

The TIAR for the Development of Parcels 1, 2, and 3 in Kalaeloa shall be updated and provided to HDOT (and CCH) for review and concurrence prior to HCDA's determination on the EA.

b. The TIAR 2020 horizon year is not realistic for assessing either the proposed roadway improvements alone or the full build-out of Hunt's parcels. For example, the horizon year does not account for the time required for HDOT to convey roadways to HCDA, per the 2016 MOU or for Hunt/HCDA to establish fair share cost agreements for regional improvements among landowners and developers that would benefit in the future from the proposed action.

7. The HCDA or designee shall submit an updated transportation master plan for the Kalaeloa CDD master plan for review and concurrence by HDOT and CCH, Department of Transportation Services before it is adopted by HCDA. HDOT previously provided comments on the draft Kalaeloa Master Plan – Draft Infrastructure Master Plan Update from 2010 but were not provided the opportunity to review or concur on the assumptions and findings of a "final" document prior to adoption by HCDA. The HDOT and CCH concurrence on the updated transportation master plan would facilitate regional planning efforts and future land use reviews within the Kalaeloa CDD.

8. Add the following to Section 8, Permits and Approvals That May Be Required:

    a. All work within HDOT ROW will require HDOT approval.

    b. HDOT and CCH review and acceptance of the Hunt development TIAR.

c. HDOT and CCH review and acceptance of the Kalaeloa CDD transportation master Plan.

d. HRS Chapter 343 compliance for the Hunt development

9. The amount of fair share contributions for the improvements to roadways under HDOT jurisdiction listed in Appendix E, Table ES-2, of the TIAR (DEA Appendix E) shall be coordinated with and provided to the Highways Division, Planning Branch for review.

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: Brian Takeda – R.M. Towill Corporation

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Jade T. Butay, Director
Department of Transportation
State of Hawaiʻi
869 Punchbowl Street
Honolulu, Hawaiʻi 96813-5097

Dear Mr. Butay:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 9, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

*Airports Division (HDOT-A)*

1. *HDOT-A confirms that on Section 7.1.1, DEA page 67 (PDF view p. 81), the HCDA acknowledges HDOT-A's previous comments.*

HCDA acknowledges HDOT-A's review and confirmation of its recommendations contained in Section 7.1.1 Federal Aviation Administration (FAA) Order 5150.6B of the DEA.

2. *HDOT-A acknowledges that HCDA in a February 6, 2020 response letter to our prior DEA comments, reiterated assurances of compliance with applicable regulations. The letter further states that during the design stage of the proposed project, HDOT-A will be consulted to discuss the need for an avigation easement. HDOT-A recommends that discussions for an avigation easement be initiated at the earliest convenient time for Hunt.*

HCDA confirms that consultation with HDOT-A shall take place as the design of the Hunt Kalaeloa roadways project proceeds.

*Highways Division*

3. *Summarize the current status of the conditions listed in the following Memoranda of Understanding (MOU):*

   *2001 Signatories: NAS Barbers Point Redevelopment Commission; HDOT Highways, and City and County of Honolulu (CCH). Transfers existing roadways to HDOT (temporarily) and CCH. The HDOT roadways would be designed to CCH standards and dedicated to CCH. The HDOT roads would be: Franklin D. Roosevelt Road (FDR), West Perimeter Road, Enterprise Road, Coral Sea Road, and a right-of-way (ROW) for a future connection with the North-South Road.*

*2016 Signatories: HDOT, HCDA, and CCH. Requires a roadway demonstration project.*
*1) HDOT will transfer the portion of FDR, between West Perimeter Road and Enterprise Avenue to HCDA. HCDA will construct improvements and convey land to CCH.*
*2) HDOT transfer portion of West Perimeter Road between Saratoga Avenue and FDR to HCDA, and it will likely be abandoned.*

The 2001 MOU enabled the transfer of roadways (all substandard) by the Naval Air Station (NAS) Barbers Point Redevelopment Commission to HDOT and CCH. This transfer has since occurred. In 2016, described above, another MOU was entered into with the affected parties to take action and make roadway improvements.

The purpose of the 2016 MOU was to establish an 80' interim design standard right-of-way (ROW) with a set aside of a 108' ROW for use at a later date. Discussion amongst the Department of Planning and Permitting, Traffic Review Branch (DPP TRB) and Hunt are ongoing for the preliminary design and subject roadways subdivision pre-application process. Please also see Response #7 below.

2. *Section 3.1, Description of Proposed Project: Offsite improvements are as described in the 2018 DEA. The Copahee Avenue-FDR intersection is not specified in the Page 10 text but is mentioned elsewhere in the DEA. Review the text and edit as necessary.*

Off-site improvements discussed in the DEA, Section 3.1, Description of Proposed Project, page 10, will be revised to include the FDR Avenue and Copahee Avenue intersection.

3. *The Project Schedule and Costs are outdated. Include the development schedule for the proposed action and anticipated near term (Hunt) development.*

The Final EA will state that construction is tentatively scheduled to commence as early as mid-2021.

4. *We appreciate the inclusion of multimodal improvements.*

HCDA acknowledges the inclusion of multimodal improvements in the February 2020 DEA.

5. *Include the jurisdiction (current and future) of roadways in the vicinity of the proposed action on one of the DEA figures.*

Figure 3-4 will include the jurisdiction (current and future) of roadways in the FEA.

6. *The Traffic Impact Analysis Report (TIAR), dated December 2017, included as 2020 DEA Appendix E, is the same TIAR the HDOT commented on during our 2018 DEA review. Comments on the TIAR are as follows:*

   *a. Typically, a TIAR is intended to assess potential impacts (and recommend mitigation for these impacts) due to the DEA proposed action. The DEA and the TIAR would be based on the same proposed action. In this case, the DEA proposed action is limited to* *infrastructure for the Hunt development, but the TIAR proposed action is the Hunt development under two scenarios: residential and mixed use. The TIAR identifies significant adverse impacts to traffic conditions in the region due to either Hunt development scenarios and recommends mitigation measures. The DEA proposed action includes the TIAR recommended mitigation measures for the Hunt development impacts. The DEA impact analysis is an assessment of implementing Hunt development traffic impact mitigation before assessing other impacts of the Hunt development. It is not surprising that the proposed action would have a beneficial impact on traffic conditions.*

*We understand the proposed infrastructure improvements need to be completed prior to the Hunt development, but there is a risk of segmenting the environmental impact analysis when the two actions are phases of a larger project.*

*In the Final Environmental Assessment (EA), 1) describe the rationale for limiting the DEA proposed action to the roadway and other infrastructure improvements, rather than preparing a DEA for the larger project, Hunt development; 2) identify Hawaii Revised Statute (HRS) Chapter 343 compliance that may be required for the Hunt master plan permit from HCDA; and 3) explain how the TIAR is used in the DEA traffic impact assessment and contributed to the DEA proposed action.*

*The TIAR for the Development of Parcels 1, 2, and 3 in Kalaeloa shall be updated and provided to HDOT (and CCH) for review and concurrence prior to HCDA's determination on the EA.*

As stated in Sections 2.1 and 2.2 of the DEA, HCDA adopted the Kalaeloa Master Plan in March 2006, which serves as the foundation for redevelopment of the roughly 2,180 acres transferred by the Barbers Point Naval Air Station Redevelopment Commission via Act 182 of the Hawaiʻi State Legislature in 2002. The master plan also defines the Kalaeloa Community Development District (CDD). It is the principal policy and planning document for HCDA's use in coordinating with federal, state, and county government agencies, developers, private landowners, and the community.

Subsequently, HCDA put into place its rules in HAR, Chapter 15-215, Kalaeloa Community Development District Rules, which provide standards for development.

Hunt, owner and developer of the 538-acre northwestern portion of the HCDA Kalaeloa CDD is required to comply with HAR, Chapter 15-215, Kalaeloa CDD Rules. The Rules specify that the Roadways Subdivision project is subject to construction plan review for consistency with Subchapter 15-215-24, Thoroughfare Plan Standards, and other rules that require the integration of bike trails, mass transit in roadway projects, and Complete Streets principles. HRS, Chapter 343, requires the preparation of this EA based on the underlying use of state land for development.

The timing of the Roadways Subdivision project is also based on available funding and anticipated long-range development over an approximately 7 to 20+ year horizon. It is expected that when the parcels planned for land uses such as residential, commercial and recreational development are pursued that Hunt will be expected to fulfill HCDA's HRS, Chapter 343 environmental documentation and permitting requirements.

> *b. The TIAR 2020 horizon year is not realistic for assessing either the proposed roadway improvements alone or the full build-out of Hunt's parcels. For example, the horizon year does not account for the time required for HDOT to convey roadways to HCDA, per the 2016 MOU or for Hunt/HCDA to establish fair share cost agreements for regional improvements among landowners and developers that would benefit in the future from the proposed action.*

The HDOT's comment regarding the TIAR 2020 horizon year is acknowledged. The Traffic Impact Analysis Report (TIAR), dated December 2017, included as the 2020 DEA Appendix E, and a Memorandum from Fehr & Peers dated September 17, 2019 that will be included as a supplement to the 2017 TIAR, will provide the projected traffic impact assessment required for the subject Kalaeloa roadways project. A copy of the September 2019 Memorandum is included as Exhibit A in this response letter.

7. *The HCDA or designee shall submit an updated transportation master plan for the Kalaeloa CDD master plan for review and concurrence by HDOT and CCH, Department of Transportation Services before it is adopted by HCDA. HDOT previously provided comments on the draft Kalaeloa Master Plan -Draft Infrastructure Master Plan Update from 2010 but were not provided the opportunity to review or concur on the assumptions and findings of a "final" document prior to adoption by HCDA. The HDOT and CCH concurrence on the updated transportation master plan would facilitate regional planning efforts and future land use reviews within the Kalaeloa CDD.*

The subject project covers only a small portion of Franklin D. Roosevelt Avenue (FDR) from West Perimeter Road to Enterprise. In a letter dated March 3, 2020, Mr. Edwin Sniffen, the Deputy Director of the State Department of Transportation Highways Division, stated that the DOT-Highways Division wants the City and County of Honolulu to review and be responsible for the proposed project roadway. No further review is required for this short section of FDR. Please see attached letter (Exhibit B) from Mr. Edwin Sniffen.

The overall master roadway master plan will be developed in the future and the DOT - Highways Division will have the opportunity to review and comment at a later date.

The DPP-TRB will review and approve the proposed construction drawings and Roadway Master Plan prior to start up of any construction.

8. *Add the following to Section 8, Permits and Approvals That May Be Required:*
   *a. All work within HDOT ROW will require HDOT approval.*
   *b. HDOT and CCH review and acceptance of the Hunt development TIAR.*
   *c. HDOT and CCH review and acceptance of the Kalaeloa CDD transportation master Plan.*
   *d. HRS Chapter 343 compliance for the Hunt development*

Section 8 of the FEA will not be expanded to include items a, b and c. Item d is already listed as the subject project is required to comply with HRS, Chapter 343 as triggered by the proposed use of state land. Also, please refer to response #7 above, and Exhibit 2, letter from Mr. Edwin Sniffen.

9. *The amount of fair share contributions for the improvements to roadways under HDOT jurisdiction listed in Appendix E, Table ES-2, of the TIAR (DEA Appendix E) shall be coordinated with and provided to the Highways Division, Planning Branch for review.*

This comment concerning the coordination of the amount of fair share contributions for road improvements listed in Appendix E, Table ES-2, with the Highways Division, Planning Branch is acknowledged.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

Exhibits:
1 - Fehr & Peers Memorandum dated September 17, 2019
2 - Letter From E. Sniffen, Deputy Director, HDOT Highways

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

FEHR PEERS

# MEMORANDUM (REVISED)

Date: September 17, 2019

To: Craig Luke and Chris Nakamura, R.M. Towill Corporation

From: Andrew Scher and Sohrab Rashid

***Subject: Kalaeloa Roadway Master Plan Update and Hunt Parcel Consistency***

*SD15-0169.02*

This memorandum summarizes the internal roadway infrastructure that would be needed to support the proposed Kalaeloa development in the Ewa Region of Oahu, Hawaii. The purpose of this study update is to determine the street typology, intersection lane configurations, and anticipated traffic control devices for the primary roadways within Kalaeloa under Buildout Conditions of the proposed Master Plan. This study was originally completed in August 2010 to address the development proposal of Ford Island Ventures (FIV) within the greater Master Plan area under the jurisdiction of the Hawaii Community Development Authority (HCDA). The study identified the number of travel lanes and the presence of on-street parking and/or bicycle lanes on each facility, as well as the required lane configurations and storage pocket lengths at each major intersection within the plan area. The roadway plan for the 2010 study was based on a set of land use assumptions provided HCDA with input from FIV and Belt Collins Hawaii (BCH).

The need for this update is to identify the ultimate street sections surrounding three of the parcels (Parcels 1, 2, and 3) located in the northwest portion of the Master Plan area. These parcels are currently being developed by Hunt Development Group. The results of the study update are presented in the following sections:

- A brief **background**,
- A summary of our **assumptions and methods**, and
- **Recommended roadway improvements** describing the master roadway network.

The potential impacts of the proposed project on roadways outside the Kalaeloa development area (e.g., at the Kapolei Parkway intersections of Kamokila Boulevard, Fort Barrette Road and at Kualakai Parkway) will be addressed as part of a separate analysis. In addition, the project team reviewed and assessed alternate master plan roadway configurations and determined that the proposed network analyzed in this report is the preferred network.

## BACKGROUND

HCDA adopted the *Kalaeloa Master Plan* in March 2006, which lays out the framework for the redevelopment of Kalaeloa. The total Kalaeloa project area is approximately 3,700 acres and is bounded by the Campbell Industrial Park to the west, the City and Villages of Kapolei to the north, Ewa Villages, Ewa by Gentry and Ewa Beach residential communities and open spaces to the east, and the Pacific Ocean to the south. At this point, few specific projects with detailed site plans have been built or are identified for development within Kalaeloa, though proposed development is expected to include a mix of residential, retail, office, and other supporting commercial and public uses. Because this evaluation is at the Master Plan level, not all the local and sub-collector roadways have been identified within each parcel. As such, the roadway layouts may be modified in the future as specific development proposals are made and more detailed access plans are defined.

## ASSUMPTIONS AND METHODS

This section describes the land use and roadway network assumptions and includes a discussion of the project traffic estimate method.

### *Land Use Assumptions*

As noted in the introduction, HCDA (with input from FIV and BCH) provided a complete inventory of existing and proposed land uses for Kalaeloa by parcel, which we used to estimate future roadway and intersection volumes. **Figure 1** illustrates the Kalaeloa Master Plan area as presented in 2010 and the specific parcel locations. It is important to note that the 2010 Master Plan parcels 45, 46 and 47 on **Figure 1** correspond to Hunt Parcels 1, 2, and 3 for this 2019 study. HCDA staff has confirmed with R. M. Towill that the remaining land use assumptions from 2010 are still valid for this evaluation.

The land use inventory included the type of use (e.g., single-family dwelling unit vs. multi-family unit) and size (e.g., square feet of retail space or office space, number of hotel rooms, or school enrollment), as well as the land use context or transect (i.e., urban center, urban core, rural, etc.). Based on the information received, more than 4.6 million square feet of commercial/office/light industrial development and 6,852 residential units are estimated for full buildout of the area. The buildout land use summary is presented in **Table 1,** and the land use summary by anticipated development phase is presented in **Table 2**. Note that the development phase information was originally requested in the 2010 study and has not been updated for this study given that the focus is on the Master Plan's impact on roadways serving Parcels 1, 2, and 3.

**TABLE 1**
**LAND USE SUMMARY BY TRANSECT UNDER BUILDOUT CONDITIONS**

| Land Use Type | Land Use by Transect | | | | |
|---|---|---|---|---|---|
| | **Rural (T2)** | **General Urban (T3)** | **Urban Center (T4)** | **Urban Core (T5)** | **Special District (SD)** |
| ***Residential (Dwelling Units)*** | | | | | |
| ***Residential Total*** | ***328*** | ***3,092*** | ***2,392*** | ***890*** | ***150*** |
| ***Non-Residential (Square Feet)*** | | | | | |
| Civic | 188,975 | 103,528 | 0 | 0 | 0 |
| R&D | 111,068 | 438,354 | 0 | 0 | 0 |
| Light Industrial | 173,370 | 1,373,356 | 0 | 0 | 40,214 |
| Office | 103,416 | 534,163 | 114,927 | 209,229 | 0 |
| Retail | 253,203 | 389,414 | 317,307 | 271486 | 0 |
| ***Non-Residential Total*** | ***830,032*** | ***2,838,815*** | ***432,715*** | ***480,715*** | ***40,214*** |

Source: Hawaii Community Development Authority (HCDA), May 2010 except for Hunt Parcels 1, 2, and 3 from R. M. Towill Corporation (2019).

**TABLE 2**
**LAND USE SUMMARY BY DEVELOPMENT PHASE**

| Time Period | Land Use by Transect | | | | |
|---|---|---|---|---|---|
| | Rural (T2) | General Urban (T3) | Urban Center (T4) | Urban Core (T5) | Special District (SD) |
| ***Residential (Dwelling Units)*** | | | | | |
| Within 7 Years | 0 | 883 | 298 | 120 | 0 |
| 7 to 20 Years | 328 | 1,925 | 1,713 | 770 | 150 |
| More than 20 Years | 0 | 284 | 381 | 0 | 0 |
| ***Residential Buildout*** | ***328*** | ***3,092*** | ***2,392*** | ***890*** | ***150*** |
| ***Non-Residential (Square Feet)*** | | | | | |
| Within 7 Years | 282,903 | 375,622 | 22,690 | 180,000 | 0 |
| 7 to 20 Years | 327,720 | 2,213,441 | 366,216 | 300,715 | 40,214 |
| More than 20 Years | 219,409 | 249,751 | 43,328 | 0 | 0 |
| ***Non-Residential Buildout*** | ***830,032*** | ***2,838,815*** | ***432,234*** | ***480,715*** | ***40,214*** |

Source: Hawaii Community Development Authority (HCDA), May 2010 except for Hunt Parcels 1, 2, and 3 from R. M. Towill Corporation (2019).

### *Roadway Assumptions*

Since our evaluation is based on buildout of Kalaeloa that is expected to take at least 20 years to complete, the following planned roadway improvements were assumed to be in place included under Buildout Conditions:

- Extension of Kualaka`i Parkway as a 4-lane roadway between Kapolei Parkway and Saratoga Avenue
- Extension of Kualaka`i Parkway as a 2-lane roadway between Saratoga Avenue and Keoneula Boulevard
- Extension of Wakea Avenue as a 4-lane roadway from makai of Kapolei Parkway (across Roosevelt Avenue) to Saratoga Avenue (generally built along the existing Bennington Street alignment)
- Extension of Kamokila Boulevard as a 4-lane roadway from Roosevelt Avenue to a realigned Boxer Road

### *Trip Estimates*

Existing traffic volumes for intersections along Roosevelt Avenue were obtained from the Parcel 1, 2, and 3 TIAR and other available studies. Volumes were adjusted to 2019 conditions using a growth factor of 0.5% per year, and these factored volumes were re-distributed to account for the future connections at Wakea Street and Kualakai Parkway.

The amount of traffic added to the roadway system by the proposed Master Plan development was estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. The first step estimates the amount of added traffic to the roadway network. The second step estimates the direction of travel to and from the larger zones. The trips are assigned to specific street segments and intersection turning movements during the third step.

Trip Generation

The amount of traffic added to the surrounding roadway system by the proposed development was estimated by applying the applicable trip generation rates from the *Trip Generation (10th Edition)* published by the Institute of Transportation Engineers (2017).

In a mixed-use and integrated community such as Kalaeloa, a proportion of the total vehicle trips will be made internally within the development site, and some trips will be made by walking or bicycling to destinations due to their proximity. For example, people who live in the on-site residential units will drive to the retail or restaurant uses within the site, and then return home, and still others will walk instead of driving. Accordingly, their trip-making activity will never reach the external roadway system, but they will be accounted for within the site. By applying an internal capture reduction to the overall project trip generation, the number of estimated vehicle trips added to the surrounding roadway network is reduced.

To account for the interaction of land uses within the project area and the presence of transit, Fehr & Peers estimated an internal capture rate of 15 percent based on recent mixed-use (MXD) trip generation research we have conducted in association with the Federal Environmental Protection Agency (EPA). Our MXD research is based on data from approximately 15 sites in 6 major metropolitan areas and is proven to be statistically superior to other mixed-use trip reduction methods including those published by ITE. The MXD approach yields more realistic estimates of vehicle trip generation based on project design and the interaction of uses that allows more trips to be made internally by walking, bicycling, or transit. **Table 3** shows the trip generation estimates and mixed-use trip generation reduction under Buildout Conditions.

Trip Distribution

After trip generation estimates were determined for each zone, trip distribution patterns (the directions of approach and departure) were estimated. The directions of approach and departure were estimated based on prior studies in the area, existing travel patterns, and the relative location of complementary land uses (e.g., retail and jobs in the City of Kapolei and other areas outside Ewa).

Trip Assignment

Vehicle traffic was then assigned through the roadway network for each land use scenario based on the directions of approach and departure discussed above. The trip assignments were then added to the existing volumes to estimate buildout roadway and intersection volumes.

**TABLE 3**
**VEHICLE TRIP GENERATION ESTIMATES UNDER BUILDOUT CONDITIONS**

| Land Use Type | Daily[1] | AM Peak Period[1] | | | PM Peak Period[1] | | |
|---|---|---|---|---|---|---|---|
| | **Total** | **In** | **Out** | **Total** | **In** | **Out** | **Total** |
| | | | | ***Residential Land Use*** | | | |
| *Residential Total Gross Vehicle Trips [A]* | *55,076* | *884* | *2,769* | *3,653* | *2,824* | *1,674* | *4,498* |
| | | | | ***Non-Residential Land Use*** | | | |
| Civic[2] | 7,959 | 762 | 242 | 1,004 | 625 | 211 | 414 |
| R&D | 6,078 | 173 | 58 | 231 | 482 | 71 | 411 |
| Light Industrial | 11,148 | 592 | 79 | 671 | 552 | 73 | 479 |
| Office | 14,401 | 962 | 156 | 1,118 | 1,120 | 190 | 930 |
| Retail | 107,070 | 2,210 | 1,352 | 3,562 | 7,919 | 3803 | 4116 |
| *Non-Residential Total Gross Vehicle Trips [B]* | *124,950* | *4,699* | *1,887* | *6,586* | *4,348* | *6,350* | *10,698* |
| | | | | ***Buildout Land Use*** | | | |
| *Total Gross Trips [A + B]* | *180,026* | *5,583* | *4,656* | *10,239* | *7,172* | *8,024* | *15,196* |
| *15% Reduction[3]* | *(23,636)* | *(750)* | *(608)* | *(1,358)* | *(948)* | *(1,077)* | *(2,024)* |
| ***Total Net New Vehicle Trips*** | ***156,390*** | ***4,833*** | ***4,048*** | ***8,881*** | ***6,224*** | ***6,947*** | ***13,172*** |

Notes:

1. *Trip Generation Manual*, 10th Edition, Institute of Transportation Engineers. Trips generated by Hunt parcels 1, 2, and 3 were taken from the *Development of Parcels 1, 2, and 3 in Kalaeloa Transportation Impact Analysis Report* (Fehr & Peers, December 2017)
2. Civic land use rates developed by Fehr & Peers based on allowable land uses within the *Kalaeloa Master Plan* (March 2006).
3. To account for the interaction of land uses within the project area, Fehr & Peers estimated an internal capture rate of 15 percent based on recent mixed-use (MXD) trip generation research we have conducted in association with the Federal Environmental Protection Agency (EPA). This reduction does not include the internal capture for Hunt parcels 1, 2, and 3. Reductions were already considered in the source document *Development of Parcels 1, 2, and 3 in Kalaeloa Transportation Impact Analysis Report* (Fehr & Peers, December 2017)

Source: Fehr & Peers, September 2019.

**RECOMMENDED ROADWAY IMPROVEMENTS**

We used the TRAFFIX software package to build a model of the Master Plan roadway system to track the vehicle trips generated by each land use travelling within the Kalaeloa project site, as well as travelling externally to other areas of Ewa and beyond. The model was used to define the street typology including number of travel lanes, intersection configurations, and anticipated traffic control devices within the project area for the proposed roadways. Smaller two-lane local and sub-collector roadways will be developed as more detailed plans for each parcel are prepared. **Figure 2** presents the required street typology and cross-sections under Buildout Conditions for all primary roadways within the Master Plan area, which includes the number of travel lanes, where on-street parking is expected to be permitted at a minimum, and type of bicycle facility expected to be provided. The required rights-of-way shown on **Figure 2** are based on two-and four-lane street sections illustrated in the *Subdivision Street Standards (DPP, December 2000)* or were agreed to by DPP staff and R.M. Towill (e.g., the 80-foot ROW on Roosevelt Avenue). The roadway sections proposed for Hunt Parcels 1, 2 and 3 are consistent with these ultimate sections required for the buildout of the Kalaeloa Master Plan.

Overall, the traffic demand under Buildout Conditions would generally require a total of six lanes of roadway capacity in the Ewa-Diamond Head direction at the far western and eastern extents of the plan area, with an additional two lanes of capacity desirable within the central core area. East of Enterprise Street, either Roosevelt Avenue or Saratoga Avenue would need to be a continuous four-lane roadway with the other operating as a two-lane street. The final layout should be determined based on future refinement of the land use plan and supporting street network. For this study Roosevelt Avenue is assumed to be a two-lane roadway with an additional westbound through lane provided at the Fort Barrette Road-Enterprise Avenue intersection. Roosevelt Avenue between Kamokila Boulevard and Enterprise Street would be a four-lane roadway allowing Boxer Road to be operated as a two-lane roadway along its entire length with the Master Plan buildout. A four-lane “ring road” was previously proposed around the downtown core area to minimize street widths within the core comprising Lexington, Yorktown and Shangri-La Streets.

The volume of traffic expected to use the mauka-makai streets across Franklin D. Roosevelt Avenue (e.g., Kamokila Boulevard, Wakea Avenue, Fort Barrette Road, and Kualakai Parkway) will warrant four-lane roadways (i.e., two through lanes in each direction). It is possible that buildout of the Kalaeloa area will result in impacts to off-site intersections mauka of the site (e.g., along Kapolei Parkway) that have not previously been anticipated in previous Ewa planning studies. However, as noted previously, that detailed analysis will be conducted as part of a separate study.

The overall street layout is based on the desire of HCDA to establish Saratoga Avenue as a “main street” between Wakea Street and Enterprise Street. We expect that the proposed two-lane section of Saratoga Avenue will be congested during peak hours because it will be a desirable destination within the Kalaeloa area and will also serve some through traffic across the area because it is the most direct connection between Boxer Road and Enterprise Street. However, peak period congestion should be anticipated and is a sustainable approach to transportation planning; that is, increased use of roadways over the course of the day is a better utilization of the investment in the transportation system and avoids overbuilding of roadways to serve a limited number of hours over a 24-hour period.

All roadways on **Figure 2** are proposed to have turn lane/median lanes except the following:

- Copahee Avenue between Saratoga Avenue and Franklin D. Roosevelt Avenue
- Yorktown Street between Lexington Street and Enterprise Street
- West Perimeter Road between the future Malakole Street and Olai Street extensions
- Local driveway makai from West Perimeter Road toward the Pacific Ocean
- Coral Sea Street makai of Tripoli Street toward the Pacific Ocean

**Figure 3** presents the recommended intersection configurations, intersection control, and standard turn lane storage pocket lengths under Buildout Conditions. These proposed intersection turn-lane configurations and control devices were developed based on the number of travel lanes for each roadway. Dual left-turn lanes are recommended where two four-lane roadways intersect or where volumes are expected to exceed 300 to 350 vehicles per hour (vph) during either peak period. Similarly, separate right-turn lanes are provided at intersections with higher right-turn volumes, typically on the order of 150 vph. Shared-through right turn lanes are proposed at multiple locations to minimize pedestrian crossing distances.

To assist with intersection design and defining right-of-way requirements, **Figure 3** assumes standard storage pocket lengths for left- and right-turn lanes. Because this evaluation is at the Master Plan level, the standard pocket lengths may be modified in the future as specific development proposals are made and more detailed access plans are defined for local and sub-collector roadways within each parcel. Unless noted otherwise on **Figure 3**, the standard length for a left-turn lane is 200 feet for arterial roadways and 125 feet for collector roadways. The standard right-turn lane storage pocket length is 125 feet for arterial and collector roadways.

**Table 4** presents the intersection levels of service calculated using the TRAFFIX software, the projected turning movement volumes,  and the lane configurations required to provide desired operating levels (i.e., LOS D or better) at buildout of the Master Plan area.

**BICYCLE FACILITIES**

The proposed bicycle network is generally consistent with the current *Oahu Bike Plan 2018 Update* web map (address is: http://hhf.maps.arcgis.com/apps/View/index.html?appid=edb13f5208314d94842bf0380bff4cf6&extent=-158.3866,21.2813,-157.5076,21.6813), but the map does not have enough detail in the study area for all Master Plan roadways.  Accordingly, additional facilities are recommended to provide a comprehensive and connected network across the entire plan area.  Additional and/or modified facilities may be proposed as more detailed planning occurs over time within the Master Plan area.

**TRANSIT**

The land use density proposed for many of the development parcels will be conducive to transit as a primary travel mode. The proposed Honolulu Rail project is currently constructing the Minimum Operating Segment (MOS) between East Kapolei and Ala Moana, which is scheduled to operate in 2025 with an initial segment between East Kapolei and the Aloha Stadium Station in late 2020.  The closest station will be at East Kapolei located approximately ½-mile from the closest point to Kalaeloa and approximately three (3) miles from the downtown core in Kalaeloa.

A future extension of the line is planned to be constructed to West Kapolei near the Kalaeloa Boulevard/Kapolei Parkway intersection with a station planned in the downtown Kalaeloa core area. While a schedule and funding for the planned extension through Kalaeloa have not been identified at this time, the general alignment of the rail line would follow the Kualakai Parkway extension, Saratoga Avenue, Enterprise Street, Midway Street, and the Wakea Street extension into the City of Kapolei. It is anticipated that piers supporting the proposed elevated rail line could be located within the center medians of the roadways within the “Transit Corridor” shown conceptually on **Figure 1**.

The specific location of the future rail station has not been identified and several factors will determine the appropriate location. Based purely on walking distance and proximity to the highest density and majority of land uses a station within the downtown is ideal for attracting potential riders and promoting transit ridership (i.e., reducing vehicle trips), and is expected to be supported by continuous sidewalks on both sides of all downtown core streets to maximize accessibility to the future station. Provision of a rail station will provide residents, employees and visitors with an excellent alternative to making an automobile trip and help to reduce vehicle demand within the study area. Prior to completion of the West Kapolei extension and to the extent operationally feasible, a public or private local bus circulator should be provided linking Kalaeloa land uses with the East Kapolei rail station. This service would allow travel to and from Kalaeloa without requiring a car and still provide a convenient form of transportation.

**FUTURE STUDIES**

The results of this analysis are based on a set of general land use assumptions provided by HCDA. Upon further refinement of proposed uses and more detailed information on individual parcel access, additional studies should be completed to revise the planned roadway network including the identification of specific driveway/vehicle access points, minor street connections, etc. In addition, a comprehensive transportation impact analysis is expected to be required to satisfy other planning and environmental requirements including the identification of off-site and regional traffic impacts.

**TABLE 4**
**KALAELOA MASTER PLAN BUILDOUT INTERSECTION LEVELS OF SERVICE**

| Intersection | Intersection Control | Buildout AM Peak Hour | | Buildout PM Peak Hour | |
|---|---|---|---|---|---|
| | | Delay[1] | LOS[2] | Delay[1] | LOS[2] |
| 1. Kamokila Blvd / Roosevelt Ave | Signalized | 32.7 | C | 27.3 | C |
| 2. Copahee Ave / Roosevelt Ave | TWSC[3,4] | 13.8 | B | 11.8 | B |
| 3. Wakea Ave / Roosevelt Ave | Signalized | 43.6 | D | 44.3 | D |
| 4. Lexington St / Roosevelt Ave | Signalized | 26.4 | C | 21.0 | C |
| 5. Fort Barrette Rd - Enterprise St / Roosevelt Ave | Signalized | 34.7 | C | 32.0 | C |
| 6. Midway St / Roosevelt Ave | Signalized | 15.3 | B | 29.0 | C |
| 7. Coral Sea St / Roosevelt Ave | Signalized | 22.6 | C | 25.8 | C |
| 8. Kualaka'i Pkwy / Roosevelt Ave | Signalized | 48.6 | D | 34.8 | C |
| 9. Kamokila Blvd / Boxer Rd | Signalized | 25.8 | C | 38.9 | D |
| 10. Copahee Ave / Boxer Rd | Signalized | 22.2 | C | 35.8 | D |
| 11. Boxer Rd / Saratoga Ave | Signalized | 18.4 | B | 30.8 | C |
| 12. Wakea Ave / Saratoga Ave | Signalized | 24.3 | C | 46.5 | D |
| 13. Lexington St / Saratoga Ave | Signalized | 32.5 | C | 38.4 | D |
| 14. Enterprise St / Saratoga Ave | Signalized | 43.2 | D | 29.2 | C |
| 15. Midway St / Saratoga Ave | Signalized | 15.1 | B | 28.2 | C |
| 16. Coral Sea St / Saratoga Ave | Signalized | 25.4 | C | 30.4 | C |
| 17. Kualaka'i Pkwy / Saratoga Ave | Signalized | 43.4 | D | 38.3 | D |
| 18. Saratoga Ave - Geiger Rd / Roosevelt Ave | Signalized | 17.1 | B | 20.3 | C |
| 19. W. Perimeter Rd / Malakole St | Signalized | 18.7 | B | 34.5 | C |
| 20. Boxer Rd-Midway Rd / Wakea Ave-Malakole St | Roundabout | 2.1 | A | 3.5 | A |
| 21. Lexington St / Midway Rd | Signalized | 21 | C | 37.5 | D |
| 22. Lexington St / Yorktown St | Signalized | 16.3 | B | 28 | C |
| 23. Lexington St / Shangrila St | Signalized | 27.2 | C | 28.4 | C |
| 24. Enterprise St / Yorktown St | Signalized | 27.1 | C | 33.4 | C |
| 25. Enterprise St / Shangrila St | Signalized | 13 | B | 19.7 | B |
| 26. W. Perimeter Rd / Olai St | TWSC[3] | 4.6 | A | 4 | A |
| 27. Coral Sea St / Tripoli Rd | TWSC[3] | 5.6 | B | 4.2 | B |

Notes:

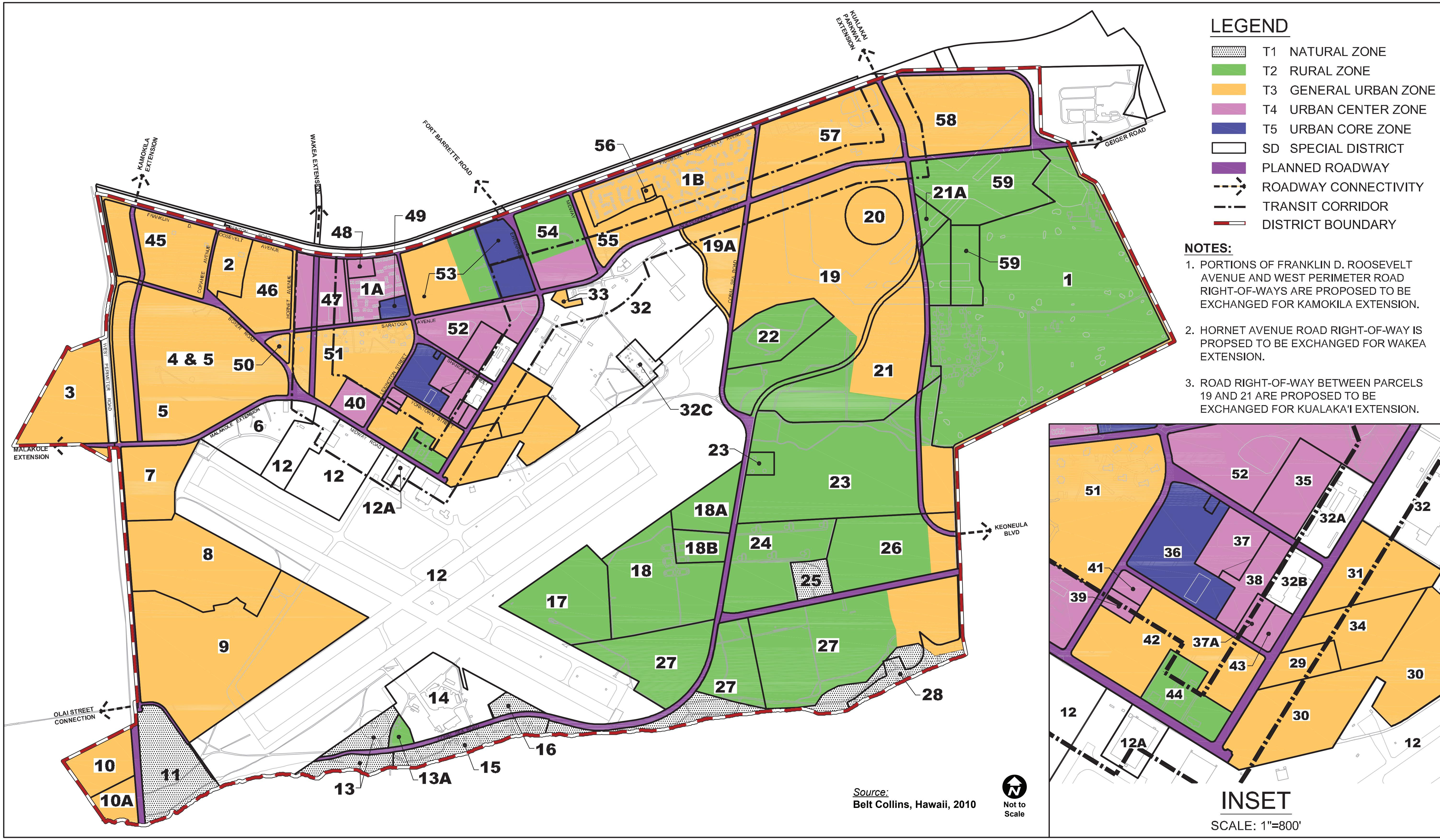
1 Whole intersection weighted average control delay expressed in seconds per vehicle for signalized intersections using methodology described in the 2000 *Highway Capacity Manual*. For two-way stop controlled unsignalized intersections, total control delay for the worst movement, expressed in seconds per vehicle, is presented. Federal Highway Administration analytical methodology used for roundabout analysis. LOS calculations conducted using the TRAFFIX level of service analysis software package.

2 LOS = Level of service

3 TWSC = Two Way Stop Control

4 Includes channelized refuge lane for northbound left-turns and separate left-turn for westbound approach.

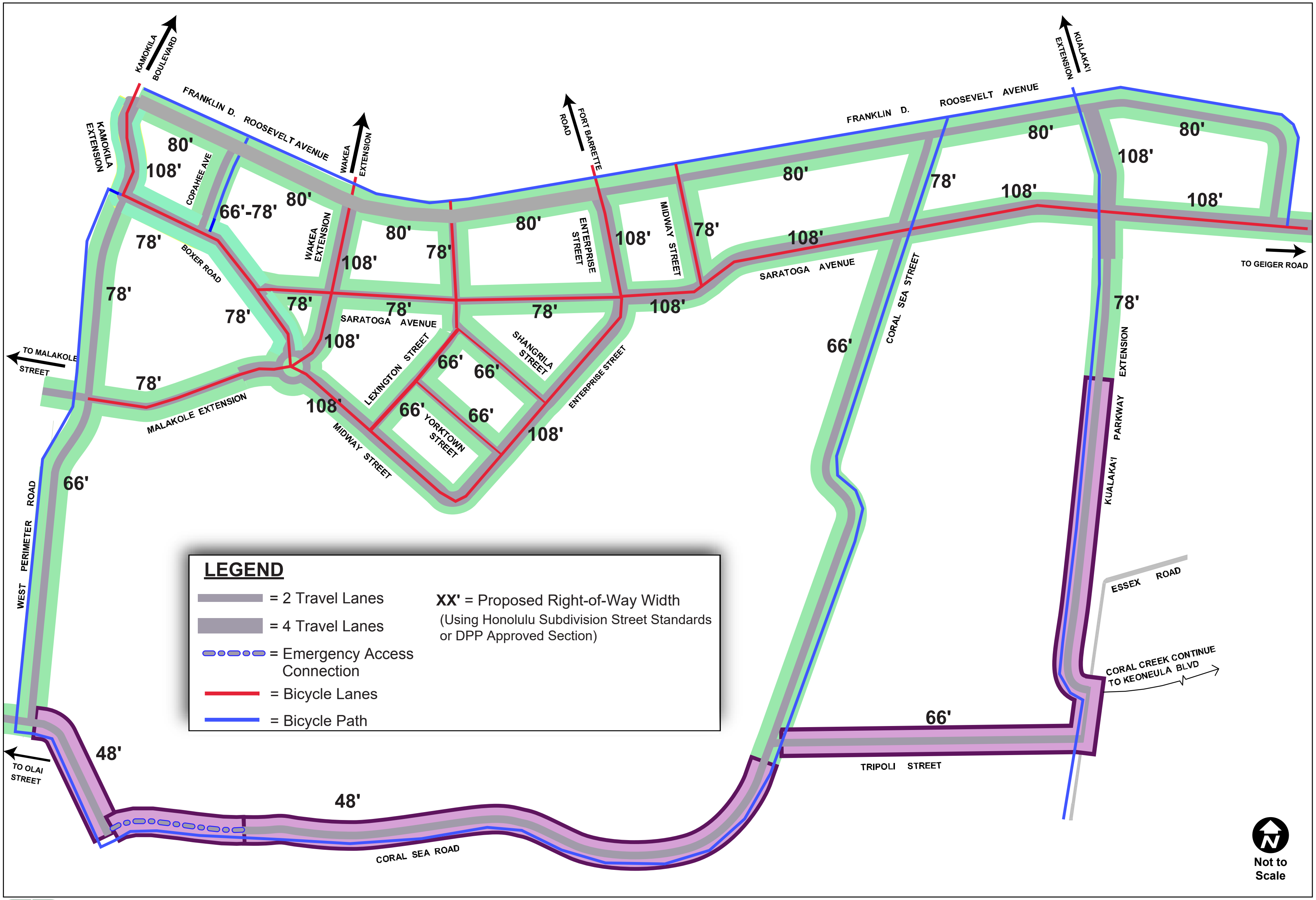
Source: Fehr & Peers, September 2019




Kalaeloa Roadway Master Plan Study

**Kalaeloa Parcel Map**

Figure 1

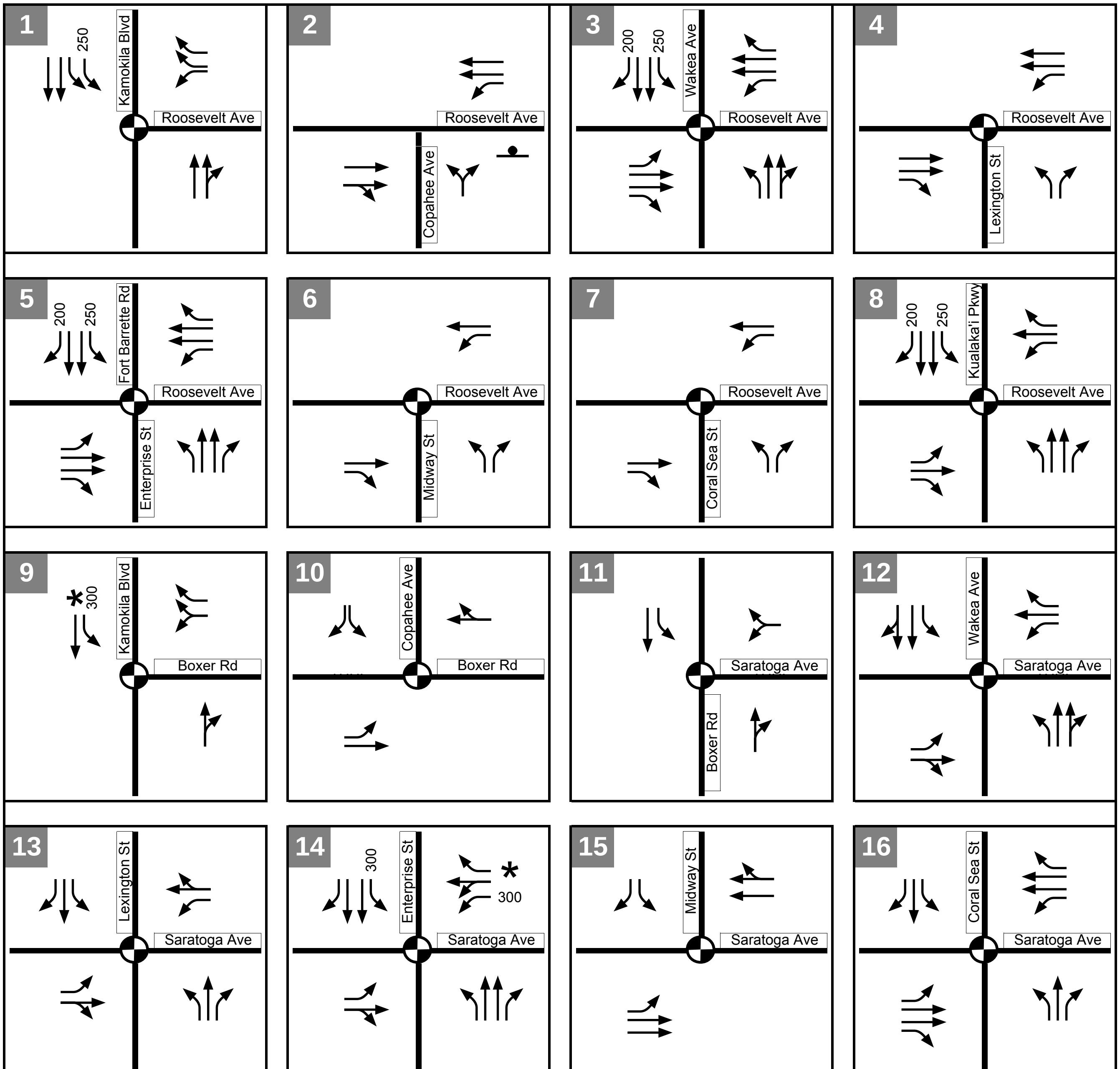



**Kalaeloa Roadway Master Plan Study**

## Proposed Street Typology and Bicycle Facilities

Figure 2

September 2019
SD15-0169.02




*Note:*
Unless noted standard length for a left turn storage pocket is 200 feet for arterial roadways and 125 feet for collectors. Standard right turn lane storage pocket length is 125 feet for arterial and collector roadways.

**KEY:**

= Signalized Intersection

= Roundabout

= Stop Sign

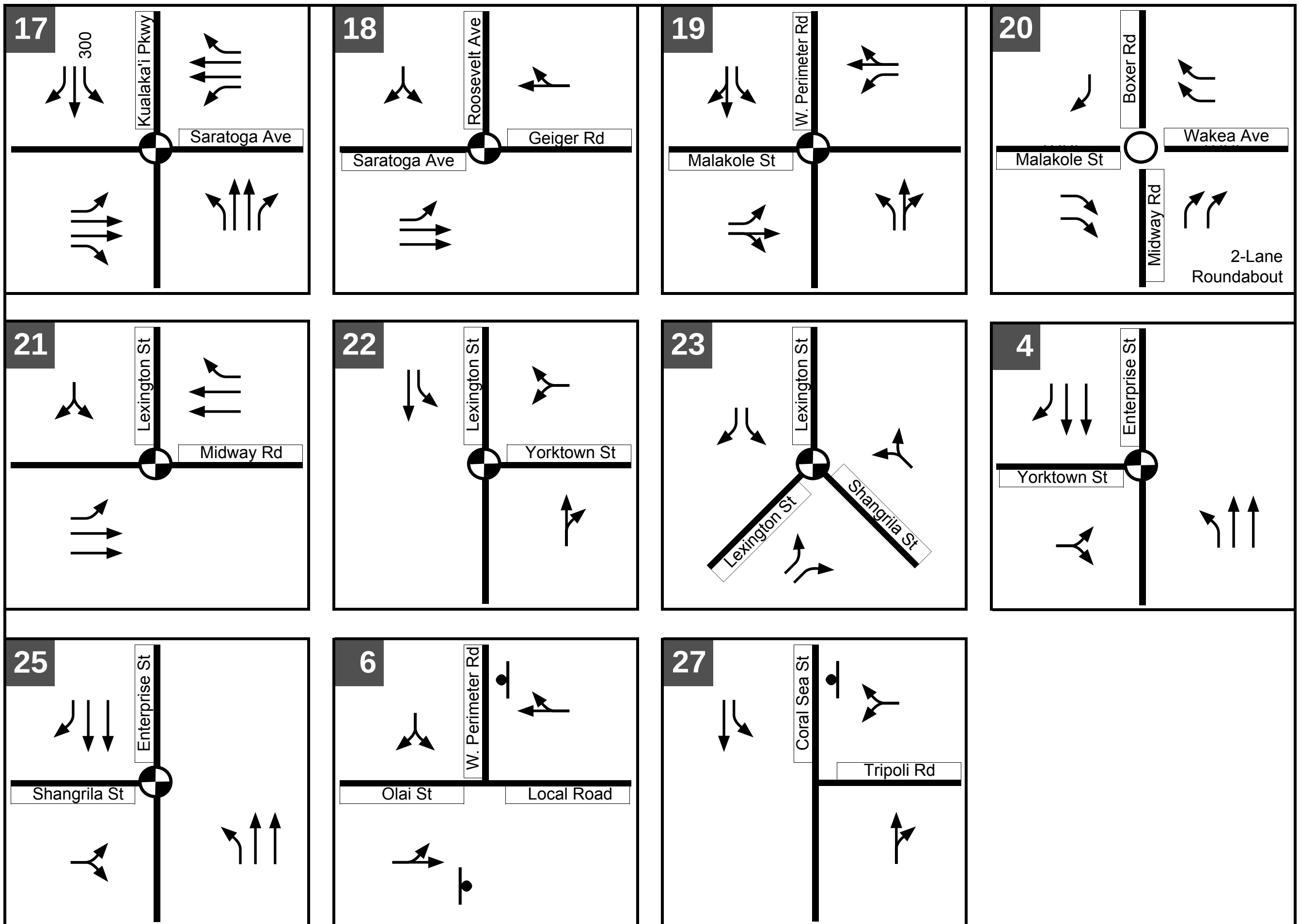
YYY = Storage Pocket Length in Feet

* = Trap Turn Lane

**Kalaeloa Roadway Master Plan Study**

**Proposed Intersection Configuration and Standard Turn Lane Storage Pocket Lengths Under Buildout Conditions**

**FIGURE 3A**




*Note:*
Unless noted standard length for a left turn storage pocket is 200 feet for arterial roadways and 125 feet for collectors. Standard right turn lane storage pocket length is 125 feet for arterial and collector roadways.

**KEY:**
- = Signalized Intersection
- = Roundabout
- = Stop Sign
- YYY = Storage Pocket Length in Feet
- * = Trap Turn Lane

**Kalaeloa Roadway Master Plan Study**

## Proposed Intersection Configuration and Standard Turn Lane Storage Pocket Lengths Under Buildout Conditions

September 2019
SD15-0169

**FIGURE 3B**

Exhibit 2

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:

DEP-HWY 5.2020

March 3, 2020

Ms. Kathy Sokugawa
Acting Director
Department of Planning and Permitting
650 South King Street
Honolulu, Hawaii 96813

Dear Ms. Sokugawa:

Subject: State Department of Transportation (DOT) Review of Franklin D. Roosevelt Improvements from West Perimeter Road to Enterprise Memorandum of Understanding dated July 25, 2016

We understand that Hawaii Community Development Authority (HCDA) and Hunt Companies Inc are in the process of developing Kalaeloa (previously known as Barbers Point Naval Station). As part of the subject Memorandum of Understanding (MOU), Franklin D. Roosevelt Avenue from West Perimeter Road to Enterprise will be turned over to the City & County of Honolulu and DOT will no longer have jurisdiction.

Therefore, DOT, Highways Division hereby waives review of subdivision applications related to land along Franklin D. Roosevelt Avenue as the portion of Roosevelt Avenue that is owned by DOT which is to be conveyed to HCDA and designed to City & County standards, per the MOU executed on July 25, 2016 between the City & County of Honolulu, HCDA and DOT.

Please call me at (808) 587-2156, or email me at edwin.h.sniffen@hawaii.gov if you have any questions.

Sincerely,

Edwin Sniffen
Deputy Director, Department of Transportation

cc: Mr. Mario Siu-Li, Subdivision Branch
Mr. Lance Watanabe, Traffic Review Branch
Mr. Garett Kamemoto, Interim Executive Director, HCDA

Attachment

THE OUTDOOR CIRCLE

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Operations Director

Myles Ritchie
Programs Director

Helping to keep Hawai'i clean, green, and beautiful since 1912

Mr. Keith Kawaoka, Acting Director
Office of Environmental Quality Control
State Office Tower
235 South Beretania Street, Room 702
Honolulu, Hawai'i 96813-2437

March 9, 2020

RE: Comments on HCDA/Hunt Kalaeloa Subdivision Roads District Corp Application for Roadway Construction in former Kalaeloa Airfield-- **Submittal of Draft Environmental Assessment Pursuant to Hawai'i Revised Statutes, Chapter 343 Hunt Kalaeloa Subdivision Roads District of 'Ewa, Island of O'ahu, Hawai'i**

Dear Acting Director Kawaoka,

The Outdoor Circle wishes to express its deep concern about the potential loss of large and healthy trees which have been existent on this parcel for decades and would like to see protection for these trees before any permissions, permits or green lights are granted for redevelopment of the parcel.. Given our city and state goals of increasing, not decreasing canopy tree coverage for the huge number of ecosystem service benefits trees, especially larger trees provide, any permits to proceed with this work should only be granted with protection and preservation of large trees on this parcel, or any parcel which comes up for redevelopment.

It is simple to move a roadway and protect trees. A qualified and certified arborist should be present during planning and construction to ensure that tree canopies and roots are not impacted negatively during this, nor future development plans.

In addition, the survey conducted mentioned 7 species of birds protected by the Migratory Bird Treaty Act of 1918. The native Pueo Owl, may also hunt and nest in the area, as is noted in the survey submitted for this petition. Destruction of habitat, especially trees in which to rest or seek prey, is, by its very nature, detrimental to these species. Similarly, the Hawaiian Hoary Bat ('ōpe'ape'a) may use the trees as roosting sites, as noted in the survey, and surely we can accommodate the remaining trees for these animals as this land is developed.

It is for these reasons that we ask that any permits or permissions be granted only after we are able to work with Hunt and other developers to ensure that the trees are protected by moving potential roadways as needed.

Thank you for the opportunity to submit these comments.

Winston Welch

Winston Welch
Executive Director

1314 S. King Street #306 | Honolulu, Hawai'i 96814
T: 808-593-0300 | mail@outdoorcircle.org | www.outdoorcircle.org

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Winston Welch
Executive Director
The Outdoor Circle
1314 S. King Street #306
Honolulu, Hawaiʻi 96814

Dear Mr. Welch:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 9, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

1. *Any permits to proceed with this work should only be granted with protection and preservation of large trees on this parcel, or any parcel which comes up for redevelopment.*

   *A qualified and certified arborist should be present during planning and construction to ensure that tree canopies and roots are not impacted negatively during this, nor future development plans.*

HCDA appreciates the suggestion that a certified arborist be consulted during the planning and implementation of the current and future projects. This recommendation will be included in the FEA.

2. *The survey conducted mentioned 7 species of birds protected by the Migratory Bird Treaty Act of 1918. The native Pueo Owl, may also hunt and nest in the area, as is noted in the survey submitted for this petition. Destruction of habitat, especially trees in which to rest or seek prey, is, by its very nature, detrimental to these species. Similarly, the Hawaiian Hoary Bat (ʻōpeʻapeʻa) may use the trees as roosting sites, as noted in the survey, and surely we can accommodate the remaining trees for these animals as this land is developed.*

   *It is for these reasons that we ask that any permits or permissions be granted only after we are able to work with Hunt and other developers to ensure that the trees are protected by moving potential roadways as needed.*

The Outdoor Circle will continue to be consulted during the planning and implementation of this project.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the Final EA. Should you have any questions, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

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Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

March 9, 2020

Mr. Brian Takeda
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

Subject: Your Letter Dated February 6, 2020 Requesting Comments on the Revised Draft Environmental Assessment for the Hunt Kalaeloa Subdivision Roads Project in Kalaeloa – Tax Map Key: 9-1-013: 002, 003, 004, 010, 026, 093, 107, 128, 129; 9-1-015: 013, 028, 029, 032; 9-1-016: 027, 035; 9-1-118: 013, 014; 9-1-148: 011, 031; 9-1-160: 006, 009, 012, 013, 015, 018, 036

Thank you for the opportunity to comment on the proposed roadway improvement project.

The Honolulu Board of Water Supply does not have any water system located within the project area. All potable, non-potable, and fire protection water services shall be provided by the private water system serving the area.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 22, 2020

Ernest Y. W. Lau, P.E.
Manager and Chief Engineer
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

Dear Mr. Lau:

Subject: **Response to Comments for Hawai'i Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, 'Ewa, O'ahu, Hawai'i**

On behalf of the Hawai'i Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 9, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

> *The Honolulu Board of Water Supply does not have any water system located within the project area. All potable, non-potable, and fire protection water services shall be provided by the private water system serving the area.*

This comment is acknowledged and is noted in the project's Draft EA in *Section 5.14.2 Utilities Water Supply* wherein it is stated that the BWS does not have any existing water systems within the project site.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be incorporated into the preparation of the project's Final EA for this project. Should you have any questions or further comments, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies

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

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 20-151

March 17, 2020

Mr. Brian Takeda
R. M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

Subject: Draft Environmental Assessment (DEA) for Hunt Kalaeloa Subdivision Roads Project

Thank you for the opportunity to review and comment on the subject project.

Our comments are as follows:

- In regards to roadway improvements, please consider resurfacing all asphaltic concrete bus stop area(s) along this stretch of Kapolei Parkway, to 2" asphalt concrete over 8" asphalt base course or better.

- During construction and upon completion of project; any damages/deficiencies along the sidewalks and/or roadways on Kapolei Parkway, Hornet Avenue, Boxer Road, Copahee Avenue, and Saratoga Avenue shall be repaired to City Standards and accepted by the City and at no cost to the City and County of Honolulu.

- Please note that Fort Barrette Road is under the jurisdiction of the State of Hawaii, Department of Transportation.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

for Ross S. Sasamura, P.E.
Director and Chief Engineer

2024 North King Street
Suite 200
Honolulu Hawaii 96819-3470
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
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Environmental Services
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Surveying
Construction Management

August 22, 2020

Ross S. Sasamura, P.E.
Director and Chief Engineer
City and County of Honolulu
1000 Uluohia Street, Suite 215
Kapolei, Hawaiʻi 96707

Dear Mr. Sasamura:

Subject: **Response to Comments for Hawaiʻi Revised Statutes, Chapter 343, Draft Environmental Assessment (EA) for Hunt Kalaeloa Subdivision Roads Project, Kalaeloa, ʻEwa, Oʻahu, Hawaiʻi**

On behalf of the Hawaiʻi Community Development Authority (HCDA), we acknowledge receipt of your letter dated March 17, 2020, concerning the subject project. The following has been prepared in response to your comments (your comments are *italicized* for reference):

- *In regards to roadway improvements, please consider resurfacing all asphaltic concrete bus stop area(s) along this stretch of Kapolei Parkway, to 2" asphalt concrete over 8" asphalt base course or better.*

This comment is acknowledged. The planned roadway improvements will address City and County of Honolulu requirements for the construction and dedication of roads within the public right of way under the subdivision process. Additional improvements outside of the project area may be considered if appropriate and reasonable.

- *During construction and upon completion of project; any damages/deficiencies along the sidewalks and/or roadways on Kapolei Parkway, Hornet Avenue, Boxer Road, Copahee Avenue, and Saratoga Avenue shall be repaired to City Standards and accepted by the City and at no cost to the City and County of Honolulu.*

This comment is acknowledged. Any damage caused as a result of construction activities for the subject project shall be repaired and/or restored to existing conditions at no cost to the City and County of Honolulu.

- *Please note that Fort Barrette Road is under the jurisdiction of the State of Hawaii, Department of Transportation*

This comment regarding the jurisdiction of Fort Barette Road is acknowledged. Please note that Fort Barette Road is outside of our proposed project limit.

We appreciated your review of the subject document and allowing us this opportunity to respond. Your letter and this response will be included in the preparation of the project's Final

EA. Should you have any questions or further comments, please contact me by phone at (808) 842-1133 or by e-mail at BrianT@rmtowill.com.

Sincerely,

Brian Takeda
Planning Project Manager

cc: Ms. Tesha Mālama, HCDA
Ms. Jinny Cheung, Hunt Companies