Attachment Q
Traffic Impact Analysis Report

AES WEST OAHU SOLAR PLUS STORAGE PROJECT

TRAFFIC IMPACT ANALYSIS REPORT

KAPOLEI, OAHU, HAWAII

February 18, 2020

Prepared for:
AES Distributed Energy
282 Century Place, Suite 200
Louisville, CO 80027

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

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

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

TRAFFIC IMPACT ANALYSIS REPORT
AES West Oahu Solar Plus Storage Project
Kapolei, Oahu, Hawaii

1. INTRODUCTION

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

1.1 Project Location

The Project is located in Kapolei on the island of Oahu on parcels of land more specifically identified as TMK: (1) 9-2-002:007. The Project will be located on approximately 80 acres of land within the larger mauka lands parcel owned by the University of Hawaii (UH) West Oahu near Makakilo, mauka (mountain side) of the H-1 freeway (H-1).

See Figure 1.1 for Project Location.

1.2 Project Description

The Project is envisioned to develop a solar and battery storage facility on an approximately 80 acre area within the currently undeveloped UH West Oahu mauka lands parcel. The Project will host a 12.5 megawatt (MW) ground-mounted solar photovoltaic (PV) system, 50 MW-hour battery energy storage system, and related interconnection and ancillary facilities. The site will be accessed from Palehua Road at an existing gated entry located north of the Kualakai Parkway intersection with the H-1 westbound on- and off-ramps. The Project is anticipated to be completed by the end of Year 2021.

See Figure 1.2 for a Preliminary Project Site Plan.

AES WEST OAHU SOLAR PLUS STORAGE PROJECT

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

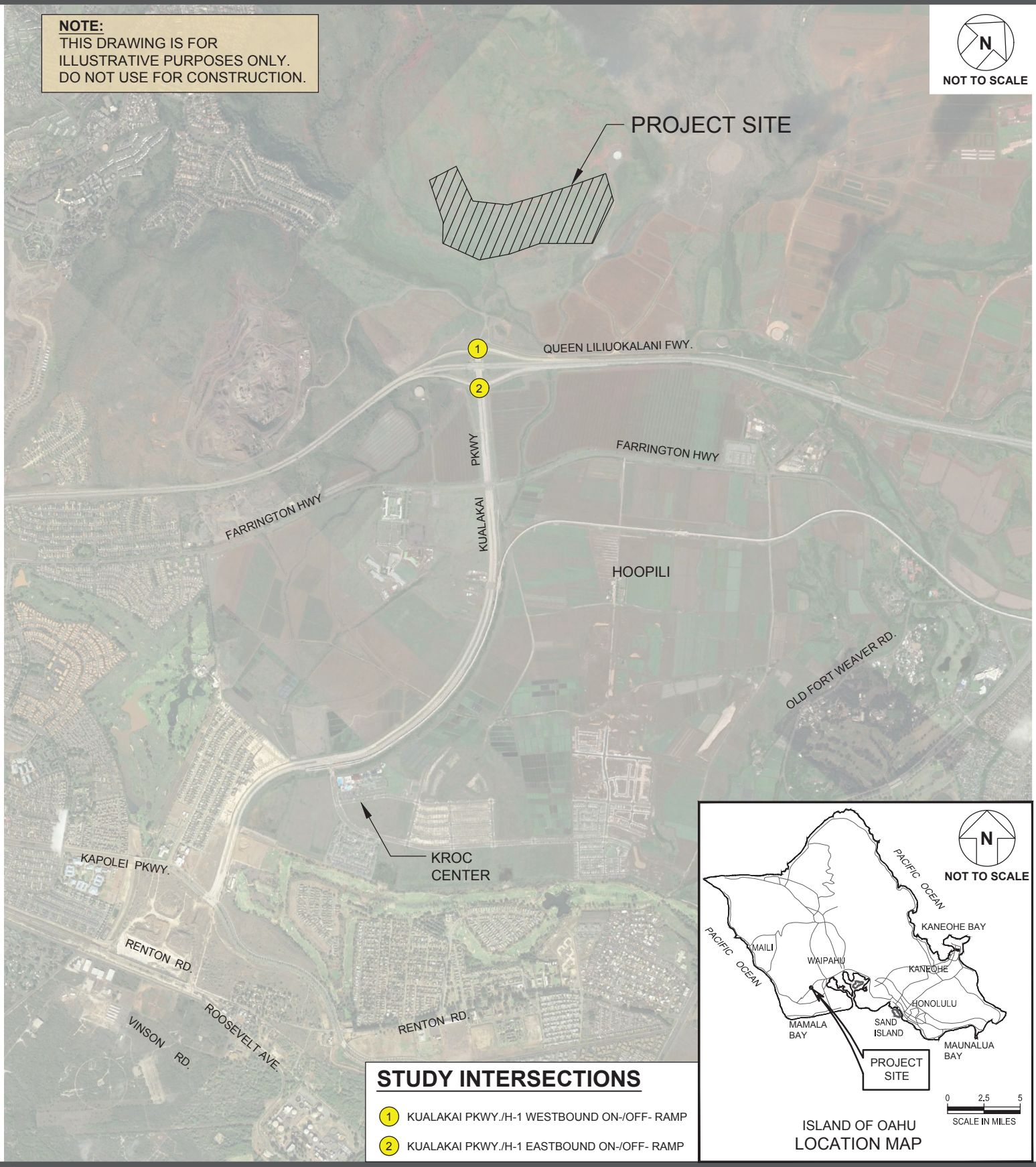
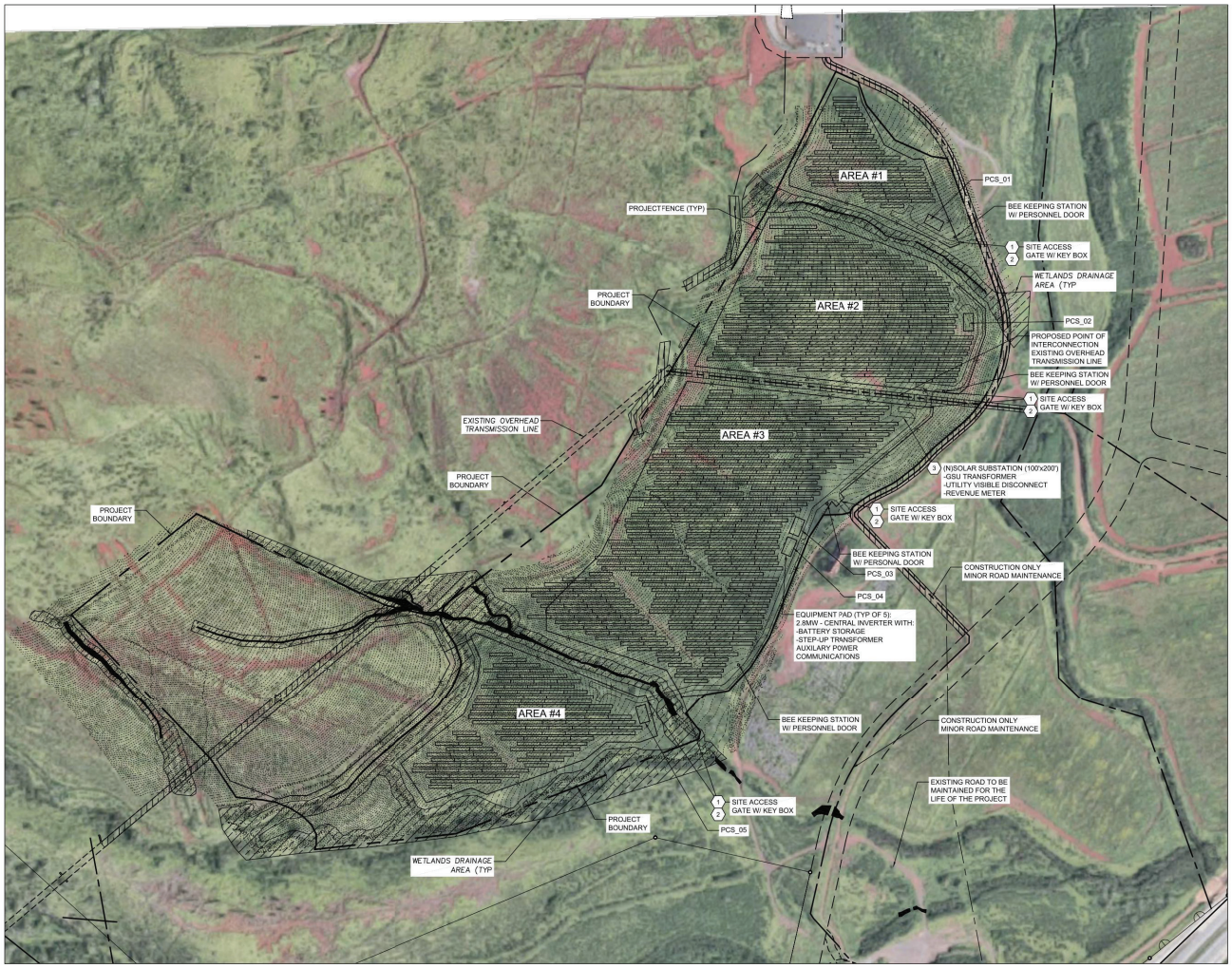


FIGURE 1.1

PROJECT LOCATION



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SITE PLAN OBTAINED FROM AES DISTRIBUTED ENERGY.

LEGEND

PCS — PCS POWER CONVERSION STATION

PCS BOUNDARY

GENERAL NOTES

1. REFER TO CIVIL DRAWINGS FOR PERIMETER FENCE, ROADS AND GATES.
2. REFER TO SOLTEC DRAWINGS FOR TRACKER PILE LOCATIONS.
3. PV SITE WILL NOT HAVE SITE LIGHTING OR SECURITY CAMERAS.

KEYED NOTES

1. CONTRACTOR TO FURNISH AND INSTALL KNOX BOX ACCESS ENCLOSURE AT ENTRANCE TO EVERY ROAD.
2. INSTALL FENCE GROUNDING. SEE E511 FOR DETAILS.
3. SUBSTATION LOCATION IS PENDING, AND SUBJECT TO CHANGE.

DESIGN SPECIFICATIONS

DC SYSTEM VOLTAGE	1500V	
ARRAY CAPACITY	17.407MW DC	
	12.5MW AC POI	
DC/AC RATIO	1.39	
MODULE	JINKO - EAGLE BIFACIAL 4C-72M	
MODULE WATTAGE	405Wp	
MODULE QUANTITY	AREA #1	3,192
	AREA #2	12,656
	AREA #3	20,776
	AREA #4	6,384
	AREA #5	-
	TOTAL	43,008
STRINGS	1,536 STRINGS OF 28 MODULES	
INVERTERS (QTY)	(5) 2.8MW CENTRAL INVERTERS WITH INTEGRAL BESS DC/DC CONVERSION	
BATTERY STORAGE	(10) 1,300kW BATTERY CONTAINERS	
RACKING SYSTEM	FIXED TILT 15°	
AZIMUTH	0°	
PANEL TILT ANGLE	15°	
ROW TO ROW SPACING	21' - 7"	
GROUND COVER RATIO	0.62 (TBC)	
FENCED IN AREA	AREA #1	APPROX. 4.6 ACRES
	AREA #2	APPROX. 13.26 ACRES
	AREA #3	APPROX. 22.04 ACRES
	AREA #4	APPROX. 9.16 ACRES
	AREA #5	APPROX. 7.79 ACRES
	TOTAL	APPROX. 56.23 ACRES

1. MODULES ARE POSITIONED TWO DEEP IN PORTRAIT ORIENTATION.

NOTE: EACH TRACKER CONTAINS (2) STRINGS OF (28) PV MODULES.

2 - TRACKER STRING DETAIL
SCALE: NONE

N
W E
S

SCALE: 1" = 200'
0 200' 400' FT

AES
Distributed Energy

AES Distributed Energy
282 Century Pl. Suite 2000
Louisville, CO 80027 USA

FDR SJ CONSULTING

SYSTEM DESCRIPTION

REVISIONS

REV	BY	DATE	DESCRIPTION

PE STAMP

OVERALL SITE PLAN
WEST OAHU SOLAR
AES DE
OAHU, HI

PROJECT NUMBER
19537
PHASE
ISSUED FOR REVIEW
MILESTONE
30% DESIGN
ELECTRICAL DESIGNER
STRUCTURAL DESIGNER
DATE
12-04-2019
SCALE
1"=200'
TITLE
DRAWING
C200

2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Year 2021 without the Project including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area.
- Trip generation and traffic assignment characteristics during and after construction for the proposed Project.
- Traffic projections for Year 2021 during Project construction, which includes Year 2021 without Project traffic volumes in addition to traffic volumes generated during construction.
- Traffic projections for Year 2021 with the Project, which includes Year 2021 without Project traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations as needed to mitigate any impacts resulting from Year 2021 conditions during construction or at Project completion.

2.2 Intersection Analysis

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

2.3 Study Area Intersection Analysis

Intersection analysis within the Project's study area was performed on the following intersections due to their proximity to the Project:

- Palehua Road/H-1 Freeway Westbound on-/off-ramp (Signalized)
- Kualakai Parkway/H-1 Freeway Eastbound on-/off-ramp (Signalized)

3. EXISTING TRAFFIC CONDITIONS

The existing conditions scenario represents the traffic conditions within the Project area as it currently stands, with no build-out of the Project.

3.1 Roadway System

The following are brief descriptions of the studied roadways within the vicinity of the Project:

Palehua Road is generally a two-way, two-lane, undivided, east-west private roadway that begins at its intersection with the H-1 Westbound on-/off-ramps and terminates to the west as the entrance to Makakilo Quarry. The portion of the roadway nearest the Project Access serves as a haul road for Makakilo Quarry and is used exclusively by local traffic. Currently, there is no posted speed limit.

Kualakai Parkway is generally a two-way, 4-6 lane, divided, north-south State roadway that begins at its intersection with the H-1 Westbound on-/off-ramps and terminates to the south at its intersection with Kapolei Parkway. Kualakai Parkway provides regional access to and from locations such as Hoopili, Ka Makana Alii, and the Kroc Center. The posted speed limit is 35 miles per hour (mph).

H-1 Freeway is generally an east-west, two-way divided freeway which begins to the west in the vicinity of the Palailai Interchange then extends through Kapolei, Ewa, Waipahu, Airport Industrial Area and Central Honolulu before terminating to the east and continuing on as Kalanianaole Highway. The H-1 Freeway is approximately 27.1 miles long.

In the vicinity of the Project the H-1 Freeway is a two-way, six lane divided highway which provides three lanes in each direction with a posted speed limit of 60 miles per hour (mph).

3.2 Existing Traffic Volumes

Traffic data utilized in this report was collected on Thursday, October 24, 2019. Traffic count data is provided in Appendix A. Based on the traffic count data, the weekday AM and PM peak hours of traffic were determined to occur between 6:30 AM and 7:30 AM and between 3:45 PM to 4:45 PM, respectively.

3.3 Existing Observations and Intersection Analysis

Traffic along Kualakai Parkway is generally higher in the northbound direction during the AM peak hour and higher in the southbound direction during the PM peak hour largely due to commuter traffic.

Palehua Road & H-1 Freeway Westbound on-/off-ramp – The signalized intersection operates at LOS B or better during both AM and PM peak hours and does not experience significant delays or queuing during either peak period. All individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

Kualakai Parkway & H-1 Freeway Eastbound on-/off-ramp – The signalized intersection operates at overall LOS A and does not experience significant delays or queuing during the AM or PM peak hours. All individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

No pedestrians were observed during the AM or PM peak hours.

See Figure 3.1 for existing lane configuration, traffic volumes, and LOS for the study intersections. See Table 4.1 for a LOS comparison between Existing Conditions and Year 2021 without Project conditions.

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Engineers & Surveyors

N
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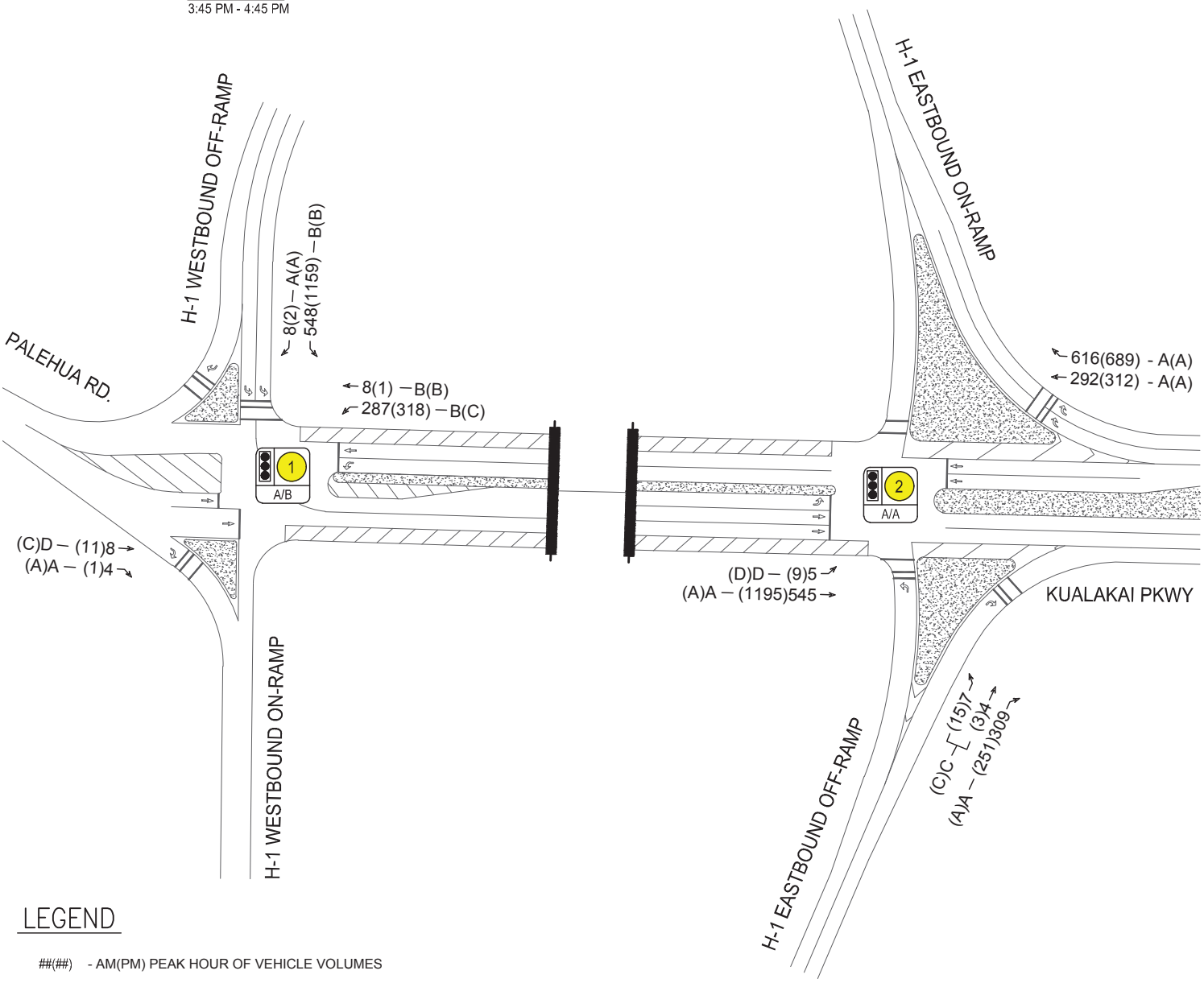
DATE OF COUNTS:
OCTOBER 24, 2019

AM PEAK HOUR:
6:30 AM - 7:30 AM

PM PEAK HOUR:
3:45 PM - 4:45 PM



LEGEND

##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES

Y
X/X
- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) - AM(PM) LOS

FIGURE 3.1

EXISTING CONDITIONS, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

TABLE 3.1: LOS SUMMARY TABLE
EXISTING CONDITIONS

Intersection	Existing Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1. Kualakai Pkwy./Palehua Rd./H1 WB Ramps						
NB LT	15.8	0.75	B	27.8	0.84	C
NB TH	10.9	0.02	B	17.1	0.00	B
WB LT	12.8	0.65	B	15.8	0.82	B
WB RT	-	-	A	-	-	A
SB TH	30.2	0.41	C	39.9	0.45	D
SB RT	-	-	A	-	-	A
OVERALL	13.9	-	A	18.6	-	B
2. Kualakai Pkwy./H1 EB Ramps						
NB TH	7.9	0.36	A	5.6	0.20	A
NB RT	-	-	A	-	-	A
EB LT/TH	28.8	0.52	C	30.7	0.55	C
EB RT	-	-	A	-	-	A
SB LT	48.4	0.51	D	39.2	0.53	D
SB TH	3.8	0.33	A	3.7	0.56	A
OVERALL	5.8	-	A	4.6	-	A

Directions
NB = Northbound approach
SB = Southbound approach
EB = Eastbound approach
WB = Westbound approach

4. YEAR 2021 TRAFFIC CONDITIONS WITHOUT PROJECT

The Year 2021 was selected to reflect the Project completion year. The Base Year 2021 scenario represents the traffic conditions within the study area without the Project. Traffic projections were formulated by applying a defacto growth rate to the existing 2019 traffic count volumes as well as trips generated by known future developments in the vicinity of the Project.

4.1 Defacto Growth Rate

Projections for Year 2021 traffic were based upon the Hawaii Department of Transportation (HDOT) statewide annual count data and Hoopili TIAR, which was revised in 2014 by ATA. This defacto growth rate takes into account the continued development of the Ewa-Kapolei region, including Hoopili. By the Year 2021, Hoopili is anticipated to have completed Phase 1A and be in the process of finishing Phases 1B and 1C. These phases are anticipated to introduce over 3,000 new housing units including single-family housing, multi-family housing, and apartments, as well as neighborhood businesses, a new elementary school and a new high school.

- Kualakai Parkway – From 2014-2019 the annual growth rate was found to be 8% from the HDOT annual count data. This increase was likely due to the completion of Ka Makana Alii (2016), continued expansion of the University of Hawaii West Oahu, as well as other developments in the area. Traffic is anticipated to continue to grow at this rate as Hoopili and other developments are constructed.
- H-1 Eastbound & Westbound Freeway on-/off-ramps – Assumed the same annual growth rate of 8% as Kualakai Parkway during AM(PM) peak hours since all traffic going to and from the on-/off-ramps utilize Kualakai Parkway.

4.2 Planned Roadway Improvements

By Year 2021 without the Project, no major roadway improvements are planned to be constructed in the area. The following roadway improvements have been identified in the ORTP as future roadway improvements that may be constructed beyond Year 2021 and were therefore, not included in this TIAR.

Makakilo Drive Extension – In the vicinity of Palehua Road, Makakilo Drive is to be extended south to the Kualakai Interchange as a four-lane roadway, connecting Makakilo Drive to Kualakai Parkway between 2019-2029. At the time of this report, no information regarding the completion date of the Makakilo Drive Extension was available and was therefore not assumed to be completed prior to the Project.

Kualakai Parkway Extension – Kualakai Parkway is anticipated to be extended from Kapolei Parkway to Franklin D Roosevelt Avenue.

4.3 Year 2021 Analysis without Project

Palehua Road & H-1 Freeway Westbound on-/off-ramp – With the projection of the 8% annual growth rate from 2019 to 2021, the signalized intersection is anticipated to operate at an overall LOS B(C) during AM(PM) peak hours of traffic, respectively. Degradation of LOS from existing conditions can be attributed to background traffic growth in the region as a result of continued

development of West Oahu. However, all movements at the intersection are expected to continue operating at LOS D or better during the AM and PM peak hours of traffic.

Kualakai Parkway & H-1 Freeway Eastbound on-/off-ramp – The signalized intersection is anticipated to continue operating at overall LOS A during the AM and PM peak hours. In addition, all individual movement LOS are expected to remain the same as existing LOS with all approaches operating at LOS D or better during both AM and PM peak hours of traffic.

See Figure 4.1 for base year lane configuration, traffic volumes, and LOS for the study intersections. See Table 4.1 for a LOS comparison between Existing Conditions and Year 2021 without Project conditions.

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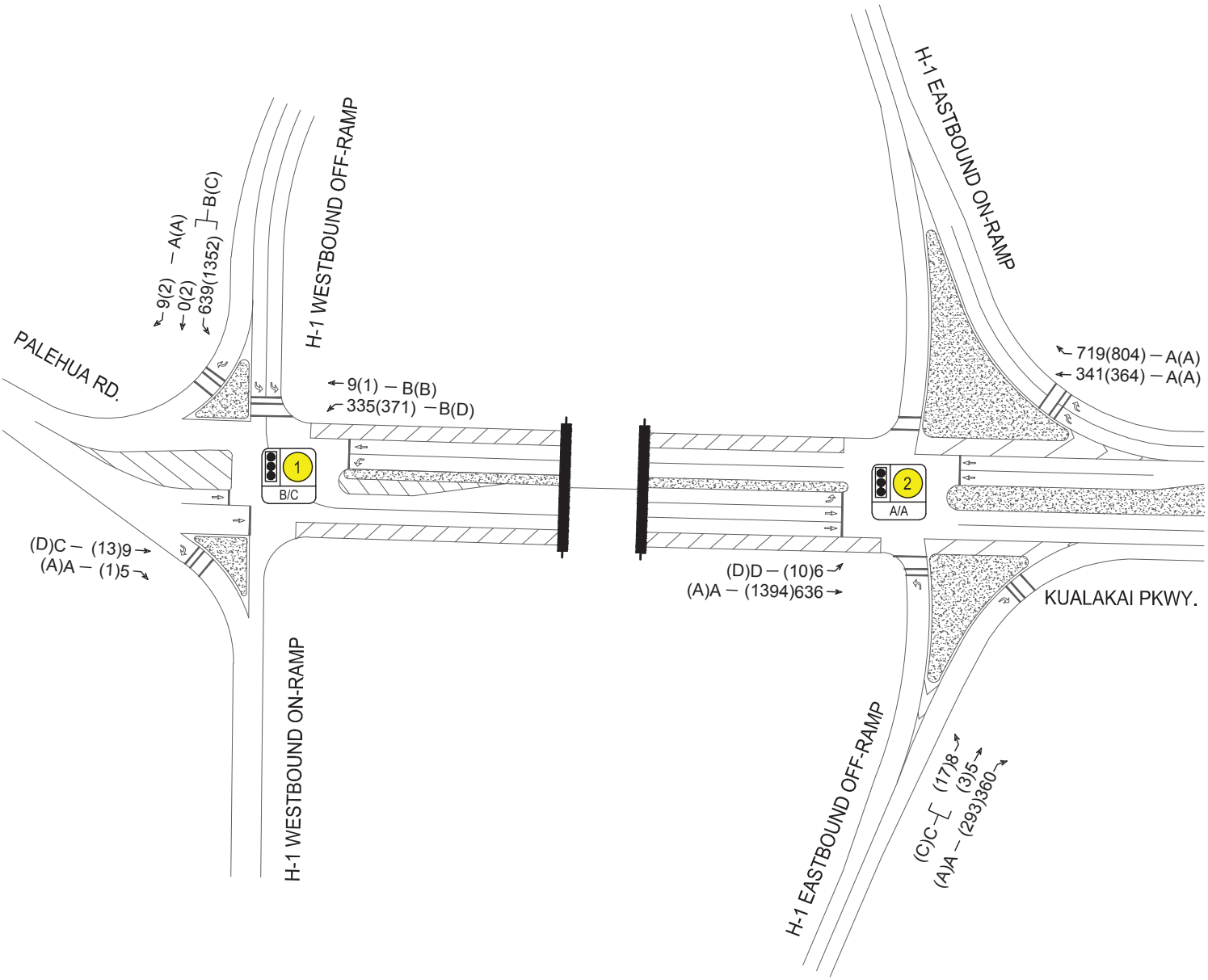

LEGEND

##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES

Y
X/X
- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) - AM(PM) LOS

FIGURE 4.1

YEAR 2021 WITHOUT PROJECT, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

TABLE 4.1: LOS SUMMARY TABLE
EXISTING CONDITIONS VS YEAR 2021 WITHOUT PROJECT CONDITIONS

Intersection	Existing Conditions						Year 2021 without Project					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1. Kualakai Pkwy./Palehua Rd./H1 WB Ramps												
NB LT	15.8	0.75	B	27.8	0.84	C	17.0	0.78	B	42.3	0.90	D
NB TH	10.9	0.02	B	17.1	0.00	B	11.3	0.02	B	19.6	0.00	B
WB LT	12.8	0.65	B	15.8	0.82	B	13.9	0.70	B	22.6	0.90	C
WB RT	-	-	A	-	-	A	-	-	A	-	-	A
SB TH	30.2	0.41	C	39.9	0.45	D	32.0	0.43	C	45.9	0.48	D
SB RT	-	-	A	-	-	A	-	-	A	-	-	A
OVERALL	13.9	-	A	18.6	-	B	15.1	-	B	27.0	-	C
2. Kualakai Pkwy./H1 EB Ramps												
NB TH	7.9	0.36	A	5.6	0.20	A	7.8	0.38	A	4.9	0.20	A
NB RT	-	-	A	-	-	A	-	-	A	-	-	A
EB LT/TH	28.8	0.52	C	30.7	0.55	C	27.3	0.52	C	34.1	0.57	C
EB RT	-	-	A	-	-	A	-	-	A	-	-	A
SB LT	48.4	0.51	D	39.2	0.53	D	40.0	0.52	D	41.8	0.54	D
SB TH	3.8	0.33	A	3.7	0.56	A	3.9	0.38	A	3.6	0.61	A
OVERALL	5.8	-	A	4.6	-	A	5.7	-	A	4.4	-	A

Directions
NB = Northbound approach
SB = Southbound approach
EB = Eastbound approach
WB = Westbound approach

5. YEAR 2021 TRAFFIC CONDITIONS WITH PROJECT

The Year 2021 with project scenario represents the traffic conditions within the Project study area with the full build-out of the Project.

5.1 Background

The Project is envisioned to be a solar and battery storage facility on approximately 80 acres of land. The Project will consist of a 12.5 MW ground-mounted solar PV system with a 50 MW-hour battery energy storage system. The Project is planning to begin construction in late 2020 and complete construction by the end of 2021.

5.2 Trip Distribution

Trips generated during construction or by the Project were assigned throughout the study area generally based upon existing and projected Base Year 2021 travel patterns. The traffic generated by the Project was added to the forecast Base Year 2021 traffic volumes within the vicinity of the Project to constitute the traffic volumes for the Future Year 2021 traffic conditions.

5.3 Year 2021 During Project Construction Conditions

5.3.1 Trip Generation

Information provided by the Client indicates that during construction daily workers on site will range from 10 to 160 workers with an average of 55 daily workers throughout the anticipated 1-year construction schedule.

During construction, an estimated 500 tractor trailer loads (mixture of flat bed and enclosed) will make deliveries to the Project site over the course of the 1-year construction schedule. In addition to the typical tractor trailer loads, a single heavy and wide load delivery will need to be made to the Project site. Due to the size of trailer required as well as its impact to typical traffic patterns, it is assumed that this special transport will be done outside of daily peak hours of traffic and will have no effect on commuter traffic.

Due to the nature of trailer deliveries and its dependence on construction progression and manpower, a worst-case scenario was assumed for the purposes of this study. It is assumed that a maximum of 40 tractor trailers, 20 during both the AM and PM peak hours of traffic, will arrive, unload and depart the project site.

See Table 5.1 below for a summary of construction trip generation and Figure 5.1 for the assignment of construction-generated traffic.

Table 5.1: Construction Trip Generation

	Weekday AM Peak Hour		Weekday PM Peak Hour	
	Enter	Exit	Enter	Exit
Construction Workers	55	0	0	55
Tractor Trailers	20	20	20	20
Total	75	20	20	75

5.3.2 Year 2021 During Project Construction Analysis

Palehua Road & H-1 Freeway Westbound on-/off-ramp – Under worst-case assumptions as stated above, the intersection is expected to continue operating at LOS B(C) during the AM(PM) peak hours, respectively. In addition, all individual movements are expected to continue operating at LOS D or better.

Kualakai Parkway & H-1 Freeway Eastbound on-/off-ramp – The signalized intersection is anticipated to continue operating at overall LOS A during the AM and PM peak hours. In addition, all individual movement LOS are expected to remain the same as existing LOS with all approaches operating at LOS D or better during both AM and PM peak hours of traffic.

The Project site is approximately 80 acres with access off of Palehua Road (private). Due to the ample size of the property as well as the long driveway between Palehua Road and the Project site, it is not expected that any vehicle queues will spill back to the H-1 Westbound intersection and adversely affect traffic operations.

See Figure 5.2 for construction conditions lane configuration, traffic volumes, and LOS for the study intersections. See Table 5.2 for a LOS comparison between Year 2021 without Project conditions and Year 2021 During Project Construction conditions.

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Engineers & Surveyors

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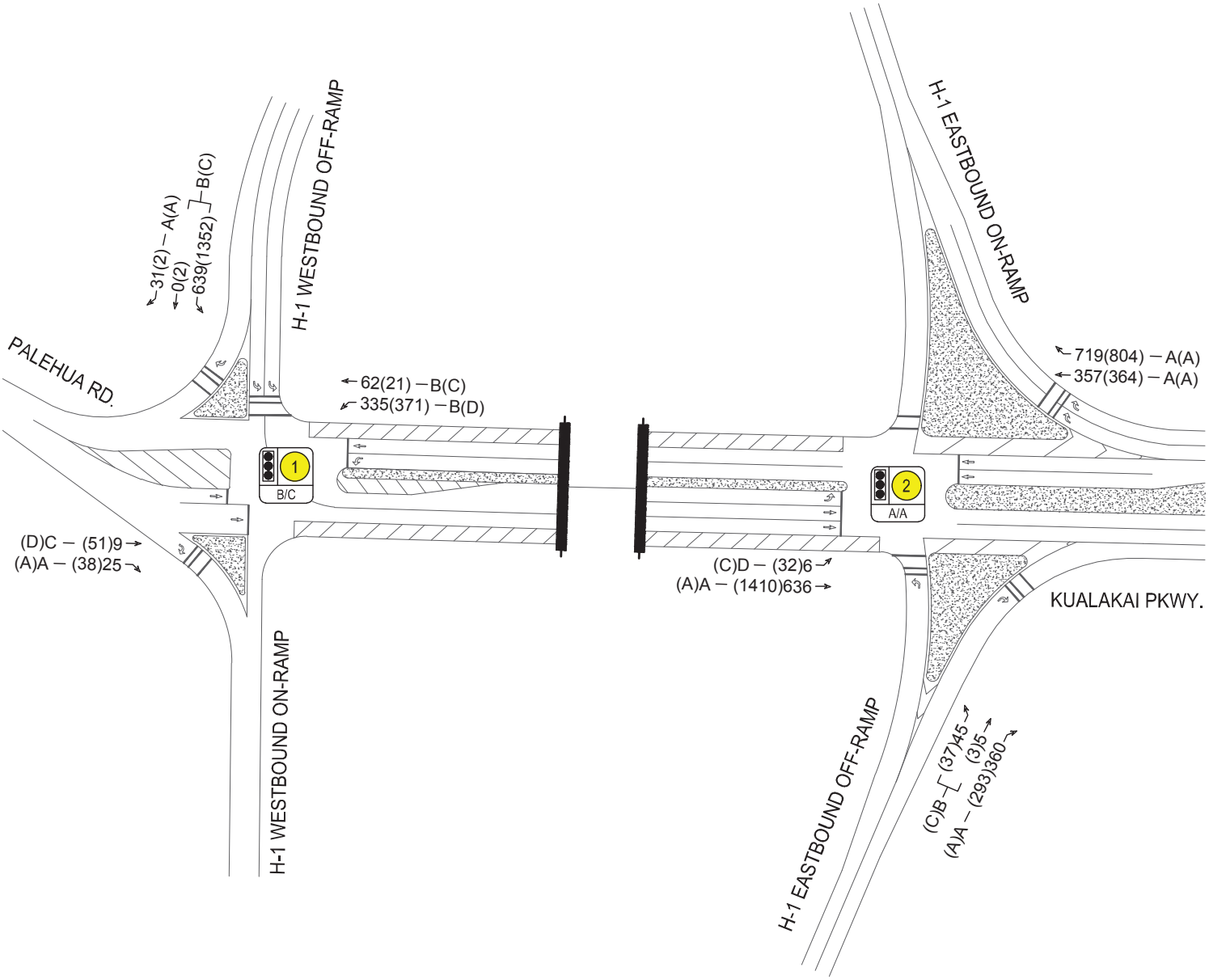

LEGEND

##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES

Y - SIGNALIZED INTERSECTION Y

FIGURE 5.1

YEAR 2021 CONSTRUCTION, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

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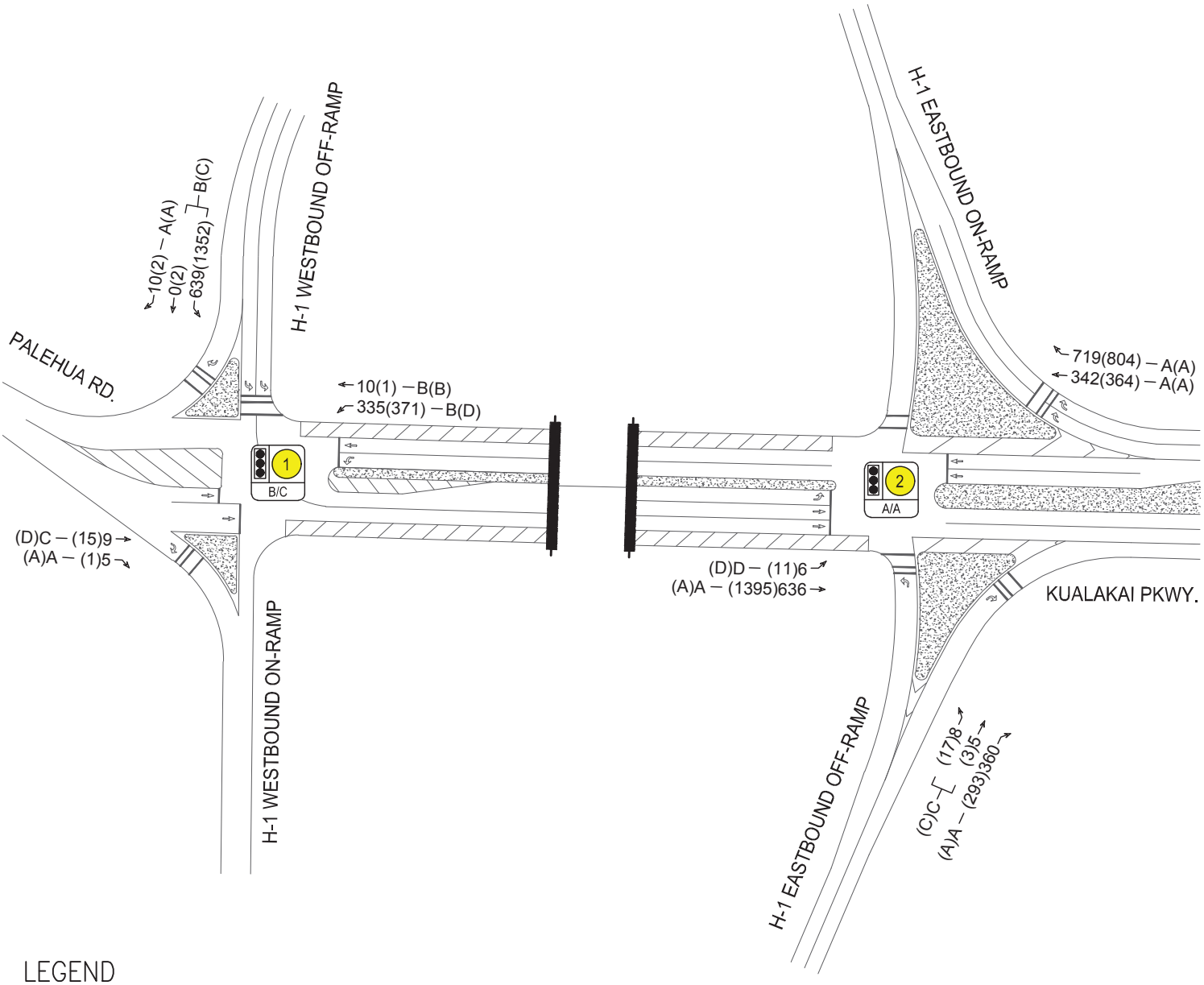


LEGEND

##(##) - AM(PM) PEAK HOUR OF VEHICLE VOLUMES

Y
X/X
- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

X(X) - AM(PM) LOS

FIGURE 5.2

YEAR 2021 WITH PROJECT, LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

5.4 Year 2021 with Project Conditions

5.4.1 Trip Generation

Based upon information provided by the client it is expected that during typical weekday operations of the Project, only two full-time employees will be on site during daytime hours. Therefore, the Project is forecast to only generate 2(2) trips during the AM(PM) peak hours of traffic.

5.4.2 Year 2021 with Project Analysis

Upon completion of the Project, with the inclusion of both the 8% annual growth rate from 2019 to 2021 and the new traffic as a result of the Project, all study intersections are projected to operate at the same overall and individual movement LOS as Year 2021 without Project traffic conditions during the AM and PM peak hours of traffic.

Palehua Road & H-1 Freeway Westbound on-/off-ramp –The signalized intersection is anticipated to operate at an overall LOS B(C) during AM(PM) peak hours of traffic, respectively. All movements at the intersection are expected to continue operating at LOS D or better during the AM and PM peak hours of traffic.

Kualakai Parkway & H-1 Freeway Eastbound on-/off-ramp – The signalized intersection is anticipated to continue operating at overall LOS A during the AM and PM peak hours. In addition, all individual movement LOS are expected to remain the same as existing LOS with all approaches operating at LOS D or better during both AM and PM peak hours of traffic.

See Figure 5.2 for Future Year 2021 with project lane configuration, traffic volumes, and LOS for the study intersections. See Table 5.3 for a LOS comparison between Year 2021 without Project conditions and Year 2021 with Project conditions

TABLE 5.2: LOS SUMMARY TABLE
YEAR 2021 WITHOUT PROJECT VS YEAR 2021 DURING PROJECT CONSTRUCTION CONDITIONS

Intersection	Year 2021 without Project						Year 2021 During Project Construction					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1. Kualakai Pkwy./Palehua Rd./H1 WB Ramps												
NB LT	17.0	0.78	B	42.3	0.90	D	16.6	0.76	B	46.5	0.90	D
NB TH	11.3	0.02	B	19.6	0.00	B	11.7	0.13	B	21.1	0.05	C
WB LT	13.9	0.70	B	22.6	0.90	C	14.2	0.70	B	25.9	0.91	C
WB RT	-	-	A	-	-	A	-	-	A	-	-	A
SB TH	32.0	0.43	C	45.9	0.48	D	32.3	0.43	C	47.1	0.72	D
SB RT	-	-	A	-	-	A	-	-	A	-	-	A
OVERALL	15.1	-	B	27.0	-	C	14.9	-	B	30.7	-	C
2. Kualakai Pkwy./H1 EB Ramps												
NB TH	7.8	0.38	A	4.9	0.20	A	8.3	0.40	A	5.6	0.21	A
NB RT	-	-	A	-	-	A	-	-	A	-	-	A
EB LT/TH	27.3	0.52	C	34.1	0.57	C	19.1	0.61	B	32.0	0.65	C
EB RT	-	-	A	-	-	A	-	-	A	-	-	A
SB LT	40.0	0.52	D	41.8	0.54	D	40.8	0.52	D	32.7	0.63	C
SB TH	3.9	0.38	A	3.6	0.61	A	4.2	0.39	A	3.9	0.62	A
OVERALL	5.7	-	A	4.4	-	A	6.5	-	A	5.3	-	A

Directions
NB = Northbound approach
SB = Southbound approach
EB = Eastbound approach
WB = Westbound approach

TABLE 5.3: LOS SUMMARY TABLE
YEAR 2021 WITHOU PROJECT VS YEAR 2021 WITH PROJECT CONDITIONS

Intersection	Year 2021 without Project						Year 2021 with Project					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1. Kualakai Pkwy./Palehua Rd./H1 WB Ramps												
NB LT	17.0	0.78	B	42.3	0.90	D	17.0	0.78	B	42.6	0.90	D
NB TH	11.3	0.02	B	19.6	0.00	B	11.3	0.02	B	19.7	0.00	B
WB LT	13.9	0.70	B	22.6	0.90	C	13.9	0.70	B	22.8	0.90	C
WB RT	-	-	A	-	-	A	-	-	A	-	-	A
SB TH	32.0	0.43	C	45.9	0.48	D	32.0	0.43	C	45.6	0.50	D
SB RT	-	-	A	-	-	A	-	-	A	-	-	A
OVERALL	15.1	-	B	27.0	-	C	15.1	-	B	27.0	-	C
2. Kualakai Pkwy./H1 EB Ramps												
NB TH	7.8	0.38	A	4.9	0.20	A	7.8	0.39	A	4.9	0.20	A
NB RT	-	-	A	-	-	A	-	-	A	-	-	A
EB LT/TH	27.3	0.52	C	34.1	0.57	C	27.3	0.52	C	34.2	0.57	C
EB RT	-	-	A	-	-	A	-	-	A	-	-	A
SB LT	40.0	0.52	D	41.8	0.54	D	40.0	0.52	D	40.5	0.54	D
SB TH	3.9	0.38	A	3.6	0.61	A	3.9	0.38	A	3.6	0.61	A
OVERALL	5.7	-	A	4.4	-	A	5.7	-	A	4.4	-	A

Directions
NB = Northbound approach
SB = Southbound approach
EB = Eastbound approach
WB = Westbound approach

6. CONCLUSIONS

The Project is envisioned to be a solar and battery storage facility within the currently undeveloped UH West Oahu mauka lands parcel in Kapolei. Vehicular access to the Project will be provided via Palehua Road at an existing gated entry located north of the Kualakai Parkway intersection with the H-1 westbound on- and off-ramps. The Project is anticipated to be completed by the end of Year 2021.

6.1 Existing Conditions

- Palehua Road & H-1 Westbound on-/off-ramp currently operates at LOS A(B) during the AM(PM) peak hours of traffic, respectively. Additionally, all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

- Kualakai Parkway & H-1 Eastbound on-/off-ramp currently operates at LOS A during both the AM and PM peak hours of traffic. Additionally, all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

6.2 Year 2021 without Project Conditions

Based upon HDOT annual traffic data, the Hoopili TIAR and Traffic Counts taken by ATA, the annual growth rate for the study roadways was determined to be 8%. This growth rate takes into account the continued development of the West Oahu including Hoopili and the University of Hawaii West Oahu campus as well as other developments.

With the inclusion of the 8% annual growth rate from 2019 to 2021,

- Palehua Road & H-1 Westbound on-/off-ramp intersection is projected to operate at LOS B(C) during the AM(PM) peak hours of traffic. Similar to existing conditions all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

- Kualakai Parkway & H-1 Eastbound on-/off-ramp intersection is projected to operate at LOS A during both AM and PM peak hours. Similar to existing conditions all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

6.3 Year 2021 During Project Construction Conditions

During construction, information provided by the client indicates that construction worker presence will vary from 10-160 daily workers with a daily average of 55 workers. In addition, tractor trailers will also be making deliveries to the Project site. A worst-case scenario was assumed for tractor trailer deliveries with 20 deliveries occurring in both the AM and PM peak hours of traffic.

With the inclusion of construction traffic into Year 2021 without Project volumes,

- Palehua Road & H-1 Westbound on-/off-ramp intersection is projected to operate at LOS B(C) during the AM(PM) peak hours of traffic. Similar to Year 2021 without Project

conditions all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

- Kualakai Parkway & H-1 Eastbound on-/off-ramp intersection is projected to operate at LOS A during both AM and PM peak hours. Similar to Year 2021 without Project conditions all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

Due to the large amount of on-site space and driveway length, it is not expected that vehicle queues will spill back to the H-1 Westbound intersection and adversely affect traffic operations.

6.4 Year 2021 with Project Conditions

Upon completion the Project will only have 2 full-time employees on site during typical weekday operations. Therefore, the Project is forecast to only generate 2(2) trips during the AM(PM) peak hours of traffic. These additional trips are anticipated to have no impact on Year 2021 without Project traffic. Therefore, upon completion of the Project, all study intersections are anticipated to operate with the same LOS as Year 2021 without Project traffic conditions.

With the inclusion of the 8% annual growth rate from 2019 to 2021,

- Palehua Road & H-1 Westbound on-/off-ramp intersection is projected to operate at LOS B(C) during the AM(PM) peak hours of traffic. Similar to Year 2021 without Project conditions all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

- Kualakai Parkway & H-1 Eastbound on-/off-ramp intersection is projected to operate at LOS A during both AM and PM peak hours. Similar to Year 2021 without Project conditions all individual movements currently operate at LOS D or better during the AM and PM peak hours of traffic.

As a result of this report, it is found that the Project during construction or upon completion will have no significant impact on the surrounding facilities.

7. REFERENCES

1. Austin Tsutsumi & Associates, Roadway Master Plan Report Hoopili, August 31, 2016.

2. Austin Tsutsumi & Associates, Traffic Impact Analysis Report Hoopili, Updated May 30, 2014.

APPENDICES

APPENDIX A

TRAFFIC COUNT DATA

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Kualakai Pkwy - H-1 West On and Off-Ramp
Site Code : West Oahu Solar
Start Date : 10/24/2019

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

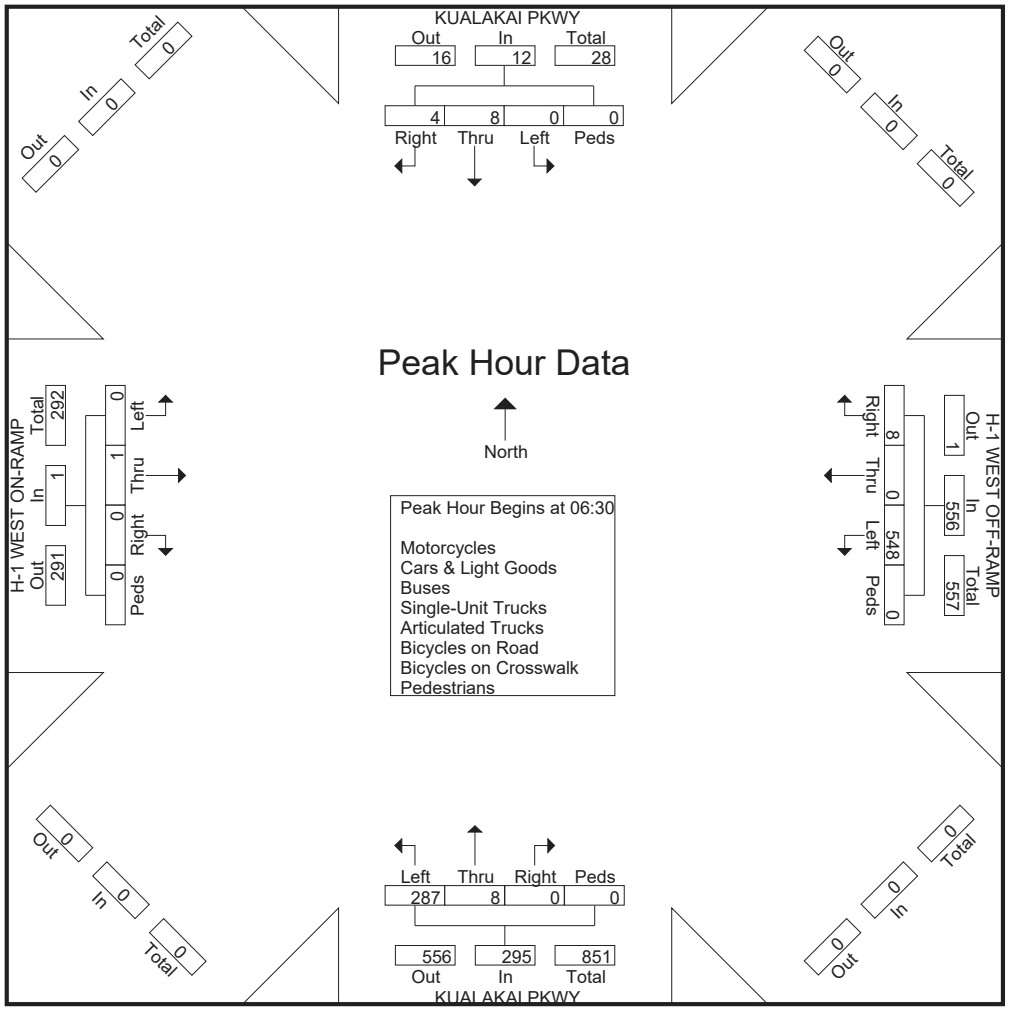
	KUALAKAI PKWY SOUTHBOUND				H-1 WEST OFF-RAMP WESTBOUND				KUALAKAI PKWY NORTHBOUND				H-1 WEST ON-RAMP EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00	0	0	0	0	137	0	4	0	31	5	0	0	0	0	0	0	177
06:15	0	0	0	0	131	0	5	0	48	4	0	0	0	0	0	0	188
06:30	0	0	1	0	160	0	4	0	65	3	0	0	0	0	0	0	233
06:45	0	3	0	0	149	0	1	0	74	3	0	0	0	0	0	0	230
Total	0	3	1	0	577	0	14	0	218	15	0	0	0	0	0	0	828
07:00	0	4	1	0	116	0	2	0	69	0	0	0	0	1	0	0	193
07:15	0	1	2	0	123	0	1	0	79	2	0	0	0	0	0	0	208
07:30	0	1	3	0	148	0	2	0	104	3	0	0	0	0	0	0	261
07:45	0	3	2	0	148	0	2	0	60	1	0	0	0	0	0	0	216
Total	0	9	8	0	535	0	7	0	312	6	0	0	0	1	0	0	878
08:00	0	1	2	0	140	0	1	0	76	1	0	0	0	0	0	0	221
08:15	0	1	2	0	129	0	2	0	53	3	0	0	0	0	0	0	190
08:30	0	3	2	0	133	0	3	0	46	3	0	0	0	0	0	0	190
08:45	0	3	5	0	119	1	3	0	32	4	0	0	0	0	0	0	167
Total	0	8	11	0	521	1	9	0	207	11	0	0	0	0	0	0	768
Grand Total	0	20	20	0	1633	1	30	0	737	32	0	0	0	1	0	0	2474
Apprch %	0	50	50	0	98.1	0.1	1.8	0	95.8	4.2	0	0	0	100	0	0	
Total %	0	0.8	0.8	0	66	0	1.2	0	29.8	1.3	0	0	0	0	0	0	
Motorcycles	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
% Motorcycles	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0.1
Cars & Light Goods	0	3	5	0	1589	1	14	0	686	12	0	0	0	0	0	0	2310
% Cars & Light Goods	0	15	25	0	97.3	100	46.7	0	93.1	37.5	0	0	0	0	0	0	93.4
Buses	0	0	0	0	2	0	0	0	6	0	0	0	0	0	0	0	8
% Buses	0	0	0	0	0.1	0	0	0	0.8	0	0	0	0	0	0	0	0.3
Single-Unit Trucks	0	13	9	0	36	0	11	0	39	15	0	0	0	1	0	0	124
% Single-Unit Trucks	0	65	45	0	2.2	0	36.7	0	5.3	46.9	0	0	0	100	0	0	5
Articulated Trucks	0	3	6	0	5	0	5	0	5	5	0	0	0	0	0	0	29
% Articulated Trucks	0	15	30	0	0.3	0	16.7	0	0.7	15.6	0	0	0	0	0	0	1.2
Bicycles on Road	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Kualakai Pkwy - H-1 West On and Off-Ramp
Site Code : West Oahu Solar
Start Date : 10/24/2019
Page No : 2

	KUALAKAI PKWY SOUTHBOUND					H-1 WEST OFF-RAMP WESTBOUND					KUALAKAI PKWY NORTHBOUND					H-1 WEST ON-RAMP EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:30																					
06:30	0	0	1	0	1	**160**	0	**4**	0	**164**	65	**3**	0	0	68	0	0	0	0	0	**233**
06:45	0	3	0	0	3	149	0	1	0	150	74	3	0	0	77	0	0	0	0	0	230
07:00	0	**4**	1	0	**5**	116	0	2	0	118	69	0	0	0	69	0	**1**	0	0	**1**	193
07:15	0	1	**2**	0	3	123	0	1	0	124	**79**	2	0	0	**81**	0	0	0	0	0	208
Total Volume	0	8	4	0	12	548	0	8	0	556	287	8	0	0	295	0	1	0	0	1	864
% App. Total	0	66.7	33.3	0		98.6	0	1.4	0		97.3	2.7	0	0		0	100	0	0		
PHF	.000	.500	.500	.000	.600	.856	.000	.500	.000	.848	.908	.667	.000	.000	.910	.000	.250	.000	.000	.250	.927



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

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Site Code : West Oahu Solar
Start Date : 10/24/2019
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KUALAKAI PKWY SOUTHBOUND				H-1 WEST OFF-RAMP WESTBOUND				KUALAKAI PKWY NORTHBOUND				H-1 WEST ON-RAMP EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:00	0	6	7	0	212	1	1	0	76	0	0	0	0	0	0	0	303
15:15	0	2	1	0	234	1	0	0	66	2	0	0	0	0	0	0	306
15:30	0	3	0	0	267	1	1	0	80	0	0	0	0	0	0	0	352
15:45	0	4	0	0	300	0	0	0	112	0	0	0	0	0	0	0	416
Total	0	15	8	0	1013	3	2	0	334	2	0	0	0	0	0	0	1377
16:00	0	2	0	0	256	1	2	0	62	1	0	0	0	0	0	0	324
16:15	0	0	1	0	295	1	0	0	77	0	0	0	0	0	0	0	374
16:30	0	5	0	0	308	0	0	0	67	0	0	0	0	0	0	0	380
16:45	0	1	1	0	306	0	0	0	58	0	0	0	0	0	0	0	366
Total	0	8	2	0	1165	2	2	0	264	1	0	0	0	0	0	0	1444
17:00	0	2	1	0	293	1	0	0	59	0	0	0	0	0	0	0	356
17:15	0	0	0	0	299	0	0	0	68	0	0	0	0	0	0	0	367
17:30	0	0	0	0	298	1	0	0	54	0	0	0	0	0	0	0	353
17:45	0	1	1	0	279	0	0	0	46	0	0	0	0	1	0	0	328
Total	0	3	2	0	1169	2	0	0	227	0	0	0	0	1	0	0	1404
Grand Total	0	26	12	0	3347	7	4	0	825	3	0	0	0	1	0	0	4225
Apprch %	0	68.4	31.6	0	99.7	0.2	0.1	0	99.6	0.4	0	0	0	100	0	0	
Total %	0	0.6	0.3	0	79.2	0.2	0.1	0	19.5	0.1	0	0	0	0	0	0	
Motorcycles	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	17
% Motorcycles	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0.4
Cars & Light Goods	0	25	11	0	3306	6	3	0	808	3	0	0	0	1	0	0	4163
% Cars & Light Goods	0	96.2	91.7	0	98.8	85.7	75	0	97.9	100	0	0	0	100	0	0	98.5
Buses	0	0	0	0	5	0	0	0	4	0	0	0	0	0	0	0	9
% Buses	0	0	0	0	0.1	0	0	0	0.5	0	0	0	0	0	0	0	0.2
Single-Unit Trucks	0	1	1	0	18	0	1	0	7	0	0	0	0	0	0	0	28
% Single-Unit Trucks	0	3.8	8.3	0	0.5	0	25	0	0.8	0	0	0	0	0	0	0	0.7
Articulated Trucks	0	0	0	0	0	1	0	0	6	0	0	0	0	0	0	0	7
% Articulated Trucks	0	0	0	0	0	14.3	0	0	0.7	0	0	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
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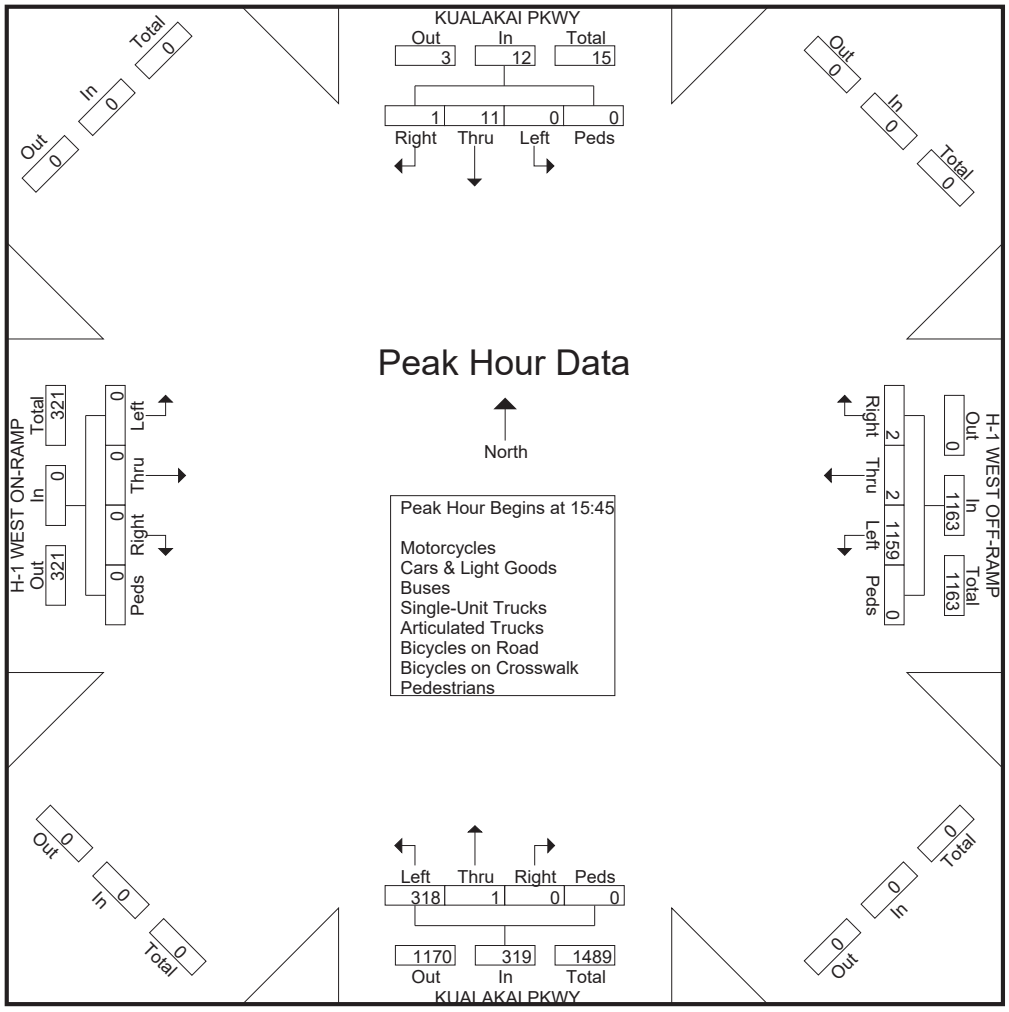
File Name : Kualakai Pkwy - H-1 West On and Off-Ramp
Site Code : West Oahu Solar
Start Date : 10/24/2019
Page No : 2

	KUALAKAI PKWY SOUTHBOUND					H-1 WEST OFF-RAMP WESTBOUND					KUALAKAI PKWY NORTHBOUND					H-1 WEST ON-RAMP EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:45																					
15:45	0	4	0	0	4	300	0	0	0	300	**112**	0	0	0	**112**	0	0	0	0	0	**416**
16:00	0	2	0	0	2	256	**1**	**2**	0	259	62	**1**	0	0	63	0	0	0	0	0	324
16:15	0	0	**1**	0	1	295	1	0	0	296	77	0	0	0	77	0	0	0	0	0	374
16:30	0	**5**	0	0	**5**	**308**	0	0	0	**308**	67	0	0	0	67	0	0	0	0	0	380
Total Volume	0	11	1	0	12	1159	2	2	0	1163	318	1	0	0	319	0	0	0	0	0	1494
% App. Total	0	91.7	8.3	0		99.7	0.2	0.2	0		99.7	0.3	0	0		0	0	0	0		
PHF	.000	.550	.250	.000	.600	.941	.500	.250	.000	.944	.710	.250	.000	.000	.712	.000	.000	.000	.000	.000	.898



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Kualakai Pkwy - H-1 East On and Off-Ramp
Site Code : West Oahu Solar
Start Date : 10/24/2019

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KUALAKAI PKWY SOUTHBOUND				H-1 EAST ON-RAMP WESTBOUND				KUALAKAI PKWY NORTHBOUND				H-1 EAST OFF-RAMP EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:00	0	138	0	0	0	0	0	0	0	29	223	0	5	0	46	0	441
06:15	0	134	0	0	0	0	0	0	0	50	181	0	3	2	66	0	436
06:30	0	158	0	0	0	0	0	0	0	73	174	0	3	1	91	0	500
06:45	1	156	0	0	0	0	0	0	0	66	166	0	3	1	74	0	467
Total	1	586	0	0	0	0	0	0	0	218	744	0	14	4	277	0	1844
07:00	4	108	0	0	0	0	0	0	0	69	110	0	0	1	65	0	357
07:15	0	123	0	0	0	0	0	0	0	84	166	0	1	1	79	0	454
07:30	1	149	0	0	0	0	0	0	0	102	137	0	3	0	69	0	461
07:45	4	148	0	0	0	0	0	0	0	61	138	0	1	0	61	0	413
Total	9	528	0	0	0	0	0	0	0	316	551	0	5	2	274	0	1685
08:00	1	131	0	0	0	0	0	0	0	75	170	0	3	0	62	0	442
08:15	4	135	0	0	0	0	0	0	0	51	167	0	3	0	47	0	407
08:30	3	135	0	0	0	0	0	0	0	45	132	0	6	0	34	0	355
08:45	3	122	0	0	0	0	0	0	0	32	121	0	5	0	42	0	325
Total	11	523	0	0	0	0	0	0	0	203	590	0	17	0	185	0	1529
Grand Total	21	1637	0	0	0	0	0	0	0	737	1885	0	36	6	736	0	5058
Apprch %	1.3	98.7	0	0	0	0	0	0	0	28.1	71.9	0	4.6	0.8	94.6	0	
Total %	0.4	32.4	0	0	0	0	0	0	0	14.6	37.3	0	0.7	0.1	14.6	0	
Motorcycles	0	1	0	0	0	0	0	0	0	4	8	0	0	0	0	0	13
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0.5	0.4	0	0	0	0	0	0.3
Cars & Light Goods	9	1595	0	0	0	0	0	0	0	678	1851	0	20	4	697	0	4854
% Cars & Light Goods	42.9	97.4	0	0	0	0	0	0	0	92	98.2	0	55.6	66.7	94.7	0	96
Buses	0	2	0	0	0	0	0	0	0	6	8	0	0	0	7	0	23
% Buses	0	0.1	0	0	0	0	0	0	0	0.8	0.4	0	0	0	1	0	0.5
Single-Unit Trucks	9	32	0	0	0	0	0	0	0	42	16	0	13	0	29	0	141
% Single-Unit Trucks	42.9	2	0	0	0	0	0	0	0	5.7	0.8	0	36.1	0	3.9	0	2.8
Articulated Trucks	3	5	0	0	0	0	0	0	0	6	2	0	3	2	3	0	24
% Articulated Trucks	14.3	0.3	0	0	0	0	0	0	0	0.8	0.1	0	8.3	33.3	0.4	0	0.5
Bicycles on Road	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
% Bicycles on Road	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Kualakai Pkwy - H-1 East On and Off-Ramp
Site Code : West Oahu Solar
Start Date : 10/24/2019
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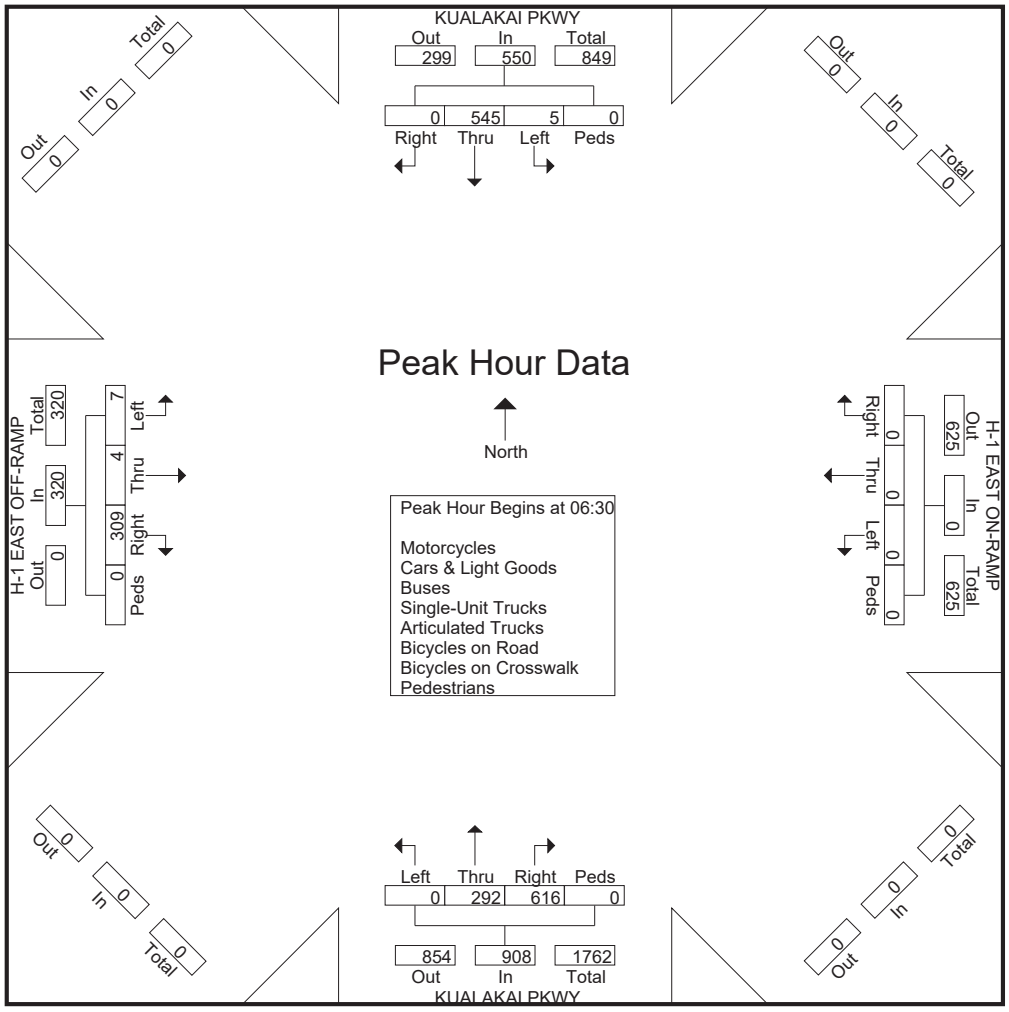
	KUALAKAI PKWY SOUTHBOUND					H-1 EAST ON-RAMP WESTBOUND					KUALAKAI PKWY NORTHBOUND					H-1 EAST OFF-RAMP EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:30																					
06:30	0	**158**	0	0	**158**	0	0	0	0	0	0	73	**174**	0	247	**3**	**1**	**91**	0	**95**	**500**
06:45	1	156	0	0	157	0	0	0	0	0	0	66	166	0	232	3	1	74	0	78	467
07:00	**4**	108	0	0	112	0	0	0	0	0	0	69	110	0	179	0	1	65	0	66	357
07:15	0	123	0	0	123	0	0	0	0	0	0	**84**	166	0	**250**	1	1	79	0	81	454
Total Volume	5	545	0	0	550	0	0	0	0	0	0	292	616	0	908	7	4	309	0	320	1778
% App. Total	0.9	99.1	0	0		0	0	0	0		0	32.2	67.8	0		2.2	1.2	96.6	0		
PHF	.313	.862	.000	.000	.870	.000	.000	.000	.000	.000	.000	.869	.885	.000	.908	.583	1.00	.849	.000	.842	.889



Austin Tsutsumi & Associates

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Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

	KUALAKAI PKWY SOUTHBOUND				H-1 EAST ON-RAMP WESTBOUND				KUALAKAI PKWY NORTHBOUND				H-1 EAST OFF-RAMP EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
15:00	5	213	0	0	0	0	0	0	0	68	194	0	3	0	52	0	535
15:15	3	240	0	0	0	0	0	0	0	64	189	0	3	1	47	0	547
15:30	2	267	0	0	0	0	0	0	0	82	251	0	0	0	64	0	666
15:45	2	305	0	0	0	0	0	0	0	111	193	0	4	1	55	0	671
Total	12	1025	0	0	0	0	0	0	0	325	827	0	10	2	218	0	2419
16:00	2	263	0	0	0	0	0	0	0	59	161	0	4	0	59	0	548
16:15	0	302	0	0	0	0	0	0	0	72	165	0	2	2	60	0	603
16:30	5	325	0	0	0	0	0	0	0	70	170	0	5	0	77	0	652
16:45	1	314	0	0	0	0	0	0	0	51	157	0	2	0	74	0	599
Total	8	1204	0	0	0	0	0	0	0	252	653	0	13	2	270	0	2402
17:00	2	294	0	0	0	0	0	0	0	58	151	0	5	0	57	0	567
17:15	1	299	0	0	0	0	0	0	0	63	142	0	1	0	46	0	552
17:30	1	292	0	0	0	0	0	0	0	52	122	0	2	0	42	0	511
17:45	2	289	0	0	0	0	0	0	0	48	119	0	3	1	48	0	510
Total	6	1174	0	0	0	0	0	0	0	221	534	0	11	1	193	0	2140
Grand Total	26	3403	0	0	0	0	0	0	0	798	2014	0	34	5	681	0	6961
Apprch %	0.8	99.2	0	0	0	0	0	0	0	28.4	71.6	0	4.7	0.7	94.6	0	
Total %	0.4	48.9	0	0	0	0	0	0	0	11.5	28.9	0	0.5	0.1	9.8	0	
Motorcycles	0	19	0	0	0	0	0	0	0	0	2	0	0	0	4	0	25
% Motorcycles	0	0.6	0	0	0	0	0	0	0	0	0.1	0	0	0	0.6	0	0.4
Cars & Light Goods	24	3365	0	0	0	0	0	0	0	781	1980	0	33	5	673	0	6861
% Cars & Light Goods	92.3	98.9	0	0	0	0	0	0	0	97.9	98.3	0	97.1	100	98.8	0	98.6
Buses	1	4	0	0	0	0	0	0	0	4	2	0	0	0	1	0	12
% Buses	3.8	0.1	0	0	0	0	0	0	0	0.5	0.1	0	0	0	0.1	0	0.2
Single-Unit Trucks	1	14	0	0	0	0	0	0	0	8	24	0	1	0	3	0	51
% Single-Unit Trucks	3.8	0.4	0	0	0	0	0	0	0	1	1.2	0	2.9	0	0.4	0	0.7
Articulated Trucks	0	1	0	0	0	0	0	0	0	5	6	0	0	0	0	0	12
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.6	0.3	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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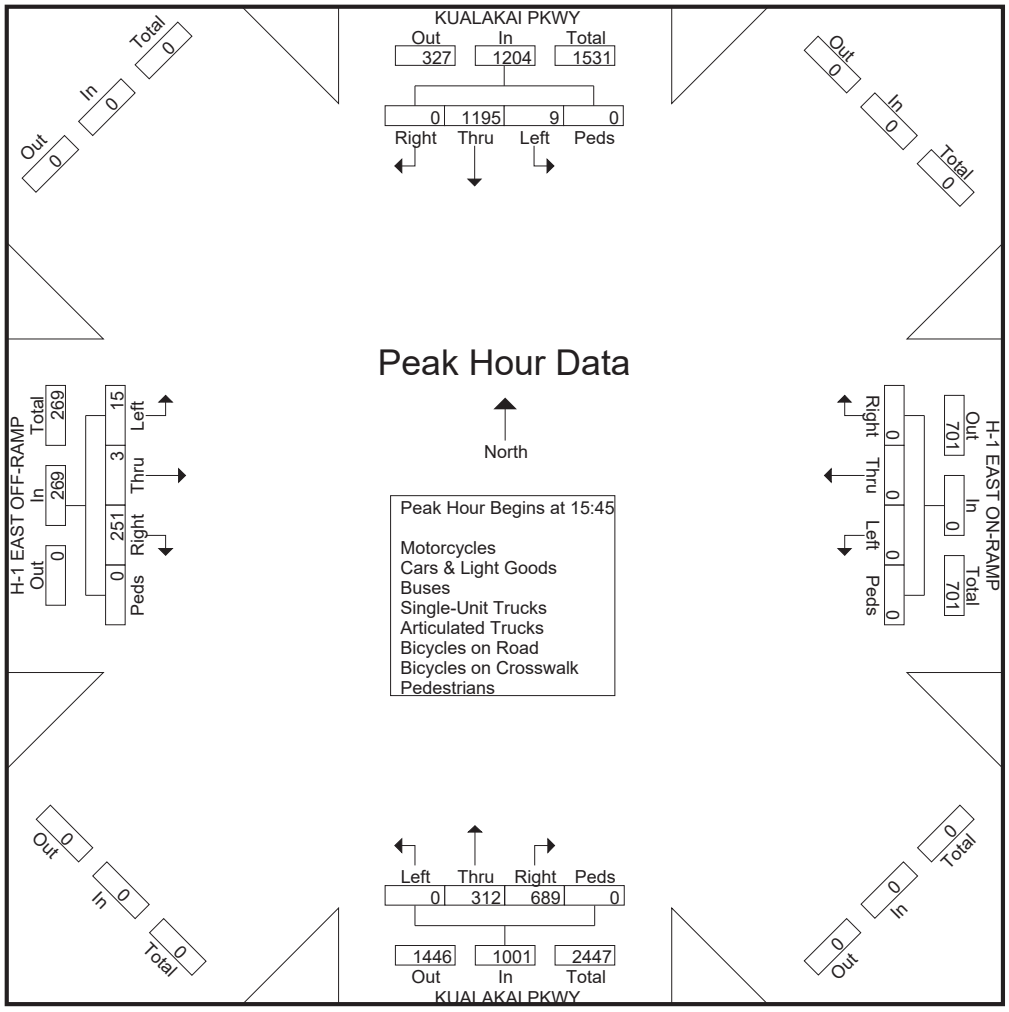
	KUALAKAI PKWY SOUTHBOUND					H-1 EAST ON-RAMP WESTBOUND					KUALAKAI PKWY NORTHBOUND					H-1 EAST OFF-RAMP EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:45 to 16:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:45																					
15:45	2	305	0	0	307	0	0	0	0	0	0	**111**	**193**	0	**304**	4	1	55	0	60	**671**
16:00	2	263	0	0	265	0	0	0	0	0	0	59	161	0	220	4	0	59	0	63	548
16:15	0	302	0	0	302	0	0	0	0	0	0	72	165	0	237	2	**2**	60	0	64	603
16:30	**5**	**325**	0	0	**330**	0	0	0	0	0	0	70	170	0	240	**5**	0	**77**	0	**82**	652
Total Volume	9	1195	0	0	1204	0	0	0	0	0	0	312	689	0	1001	15	3	251	0	269	2474
% App. Total	0.7	99.3	0	0		0	0	0	0		0	31.2	68.8	0		5.6	1.1	93.3	0		
PHF	.450	.919	.000	.000	.912	.000	.000	.000	.000	.000	.000	.703	.892	.000	.823	.750	.375	.815	.000	.820	.922



APPENDIX B

LEVEL OF SERVICE CRITERIA

APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th EDITION)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6th EDITION)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

PEDESTRIAN AND BICYCLE LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th EDITION)

Level of service for pedestrians and bicycles at signalized intersections is determined by calculating an LOS Score for each approach at a signalized intersection, and is assigned on that basis. Level of Service for non-automobile modes at signalized intersections is associated with a score value based on traveler perception research, considering factors of performance measures and intersection characteristics. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	LOS Score
A	< 1.50
B	>1.50 and ≤ 2.50
C	>2.50 and ≤ 3.50
D	>3.50 and ≤ 4.50
E	>4.50 and ≤ 5.50
F	> 5.50

PEDESTRIAN LEVEL OF SERVICE CRITERIA FOR UNCONTROLLED CROSSINGS (HCM 6th EDITION)

The level of service criteria for pedestrians at uncontrolled crossings is defined as the average control delay, in seconds per pedestrian.

LOS delay threshold values for two-way stop-controlled (TWSC) intersections are defined for pedestrians crossing a traffic stream not controlled by a STOP sign; it also applies to midblock pedestrian crossings and crossings at with special treatments such as flashing beacons and signage. Factors such as vehicle and pedestrian volumes, geometric conditions, motorist yield rates, and multiple-stage crossings affect the control delay for pedestrians.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 5
B	>5 and ≤10
C	>10 and ≤20
D	>20 and ≤30
E	>30 and ≤45
F	> 45

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing Conditions AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	548	0	8	287	8	0	0	8	4
Future Volume (veh/h)	0	0	0	548	0	8	287	8	0	0	8	4
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				596	0	0	312	9	0	0	9	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				918	0		418	439	0	0	22	
Arrive On Green				0.27	0.00	0.00	0.23	0.23	0.00	0.00	0.01	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				596	0	0	312	9	0	0	9	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				5.6	0.0	0.0	6.0	0.1	0.0	0.0	0.2	0.0
Cycle Q Clear(g_c), s				5.6	0.0	0.0	6.0	0.1	0.0	0.0	0.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				918	0		418	439	0	0	22	
V/C Ratio(X)				0.65	0.00		0.75	0.02	0.00	0.00	0.41	
Avail Cap(c_a), veh/h				2623	0		1400	1470	0	0	760	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				12.0	0.0	0.0	13.1	10.9	0.0	0.0	18.1	0.0
Incr Delay (d2), s/veh				0.8	0.0	0.0	2.7	0.0	0.0	0.0	12.1	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
%ile BackOfQ(50%),veh/ln				1.8	0.0	0.0	2.2	0.0	0.0	0.0	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				12.8	0.0	0.0	15.8	10.9	0.0	0.0	30.2	0.0
LnGrp LOS				B	A		B	B	A	A	C	
Approach Vol, veh/h					596	A		321			9	A
Approach Delay, s/veh					12.8			15.6			30.2	
Approach LOS					B			B			C	

Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				6.4		15.8		14.7				
Change Period (Y+Rc), s				6.0		6.0		6.0				
Max Green Setting (Gmax), s				15.0		28.0		29.0				
Max Q Clear Time (g_c+I1), s				2.2		7.6		8.0				
Green Ext Time (p_c), s				0.0		2.2		0.9				

Intersection Summary		
HCM 6th Ctrl Delay		13.9
HCM 6th LOS		B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	4	309	0	0	0	0	292	616	5	545	0
Future Volume (veh/h)	7	4	309	0	0	0	0	292	616	5	545	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	8	4	0				0	317	0	5	592	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	15	8					0	884		10	1772	0
Arrive On Green	0.01	0.01	0.00				0.00	0.25	0.00	0.01	0.50	0.00
Sat Flow, veh/h	1207	603	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	12	0	0				0	317	0	5	592	0
Grp Sat Flow(s),veh/h/ln	1810	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.2	0.0	0.0				0.0	1.8	0.0	0.1	2.5	0.0
Cycle Q Clear(g_c), s	0.2	0.0	0.0				0.0	1.8	0.0	0.1	2.5	0.0
Prop In Lane	0.67		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	23	0					0	884		10	1772	0
V/C Ratio(X)	0.52	0.00					0.00	0.36		0.51	0.33	0.00
Avail Cap(c_a), veh/h	1106	0					0	6078		1088	9116	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.0	0.0	0.0				0.0	7.6	0.0	12.2	3.7	0.0
Incr Delay (d2), s/veh	16.7	0.0	0.0				0.0	0.2	0.0	36.3	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
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0				0.0	0.4	0.0	0.1	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.8	0.0	0.0				0.0	7.9	0.0	48.4	3.8	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		12	A					317	A		597	
Approach Delay, s/veh		28.8						7.9			4.2	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.1	12.1		6.3		18.2
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	15.0	42.0		15.0		63.0
Max Q Clear Time (g_c+I1), s	2.1	3.8		2.2		4.5
Green Ext Time (p_c), s	0.0	2.3		0.0		4.7

Intersection Summary	
HCM 6th Ctrl Delay	5.8
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing Conditions PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1159	0	2	318	1	0	0	11	1
Future Volume (veh/h)	0	0	0	1159	0	2	318	1	0	0	11	1
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				1260	0	0	346	1	0	0	12	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				1531	0		412	432	0	0	26	
Arrive On Green				0.44	0.00	0.00	0.23	0.23	0.00	0.00	0.01	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				1260	0	0	346	1	0	0	12	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				18.5	0.0	0.0	10.7	0.0	0.0	0.0	0.4	0.0
Cycle Q Clear(g_c), s				18.5	0.0	0.0	10.7	0.0	0.0	0.0	0.4	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1531	0		412	432	0	0	26	
V/C Ratio(X)				0.82	0.00		0.84	0.00	0.00	0.00	0.45	
Avail Cap(c_a), veh/h				2214	0		617	648	0	0	486	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				14.1	0.0	0.0	21.2	17.1	0.0	0.0	28.2	0.0
Incr Delay (d2), s/veh				1.7	0.0	0.0	6.6	0.0	0.0	0.0	11.6	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
%ile BackOfQ(50%),veh/ln				6.4	0.0	0.0	4.8	0.0	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				15.8	0.0	0.0	27.8	17.1	0.0	0.0	39.9	0.0
LnGrp LOS				B	A		C	B	A	A	D	
Approach Vol, veh/h					1260	A		347			12	A
Approach Delay, s/veh					15.8			27.7			39.9	
Approach LOS					B			C			D	

Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				6.8		31.6		19.4				
Change Period (Y+Rc), s				6.0		6.0		6.0				
Max Green Setting (Gmax), s				15.0		37.0		20.0				
Max Q Clear Time (g_c+I1), s				2.4		20.5		12.7				
Green Ext Time (p_c), s				0.0		5.1		0.7				

Intersection Summary		
HCM 6th Ctrl Delay	18.6	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	3	251	0	0	0	0	312	689	9	1195	0
Future Volume (veh/h)	15	3	251	0	0	0	0	312	689	9	1195	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	16	3	0				0	339	0	10	1299	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	29	5					0	1689		19	2313	0
Arrive On Green	0.02	0.02	0.00				0.00	0.48	0.00	0.01	0.65	0.00
Sat Flow, veh/h	1511	283	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	19	0	0				0	339	0	10	1299	0
Grp Sat Flow(s),veh/h/ln	1795	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.4	0.0	0.0				0.0	2.0	0.0	0.2	7.3	0.0
Cycle Q Clear(g_c), s	0.4	0.0	0.0				0.0	2.0	0.0	0.2	7.3	0.0
Prop In Lane	0.84		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	34	0					0	1689		19	2313	0
V/C Ratio(X)	0.55	0.00					0.00	0.20		0.53	0.56	0.00
Avail Cap(c_a), veh/h	740	0					0	4105		735	6157	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.7	0.0	0.0				0.0	5.5	0.0	17.9	3.5	0.0
Incr Delay (d2), s/veh	13.0	0.0	0.0				0.0	0.1	0.0	21.3	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
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0				0.0	0.5	0.0	0.2	0.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.7	0.0	0.0				0.0	5.6	0.0	39.2	3.7	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		19	A					339	A		1309	
Approach Delay, s/veh		30.7						5.6			4.0	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.4	23.3		6.7		29.7
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	15.0	42.0		15.0		63.0
Max Q Clear Time (g_c+I1), s	2.2	4.0		2.4		9.3
Green Ext Time (p_c), s	0.0	2.4		0.0		14.3

Intersection Summary	
HCM 6th Ctrl Delay	4.6
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Year 2021 Without Project Conditions AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	639	0	9	335	9	0	0	9	5
Future Volume (veh/h)	0	0	0	639	0	9	335	9	0	0	9	5
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				695	0	0	364	10	0	0	10	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				1000	0		467	491	0	0	23	
Arrive On Green				0.29	0.00	0.00	0.26	0.26	0.00	0.00	0.01	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				695	0	0	364	10	0	0	10	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				7.4	0.0	0.0	7.8	0.2	0.0	0.0	0.2	0.0
Cycle Q Clear(g_c), s				7.4	0.0	0.0	7.8	0.2	0.0	0.0	0.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1000	0		467	491	0	0	23	
V/C Ratio(X)				0.70	0.00		0.78	0.02	0.00	0.00	0.43	
Avail Cap(c_a), veh/h				2343	0		1251	1313	0	0	679	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				13.1	0.0	0.0	14.1	11.3	0.0	0.0	20.2	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	2.9	0.0	0.0	0.0	11.7	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.4	0.0	0.0	2.9	0.1	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.9	0.0	0.0	17.0	11.3	0.0	0.0	32.0	0.0
LnGrp LOS				B	A		B	B	A	A	C	
Approach Vol, veh/h					695	A		374			10	A
Approach Delay, s/veh					13.9			16.8			32.0	
Approach LOS					B			B			C	

Timer - Assigned Phs	4	6	8
Phs Duration (G+Y+Rc), s	6.5	17.9	16.8
Change Period (Y+Rc), s	6.0	6.0	6.0
Max Green Setting (Gmax), s	15.0	28.0	29.0
Max Q Clear Time (g_c+I1), s	2.2	9.4	9.8
Green Ext Time (p_c), s	0.0	2.6	1.1

Intersection Summary	
HCM 6th Ctrl Delay	15.1
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	5	360	0	0	0	0	341	719	6	636	0
Future Volume (veh/h)	8	5	360	0	0	0	0	341	719	6	636	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	9	5	0				0	371	0	7	691	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	17	10					0	964		14	1828	0
Arrive On Green	0.01	0.01	0.00				0.00	0.27	0.00	0.01	0.51	0.00
Sat Flow, veh/h	1165	647	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	14	0	0				0	371	0	7	691	0
Grp Sat Flow(s),veh/h/ln	1812	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.2	0.0	0.0				0.0	2.2	0.0	0.1	3.0	0.0
Cycle Q Clear(g_c), s	0.2	0.0	0.0				0.0	2.2	0.0	0.1	3.0	0.0
Prop In Lane	0.64		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	27	0					0	964		14	1828	0
V/C Ratio(X)	0.52	0.00					0.00	0.38		0.52	0.38	0.00
Avail Cap(c_a), veh/h	995	0					0	6135		979	8924	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	0.0	0.0				0.0	7.6	0.0	12.6	3.7	0.0
Incr Delay (d2), s/veh	14.8	0.0	0.0				0.0	0.3	0.0	27.4	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
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0				0.0	0.5	0.0	0.1	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.3	0.0	0.0				0.0	7.8	0.0	40.0	3.9	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		14	A					371	A		698	
Approach Delay, s/veh		27.3						7.8			4.2	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.2	12.9		6.4		19.1
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	14.0	44.0		14.0		64.0
Max Q Clear Time (g_c+I1), s	2.1	4.2		2.2		5.0
Green Ext Time (p_c), s	0.0	2.7		0.0		5.7

Intersection Summary	
HCM 6th Ctrl Delay	5.7
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Year 2021 Without Project Conditions PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1352	0	2	371	1	0	0	13	1
Future Volume (veh/h)	0	0	0	1352	0	2	371	1	0	0	13	1
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				1470	0	0	403	1	0	0	14	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				1641	0		450	472	0	0	29	
Arrive On Green				0.47	0.00	0.00	0.25	0.25	0.00	0.00	0.02	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				1470	0	0	403	1	0	0	14	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				27.2	0.0	0.0	15.3	0.0	0.0	0.0	0.5	0.0
Cycle Q Clear(g_c), s				27.2	0.0	0.0	15.3	0.0	0.0	0.0	0.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1641	0		450	472	0	0	29	
V/C Ratio(X)				0.90	0.00		0.90	0.00	0.00	0.00	0.48	
Avail Cap(c_a), veh/h				1825	0		508	534	0	0	400	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				16.8	0.0	0.0	25.3	19.6	0.0	0.0	34.2	0.0
Incr Delay (d2), s/veh				5.8	0.0	0.0	17.0	0.0	0.0	0.0	11.7	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				10.7	0.0	0.0	8.2	0.0	0.0	0.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				22.6	0.0	0.0	42.3	19.6	0.0	0.0	45.9	0.0
LnGrp LOS				C	A		D	B	A	A	D	
Approach Vol, veh/h					1470	A		404			14	A
Approach Delay, s/veh					22.6			42.3			45.9	
Approach LOS					C			D			D	

Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				7.1		39.3		23.7				
Change Period (Y+Rc), s				6.0		6.0		6.0				
Max Green Setting (Gmax), s				15.0		37.0		20.0				
Max Q Clear Time (g_c+I1), s				2.5		29.2		17.3				
Green Ext Time (p_c), s				0.0		4.0		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		27.0
HCM 6th LOS		C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	3	293	0	0	0	0	364	804	10	1394	0
Future Volume (veh/h)	17	3	293	0	0	0	0	364	804	10	1394	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	18	3	0				0	396	0	11	1515	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	32	5					0	1972		20	2502	0
Arrive On Green	0.02	0.02	0.00				0.00	0.56	0.00	0.01	0.70	0.00
Sat Flow, veh/h	1537	256	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	21	0	0				0	396	0	11	1515	0
Grp Sat Flow(s),veh/h/ln	1793	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.5	0.0	0.0				0.0	2.4	0.0	0.3	9.6	0.0
Cycle Q Clear(g_c), s	0.5	0.0	0.0				0.0	2.4	0.0	0.3	9.6	0.0
Prop In Lane	0.86		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	37	0					0	1972		20	2502	0
V/C Ratio(X)	0.57	0.00					0.00	0.20		0.54	0.61	0.00
Avail Cap(c_a), veh/h	370	0					0	4647		245	5625	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.2	0.0	0.0				0.0	4.9	0.0	21.4	3.3	0.0
Incr Delay (d2), s/veh	13.0	0.0	0.0				0.0	0.0	0.0	20.4	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
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0				0.0	0.6	0.0	0.2	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.1	0.0	0.0				0.0	4.9	0.0	41.8	3.6	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		21	A					396	A		1526	
Approach Delay, s/veh		34.1						4.9			3.8	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	6.5	30.2		6.9		36.7						
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	6.0	57.0		9.0		69.0						
Max Q Clear Time (g_c+I1), s	2.3	4.4		2.5		11.6						
Green Ext Time (p_c), s	0.0	2.9		0.0		19.1						

Intersection Summary												
HCM 6th Ctrl Delay			4.4									
HCM 6th LOS			A									

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Year 2021 During Project Construction Conditions AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	639	0	31	335	62	0	0	9	25
Future Volume (veh/h)	0	0	0	639	0	31	335	62	0	0	9	25
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				695	0	0	364	67	0	0	10	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				996	0		479	503	0	0	23	
Arrive On Green				0.29	0.00	0.00	0.27	0.27	0.00	0.00	0.01	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				695	0	0	364	67	0	0	10	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				7.5	0.0	0.0	7.9	1.1	0.0	0.0	0.2	0.0
Cycle Q Clear(g_c), s				7.5	0.0	0.0	7.9	1.1	0.0	0.0	0.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				996	0		479	503	0	0	23	
V/C Ratio(X)				0.70	0.00		0.76	0.13	0.00	0.00	0.43	
Avail Cap(c_a), veh/h				2314	0		1236	1297	0	0	671	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				13.3	0.0	0.0	14.0	11.6	0.0	0.0	20.5	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	2.5	0.1	0.0	0.0	11.8	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
%ile BackOfQ(50%),veh/ln				2.5	0.0	0.0	2.9	0.4	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				14.2	0.0	0.0	16.6	11.7	0.0	0.0	32.3	0.0
LnGrp LOS				B	A		B	B	A	A	C	
Approach Vol, veh/h					695	A		431			10	A
Approach Delay, s/veh					14.2			15.8			32.3	
Approach LOS					B			B			C	

Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				6.5		18.0		17.2				
Change Period (Y+Rc), s				6.0		6.0		6.0				
Max Green Setting (Gmax), s				15.0		28.0		29.0				
Max Q Clear Time (g_c+I1), s				2.2		9.5		9.9				
Green Ext Time (p_c), s				0.0		2.6		1.4				

Intersection Summary		
HCM 6th Ctrl Delay		14.9
HCM 6th LOS		B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	5	360	0	0	0	0	357	719	6	636	0
Future Volume (veh/h)	45	5	360	0	0	0	0	357	719	6	636	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	49	5	0				0	388	0	7	691	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	80	8					0	965		13	1787	0
Arrive On Green	0.05	0.05	0.00				0.00	0.27	0.00	0.01	0.50	0.00
Sat Flow, veh/h	1624	166	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	54	0	0				0	388	0	7	691	0
Grp Sat Flow(s),veh/h/ln	1789	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.8	0.0	0.0				0.0	2.4	0.0	0.1	3.2	0.0
Cycle Q Clear(g_c), s	0.8	0.0	0.0				0.0	2.4	0.0	0.1	3.2	0.0
Prop In Lane	0.91		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	88	0					0	965		13	1787	0
V/C Ratio(X)	0.61	0.00					0.00	0.40		0.52	0.39	0.00
Avail Cap(c_a), veh/h	934	0					0	5833		930	8484	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	0.0	0.0				0.0	8.0	0.0	13.3	4.1	0.0
Incr Delay (d2), s/veh	6.7	0.0	0.0				0.0	0.3	0.0	27.5	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
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0				0.0	0.6	0.0	0.1	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.1	0.0	0.0				0.0	8.3	0.0	40.8	4.2	0.0
LnGrp LOS	B	A					A	A		D	A	A
Approach Vol, veh/h		54	A					388	A		698	
Approach Delay, s/veh		19.1						8.3			4.6	
Approach LOS		B						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.2	13.3		7.3		19.5
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	14.0	44.0		14.0		64.0
Max Q Clear Time (g_c+I1), s	2.1	4.4		2.8		5.2
Green Ext Time (p_c), s	0.0	2.8		0.1		5.7

Intersection Summary		
HCM 6th Ctrl Delay		6.5
HCM 6th LOS		A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Year 2021 During Project Construction Conditions AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1352	0	2	371	21	0	0	51	38
Future Volume (veh/h)	0	0	0	1352	0	2	371	21	0	0	51	38
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				1470	0	0	403	23	0	0	55	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				1610	0		446	468	0	0	76	
Arrive On Green				0.47	0.00	0.00	0.25	0.25	0.00	0.00	0.04	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				1470	0	0	403	23	0	0	55	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				29.3	0.0	0.0	16.2	0.7	0.0	0.0	2.2	0.0
Cycle Q Clear(g_c), s				29.3	0.0	0.0	16.2	0.7	0.0	0.0	2.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1610	0		446	468	0	0	76	
V/C Ratio(X)				0.91	0.00		0.90	0.05	0.00	0.00	0.72	
Avail Cap(c_a), veh/h				1726	0		481	505	0	0	379	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				18.4	0.0	0.0	26.9	21.1	0.0	0.0	35.1	0.0
Incr Delay (d2), s/veh				7.5	0.0	0.0	19.6	0.0	0.0	0.0	12.0	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
%ile BackOfQ(50%),veh/ln				12.1	0.0	0.0	9.0	0.3	0.0	0.0	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				25.9	0.0	0.0	46.5	21.1	0.0	0.0	47.1	0.0
LnGrp LOS				C	A		D	C	A	A	D	
Approach Vol, veh/h					1470	A		426			55	A
Approach Delay, s/veh					25.9			45.1			47.1	
Approach LOS					C			D			D	

Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				9.0		40.5		24.5				
Change Period (Y+Rc), s				6.0		6.0		6.0				
Max Green Setting (Gmax), s				15.0		37.0		20.0				
Max Q Clear Time (g_c+I1), s				4.2		31.3		18.2				
Green Ext Time (p_c), s				0.1		3.2		0.3				

Intersection Summary		
HCM 6th Ctrl Delay		30.7
HCM 6th LOS		C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	3	293	0	0	0	0	364	804	32	1410	0
Future Volume (veh/h)	37	3	293	0	0	0	0	364	804	32	1410	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	40	3	0				0	396	0	35	1533	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	61	5					0	1906		56	2486	0
Arrive On Green	0.04	0.04	0.00				0.00	0.54	0.00	0.03	0.70	0.00
Sat Flow, veh/h	1663	125	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	43	0	0				0	396	0	35	1533	0
Grp Sat Flow(s),veh/h/ln	1787	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	1.1	0.0	0.0				0.0	2.6	0.0	0.9	10.4	0.0
Cycle Q Clear(g_c), s	1.1	0.0	0.0				0.0	2.6	0.0	0.9	10.4	0.0
Prop In Lane	0.93		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	66	0					0	1906		56	2486	0
V/C Ratio(X)	0.65	0.00					0.00	0.21		0.63	0.62	0.00
Avail Cap(c_a), veh/h	353	0					0	4451		235	5388	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.6	0.0	0.0				0.0	5.5	0.0	21.8	3.6	0.0
Incr Delay (d2), s/veh	10.4	0.0	0.0				0.0	0.1	0.0	10.9	0.3	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
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0				0.0	0.7	0.0	0.5	1.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.0	0.0	0.0				0.0	5.6	0.0	32.7	3.9	0.0
LnGrp LOS	C	A					A	A		C	A	A
Approach Vol, veh/h		43	A					396	A		1568	
Approach Delay, s/veh		32.0						5.6			4.5	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	7.4	30.4		7.7		37.8
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	6.0	57.0		9.0		69.0
Max Q Clear Time (g_c+I1), s	2.9	4.6		3.1		12.4
Green Ext Time (p_c), s	0.0	2.9		0.1		19.5

Intersection Summary		
HCM 6th Ctrl Delay		5.3
HCM 6th LOS		A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Year 2021 With Project Conditions AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	639	0	10	335	10	0	0	9	5
Future Volume (veh/h)	0	0	0	639	0	10	335	10	0	0	9	5
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				695	0	0	364	11	0	0	10	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				1000	0		467	491	0	0	23	
Arrive On Green				0.29	0.00	0.00	0.26	0.26	0.00	0.00	0.01	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				695	0	0	364	11	0	0	10	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				7.4	0.0	0.0	7.8	0.2	0.0	0.0	0.2	0.0
Cycle Q Clear(g_c), s				7.4	0.0	0.0	7.8	0.2	0.0	0.0	0.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1000	0		467	491	0	0	23	
V/C Ratio(X)				0.70	0.00		0.78	0.02	0.00	0.00	0.43	
Avail Cap(c_a), veh/h				2343	0		1251	1313	0	0	679	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				13.1	0.0	0.0	14.1	11.3	0.0	0.0	20.2	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	2.8	0.0	0.0	0.0	11.7	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.4	0.0	0.0	2.9	0.1	0.0	0.0	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.9	0.0	0.0	17.0	11.3	0.0	0.0	32.0	0.0
LnGrp LOS				B	A		B	B	A	A	C	
Approach Vol, veh/h					695	A		375			10	A
Approach Delay, s/veh					13.9			16.8			32.0	
Approach LOS					B			B			C	

Timer - Assigned Phs	4	6	8
Phs Duration (G+Y+Rc), s	6.5	17.9	16.8
Change Period (Y+Rc), s	6.0	6.0	6.0
Max Green Setting (Gmax), s	15.0	28.0	29.0
Max Q Clear Time (g_c+I1), s	2.2	9.4	9.8
Green Ext Time (p_c), s	0.0	2.6	1.1

Intersection Summary	
HCM 6th Ctrl Delay	15.1
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	5	360	0	0	0	0	342	719	6	636	0
Future Volume (veh/h)	8	5	360	0	0	0	0	342	719	6	636	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	9	5	0				0	372	0	7	691	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	17	10					0	966		14	1829	0
Arrive On Green	0.01	0.01	0.00				0.00	0.27	0.00	0.01	0.51	0.00
Sat Flow, veh/h	1165	647	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	14	0	0				0	372	0	7	691	0
Grp Sat Flow(s),veh/h/ln	1812	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.2	0.0	0.0				0.0	2.2	0.0	0.1	3.0	0.0
Cycle Q Clear(g_c), s	0.2	0.0	0.0				0.0	2.2	0.0	0.1	3.0	0.0
Prop In Lane	0.64		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	27	0					0	966		14	1829	0
V/C Ratio(X)	0.52	0.00					0.00	0.39		0.52	0.38	0.00
Avail Cap(c_a), veh/h	995	0					0	6132		978	8919	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	0.0	0.0				0.0	7.6	0.0	12.6	3.7	0.0
Incr Delay (d2), s/veh	14.8	0.0	0.0				0.0	0.3	0.0	27.4	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
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0				0.0	0.5	0.0	0.1	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.3	0.0	0.0				0.0	7.8	0.0	40.0	3.9	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		14	A					372	A		698	
Approach Delay, s/veh		27.3						7.8			4.2	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.2	12.9		6.4		19.1
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	14.0	44.0		14.0		64.0
Max Q Clear Time (g_c+I1), s	2.1	4.2		2.2		5.0
Green Ext Time (p_c), s	0.0	2.7		0.0		5.7

Intersection Summary		
HCM 6th Ctrl Delay		5.7
HCM 6th LOS		A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Year 2021 With Project Conditions PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	1352	0	2	371	1	0	0	15	1
Future Volume (veh/h)	0	0	0	1352	0	2	371	1	0	0	15	1
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1870	0	1870	1870	1870	0	0	1870	1870
Adj Flow Rate, veh/h				1470	0	0	403	1	0	0	16	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	0	2	2	2	0	0	2	2
Cap, veh/h				1639	0		450	472	0	0	32	
Arrive On Green				0.47	0.00	0.00	0.25	0.25	0.00	0.00	0.02	0.00
Sat Flow, veh/h				3456	0	1585	1781	1870	0	0	1870	1585
Grp Volume(v), veh/h				1470	0	0	403	1	0	0	16	0
Grp Sat Flow(s),veh/h/ln				1728	0	1585	1781	1870	0	0	1870	1585
Q Serve(g_s), s				27.4	0.0	0.0	15.4	0.0	0.0	0.0	0.6	0.0
Cycle Q Clear(g_c), s				27.4	0.0	0.0	15.4	0.0	0.0	0.0	0.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1639	0		450	472	0	0	32	
V/C Ratio(X)				0.90	0.00		0.90	0.00	0.00	0.00	0.50	
Avail Cap(c_a), veh/h				1818	0		507	532	0	0	399	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				16.9	0.0	0.0	25.4	19.7	0.0	0.0	34.3	0.0
Incr Delay (d2), s/veh				5.9	0.0	0.0	17.2	0.0	0.0	0.0	11.3	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
%ile BackOfQ(50%),veh/ln				10.8	0.0	0.0	8.2	0.0	0.0	0.0	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				22.8	0.0	0.0	42.6	19.7	0.0	0.0	45.6	0.0
LnGrp LOS				C	A		D	B	A	A	D	
Approach Vol, veh/h					1470	A		404			16	A
Approach Delay, s/veh					22.8			42.5			45.6	
Approach LOS					C			D			D	

Timer - Assigned Phs				4		6		8				
Phs Duration (G+Y+Rc), s				7.2		39.4		23.7				
Change Period (Y+Rc), s				6.0		6.0		6.0				
Max Green Setting (Gmax), s				15.0		37.0		20.0				
Max Q Clear Time (g_c+I1), s				2.6		29.4		17.4				
Green Ext Time (p_c), s				0.0		4.0		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		27.2
HCM 6th LOS		C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	3	293	0	0	0	0	364	804	11	1395	0
Future Volume (veh/h)	17	3	293	0	0	0	0	364	804	11	1395	0
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1870	1870	0
Adj Flow Rate, veh/h	18	3	0				0	396	0	12	1516	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	32	5					0	1970		22	2503	0
Arrive On Green	0.02	0.02	0.00				0.00	0.55	0.00	0.01	0.70	0.00
Sat Flow, veh/h	1537	256	1585				0	3647	2790	1781	3647	0
Grp Volume(v), veh/h	21	0	0				0	396	0	12	1516	0
Grp Sat Flow(s),veh/h/ln	1793	0	1585				0	1777	1395	1781	1777	0
Q Serve(g_s), s	0.5	0.0	0.0				0.0	2.4	0.0	0.3	9.6	0.0
Cycle Q Clear(g_c), s	0.5	0.0	0.0				0.0	2.4	0.0	0.3	9.6	0.0
Prop In Lane	0.86		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	37	0					0	1970		22	2503	0
V/C Ratio(X)	0.57	0.00					0.00	0.20		0.54	0.61	0.00
Avail Cap(c_a), veh/h	370	0					0	4643		245	5621	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.2	0.0	0.0				0.0	4.9	0.0	21.4	3.3	0.0
Incr Delay (d2), s/veh	13.0	0.0	0.0				0.0	0.0	0.0	19.1	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
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0				0.0	0.6	0.0	0.2	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.2	0.0	0.0				0.0	4.9	0.0	40.5	3.6	0.0
LnGrp LOS	C	A					A	A		D	A	A
Approach Vol, veh/h		21	A					396	A		1528	
Approach Delay, s/veh		34.2						4.9			3.9	
Approach LOS		C						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	6.5	30.2		6.9		36.7
Change Period (Y+Rc), s	6.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	6.0	57.0		9.0		69.0
Max Q Clear Time (g_c+I1), s	2.3	4.4		2.5		11.6
Green Ext Time (p_c), s	0.0	2.9		0.0		19.1

Intersection Summary		
HCM 6th Ctrl Delay		4.4
HCM 6th LOS		A

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.