APPENDIX L: TRAFFIC STUDY

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Eldorado-Lugo-Mohave Series Capacitor Project Traffic Study

Prepared for:
Southern California Edison

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WC16-3295

FEHR & PEERS

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INTRODUCTION

Southern California Edison (SCE) is proposing several electrical infrastructure improvements in California and Nevada to safely deliver renewable energy to the Los Angeles Basin. This Project will improve capacity and power flow between SCE's existing Eldorado, Lugo, and Mohave substations. SCE will upgrade and construct new infrastructure in and around the City of Hesperia, CA; San Bernardino County, CA; Laughlin, NV; and Clark County, NV.

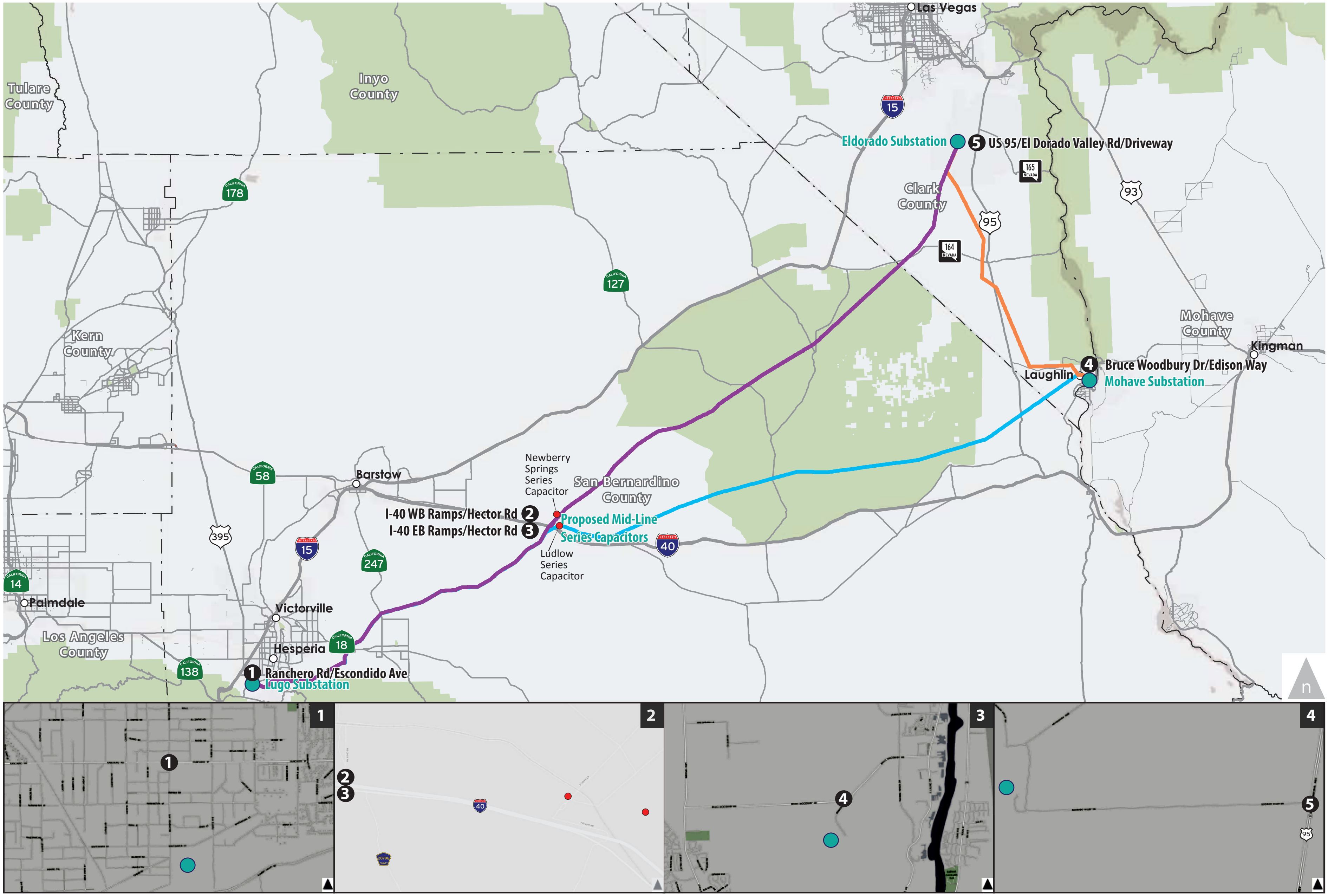
The proposed Project would generate construction-related traffic that may result in transportation impacts. This study focuses on areas where significant and sustained traffic is expected to be generated during construction (as opposed to construction at the linear components, including the three fiber optic repeater sites, where traffic would be limited in volume and duration), which include the four major Project sites:

- Lugo Substation
- Proposed Mid-Line Series Capacitors
- Mohave Substation
- Eldorado Substation

Intersections that would be particularly susceptible to construction impacts near these four Project sites were identified and evaluated in this study. The five intersections selected for evaluation include:

1. Ranchero Road at Escondido Avenue near Hesperia, California (near the Lugo Substation)
2. I-40 Westbound Ramps at Hector Road in San Bernardino County (near the Proposed Mid-Line Series Capacitors)
3. I-40 Eastbound Ramps at Hector Road in San Bernardino County (near the Proposed Mid-Line Series Capacitors)
4. Bruce Woodbury Drive at Edison Way in the Town of Laughlin, Nevada (near the Mohave Substation)
5. Eldorado Valley Drive at US-95 in Clark County, Nevada (near the Eldorado Substation)

Figure 1 presents the Project study area, including substations and study intersections. In anticipation of the proposed project, this report provides a comprehensive review of the transportation network, including existing conditions and regulatory settings. The analysis focuses on construction impacts as transportation network conditions during operation are not expected to change from how they are now. All topic areas covered under the CEQA checklist will be reviewed for potential impact. Mitigation measures will be developed and proposed if significant impacts are identified.



LEGEND
Study Intersection
Substation
Mid-line Capacitors
Eldorado-Lugo 500 kV Transmission Line
Eldorado-Mohave 500 kV Transmission Line
Lugo-Mohave 500 kV Transmission Line

Figure 1
Study Area

WC16-3295_1_StudyArea

REGULATORY SETTING

This section presents a summary of transportation regulations relevant to projects involving construction of electric facilities.

STATE

CALIFORNIA STREETS AND HIGHWAYS CODE § 670

Using California state highways for purposes other than normal transportation may require written notification or an encroachment permit from the California Department of Transportation (Caltrans). Section 670 of the California Streets and Highways Code allows Caltrans to issue encroachment permits authorizing activities related to the placement of encroachments within, under, or over state highway right-of-ways. The agency reviews all requests from utility companies that plan to conduct activities within state highway right-of-ways. Caltrans' ministerial encroachment permits may include conditions or restrictions on the timeframe for construction activities performed within or above roadways that are under Caltrans jurisdiction.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

The California Environmental Quality Act requires in-depth analysis to determine if a proposed project would have significant environmental impacts and if so, to determine feasible alternatives or mitigation measures that would avoid or substantially lessen the significant effects. CEQA significant impact criteria relating to transportation are discussed in the next section of this report.

STATE OF NEVADA HIGHWAYS, ROADS, AND TRANSPORTATION CODE

Nevada Administrative Code Chapter 408 § 427 requires non-transportation facilities along highway right of way be authorized by the Nevada Department of Transportation. Permission is granted via an occupancy permit. If the highway crosses over private property, the property owner must also give consent.

Chapter 408 § 4398 specifies design guidelines for aerial electrical or communications lines that traverse State right-of-way. Aerial electrical lines must not be lower than 22 feet above the ground. Guy wires for such facilities may not be attached to trees and must conform to requirements defined in the *National Electrical Safety Code* unless over-ridden by the district engineer. Aerial crossings of the wire over the road must be as close to 90 degrees as possible; poles must not be located closer than 2 feet to the curb of the road.

LOCAL

CALIFORNIA

The California Public Utilities Commission (CPUC) has sole and exclusive state jurisdiction over the siting and design of the proposed Project in California. Pursuant to CPUC General Order 131-D, Section XIV.B, "Local jurisdictions acting pursuant to local authority are preempted from regulating electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities subject to the CPUC's jurisdiction. However, in locating such projects, the public utilities shall consult with local agencies regarding land use matters." Consequently, public utilities are directed to consider local regulations and consult with local agencies, but the counties' and cities' regulations are not applicable as the counties and cities do not have jurisdiction over the proposed Project. Accordingly, the following discussion of local land use regulations is provided for informational purposes only.

The following local plans provide a target for intersection operations, described with the term "level of service" (LOS). Intersection LOS is a qualitative description of traffic flow based on the amount of time the average driver is delayed at the intersection. Six levels of service are defined ranging from LOS A (free flow conditions) to LOS F (over capacity conditions). LOS E generally represents operations at capacity.

San Bernardino County General Plan and Congestion Management Plan

The San Bernardino County General Plan Circulation and Infrastructure Element establishes distinct planning areas for the Valley, Mountain, and Desert regions. The Valley Planning region is south and west of the U.S. Forest Service boundaries in the San Bernardino Mountain Range. The Mountain Region encompasses the area between Valley and Desert regions. The expansive Desert Region is constituted mostly of the Mojave Desert and shares its largest border with the State of Nevada. These planning areas are characterized by their wide differences in climate, topography, and land use. As such, the General Plan establishes different levels of peak-hour level of service for each.

In the Valley and Mountain Region, the peak-hour LOS performance standards are set at LOS D for all Major Arterials. In the Desert Region, the standard is LOS C at all times. All Project study intersections are in the Desert Planning area.

LOS standards are further regulated by the San Bernardino Congestion Management Plan (CMP), which sets a minimum standard of LOS E for "principal arterials." This classification is given to facilities of multi-jurisdictional importance that carry relatively high volumes of traffic across city or county lines. Around the project area, only Interstate 40 (I-40) is a principal arterial because it is a highway.

City of Hesperia General Plan

Although the intersection of Ranchero Road at Escondido Avenue lies approximately one mile from city limits along Ranchero Road going east, the LOS standards set forth in the Hesperia General Plan are shown here for informational purposes. The peak-hour LOS standard of Hesperia is set at LOS D, while LOS E is acceptable during peak hours on freeway interchanges and major corridors.

NEVADA

Clark County, Nevada Comprehensive Plan

The comprehensive plan of Clark County, Nevada establishes LOS D as the performance standard for non-residential streets and LOS C as the performance standard for residential streets in buildout conditions.

STANDARDS OF SIGNIFICANCE

CALIFORNIA ENVIRONMENTAL QUALITY ACT GUIDELINES FOR SIGNIFICANCE CRITERIA

The proposed Project would result in a significant impact with regard to transportation and traffic if it would:

1. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
2. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.
3. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.
4. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
5. Result in inadequate emergency access.
6. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.
7. Result in significant cumulative impacts in combination with past, present and reasonably foreseeable projects.

LOCAL JURISDICTION SIGNIFICANCE CRITERIA

The study intersections fall within the jurisdiction of San Bernardino County, CA or Clark County, NV. Therefore, the significance criteria of those counties are applied to the study intersections when applicable. All study intersections in San Bernardino County are located in the desert planning region, which designates a LOS C as the minimum threshold for major arterials at all times. Clark County designates LOS D as the significance threshold on non-residential streets.

EXISTING CONDITIONS

This section describes the transportation facilities adjacent to the four project substations, including the surrounding roadway network and transit, pedestrian, and bicycle facilities.

ROADWAY SYSTEM

ROADWAYS SERVING LUGO SUBSTATION

Interstate 15 (I-15) is a major north-south grade-separated interstate highway that serves the western United States. In the project area, it has six lanes and connects the rural desert region of San Bernardino County with the urbanized valley region and the greater Southland region, passing through the mountains. Access to the project site at the Lugo Substation is provided by a recently-completed interchange at Ranchero Road.

Ranchero Road is an arterial boulevard that connects to the town of Hesperia and provides access to the Lugo Substation project site as well as I-15. From the freeway, it continues east until it terminates at Arrowhead Lake Road, serving primarily rural and suburban residential communities. It is primarily a two-lane road with left turn pockets and painted medians where it has been recently improved. Such locations include the intersection of Ranchero Road and Escondido Avenue and the segment along Oak Hills High School.

Escondido Avenue is an arterial boulevard that provides direct access to the Lugo Substation project site in the south and terminates at Main Street in the north. South of Cedar Street (including the segment between Ranchero Road and the Lugo Substation), it is a narrow two-lane road that serves primarily rural residential communities with un-improved and un-paved side roads and some left-turn pockets north of Ranchero Road. North of Cedar Street, Escondido Avenue widens to four lanes with a raised and, at times, painted median. Bicycle lanes are present on Escondido Avenue between Hollister Street and Cedar Street.

Tower Road is an un-paved dirt road that travels southwest to northeast directly from the Lugo Substation. Moving southwest away from the Substation, Tower Road serves mostly undeveloped land with sparse residential structures.

Prairie Trail is an un-paved dirt road travelling west and east directly from the Lugo Substation. It serves primarily un-developed and sparse residential structures, and terminates at Adkins Road.

Belmont Road is an un-paved dirt road travelling west and east directly from the Lugo Substation. It serves primarily un-developed and sparse residential structures, and terminates at Old Outpost Road.

ROADWAYS SERVING THE PROPOSED MID-LINE SERIES CAPACITORS

Interstate 40 (I-40) spans east-west across the United States from I-15 in Barstow, California to North Carolina. It connects the area around the Proposed Mid-line Series Capacitors to Southern California to the west, and Nevada and Arizona to the east. Near the substation, I-40 is a grade separated, four lane freeway.

Hector Road is a two lane road served by an interchange with I-40. The interchange on and off ramps are stop-controlled. At the interchange, Hector Road is a paved, two lane road that provides access between the National Trails Highway and I-40. To the north, Hector Road becomes unpaved about 1,000 feet north of the interchange.

National Trails Highway, originally part of the old US Highway 66, roughly parallels I-40 for 200 miles from Barstow to Needles. In the vicinity of the Proposed Mid-line Series Capacitors, it is two lanes and connects to Hector Road with a stop-controlled three-way intersection.

Pisgah Crater Road is an unpaved service road that provides direct access to the Proposed Mid-line Series Capacitors site from National Trails Highway via a grade separated uncrossing of I-40.

ROADWAYS SERVING MOHAVE SUBSTATION

Interstate 40 (I-40) connects the Mohave Substation to Southern California, with access provided primarily via US 95 and Needles Highway. Near the substation, it is a grade separated, four lane freeway.

United States Route 95 (US 95) is a major north-south highway that connects to the north and south United States border, and crosses into California, Arizona, and Nevada south of the substation. It provides access to the substation via NV 163. North of NV 163, US 95 is a divided four lane highway that connects to Las Vegas. South of NV 163, US 95 is a two lane highway that connects to I-40.

Nevada State Route 163 (NV 163) is a four lane, divided highway that connects the City of Laughlin to US 95. This east-west highway terminates at the Nevada-Arizona border where it becomes Bullhead Parkway in Arizona. It does not directly serve any developed land uses. Access to the substation from NV 163 is provided via either Needles Highway or Thomas Edison Drive.

Needles Highway is a two-lane arterial that provides access to the Mohave Substation via Bruce Woodbury Drive. To the north, it terminates at Laughlin Highway. To the south, it connects to I-40 and provides access to some light residential and largely rural/undeveloped land beyond that.

Thomas Edison Drive is a two-lane arterial that provides access to the Mohave Substation via Bruce Woodbury Drive. To the north, it terminates at Laughlin Highway. To the south, it terminates at South Casino Drive. It is largely parallel to South Casino Drive, and does not provide access to nearby commercial and casino uses.

Bruce Woodbury Drive is a two lane arterial with no center turning lane that provides direct access to the Mohave Substation via Edison Way. It ends with Needles Highway in the west and South Casino Drive in the East. Aside from the substation, it is mostly surrounded by rural and undeveloped land.

Edison Way is a narrow driveway providing direct access to the gates of the Mohave Substation from Bruce Woodbury Drive.

ROADWAYS SERVING ELDORADO SUBSTATION

United States Route 95 (US 95) near Eldorado Substation is a divided four lane highway with limited access to surrounding uses where they exist; most of the surrounding area is undeveloped. US 95 connects the substation with Las Vegas to the north and I-40 to the south.

Nevada State Route 165 (NV 165) is a two lane undivided highway that provides access between US 95 near Boulder to the community of Nelson in southeast Nevada. It passes through largely rural and undeveloped land.

Eldorado Valley Drive is a small service road that provides direct access to the Eldorado Substation. It also provides access to large solar panel fields.

EXISTING PEDESTRIAN, BICYCLE, AND TRANSIT FACILITIES

EXISTING FACILITIES AROUND THE LUGO SUBSTATION

Local roads immediately adjacent to the Lugo Substation have no designated bicycle, pedestrian facilities, or transit facilities/services. However, the intersection of Escondido Avenue and Ranchero Road has been recently improved and features sidewalk and ADA-compliant curb ramps at intersections.

Fixed route and paratransit bus service in the City of Hesperia is provided by the Victory Valley Transit Authority (VVTA).

EXISTING FACILITIES AROUND THE PROPOSED MID-LINE SERIES CAPACITORS

Designated sidewalks, crosswalks, and bicycle facilities do not exist at the Proposed Mid-line Series Capacitors location. Public transportation services and facilities are not provided at this location. Intercity bus services may utilize I-40 for long-distance trips between distant cities.

EXISTING FACILITIES AROUND THE MOHAVE SUBSTATION

Class II bicycle lanes are present on Bruce Woodbury Drive. Sidewalks are not present.

The Southern Nevada Transit Coalition (SNTC) provides fixed-route transit and paratransit service in the area around Laughlin.

EXISTING FACILITIES AROUND THE ELDORADO SUBSTATION

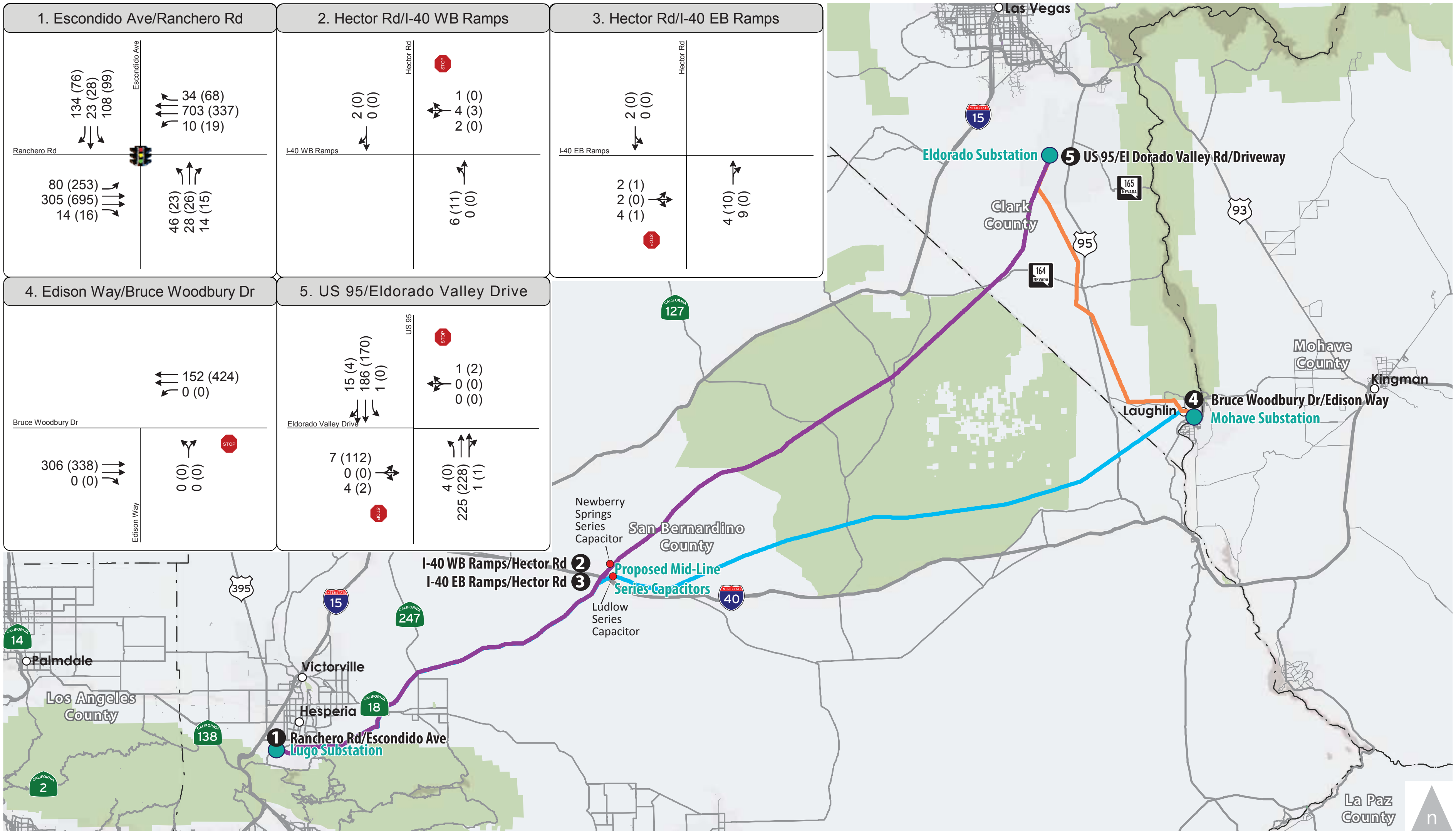
There are no designated pedestrian or bicycle facilities or transit service in the Eldorado Substation area.

EXISTING ROADWAY VOLUMES

Weekday morning (7:00 AM to 9:00 AM) and evening (4:00 PM to 6:00 PM) peak period intersection turning movement counts were conducted at the five study intersections on typical traffic days in either January 2016 or April 2016. These counts include pedestrian, bicycle, automobile, and truck counts. Existing peak hour traffic volumes are presented on **Figure 2** along with the existing lane configurations and traffic control. Traffic counts are included in Appendix A.

EXISTING INTERSECTION LEVEL OF SERVICE

Traffic conditions at signalized and unsignalized intersections are evaluated using methodologies from the *2010 Highway Capacity Manual* (HCM). For signalized intersections, LOS is calculated as the average of all vehicles entering the intersection as a whole. For side-street stop-controlled intersections, LOS is calculated for both the average of all vehicles entering the intersection in addition to the worst side street movement. The results are presented in **Table 1** (with detailed worksheets included in **Appendix A**). All intersections currently operate within the LOS standards detailed in the Standards of Significance section of this report.



LEGEND

XX (YY) AM (PM) Peak Hour Traffic Volumes

Signalized Intersection

Stop Sign

Study Intersection

Substation

Mid-line Capacitors

Eldorado-Lugo 500 kV Transmission Line

Eldorado-Mohave 500 kV Transmission Line

Lugo-Mohave 500 kV Transmission Line

Figure 2

Existing Peak Hour Traffic Volumes and Lane Configurations

WC16-3295_2_ExVol

TABLE 1: EXISTING PEAK HOUR INTERSECTION LEVEL OF SERVICE

	Intersection	Control[1]	Peak Hour	Delay[2]	Level of Service
Lugo Substation Study Intersections					
1	Escondido Avenue & Ranchero Road	Signal	7:00 AM 5:00 PM	15.6 14.0	B B
Proposed Mid-Line Series Capacitors Study Intersections					
2	Hector Road & I-40 West Ramps[3]	SSSC	7:00 AM 5:00 PM	6.9 (8.9) 7.7 (9.3)	A (A) A (A)
3	Hector Road & I-40 East Ramps[3]	SSSC	7:00 AM 5:00 PM	3.1 (8.6) 1.1 (8.4)	A (A) A (A)
Mohave Substation Study Intersections					
4	Edison Way & Bruce Woodbury Drive	SSSC	7:00 AM 5:00 PM	0 (0) 0 (0)	A (A) A (A)
Eldorado Substation Study Intersections					
5	US 95 & Eldorado Valley Road	SSSC	7:00 AM 5:00 PM	0.3 (10.6) 2.6 (11.8)	A (B) A (B)

Notes:

1. Signal = Signalized Intersection; SSSC = Side-Street Stop-Controlled Intersection.
2. Delay presented in seconds per vehicle; for signalized intersections, delay presented as Intersection Average; for side-street stop-controlled intersections, delay presented as Intersection Average (Worst Movement).
3. Results generated by HCM 2000 methodology due to limitations in HCM 2010 applications.

Source: Fehr & Peers, 2017.

PROJECT CONSTRUCTION TRIPS

This section presents the trip generation, distribution, and assignment for construction traffic generated by the proposed Project. For each study intersection, the amount of traffic associated with construction at the adjacent project site was estimated using a three-step process:

1. **Trip Generation** – The *amount* of vehicle traffic that would travel to each proposed project site during construction was estimated.
2. **Trip Distribution** – The *direction* trips would use to approach and depart the site was projected.
3. **Trip Assignment** – Trips were then *assigned* to specific roadway segments and intersection turning movements.

Construction schedule information provided by Southern California Edison was used to estimate the potential maximum number of workers and trucks that would arrive and depart from each site during the peak morning and evening hours. **Table 2** presents the resulting construction trip generation for each of the substations. Truck trips were converted into a passenger car equivalent (PCE) to reflect that trucks have a greater impact on intersection operations. The PCE, as stated in the *2010 Highway Capacity Manual*, for trucks is two.

It was conservatively assumed that all workers would drive alone (even though workers will be encouraged to carpool) to the substation sites during the morning peak hour and depart during the evening peak hour, even though it is more likely that workers would commute to and from the site outside of peak traffic hours (workers are estimated to arrive before 7:00 AM and depart between 3:00 and 4:00 PM). As shown in Table 2, it was estimated that the Proposed Mid-Line Series Capacitors would generate the most traffic in the morning with as many as 175 AM peak hour PCE trips. In the evening, the Eldorado Substation and Proposed Mid-Lin Series Capacitors would generate the most traffic with 126 and 125 respective PM peak hour PCE trips.

Construction traffic to and from the substations was distributed assuming that worker trips would primarily originate from the Los Angeles/San Bernardino and Las Vegas areas, and that truck trips would be destined to nearby cities for supplies and to nearby construction locations off-site from the substations. **Figure 3** displays the resulting trip distribution and **Figure 4** presents the resulting trip assignment by intersection turning movement.

TABLE 2: TRIP GENERATION

Trip Type	AM Trips			PM Trips		
	AM In	**AM Out**	**Total**	**PM In**	**PM Out**	**Total**
Lugo Substation						
Worker Trips	76	0	76	0	76	76
Truck Trips	10	11	21	6	5	11
Truck PCE	20	22	42	12	10	22
Total PCE	*96*	*22*	*118*	*12*	*86*	*98*
Proposed Mid-Line Series Capacitors						
Worker Trips	99	0	99	0	99	99
Truck Trips	17	21	38	4	9	13
Truck PCE	34	42	76	8	18	26
Total PCE	*133*	*42*	*175*	*8*	*117*	*125*
Mohave Substation						
Worker Trips	90	0	90	0	90	90
Truck Trips	13	14	27	7	6	13
Truck PCE	26	28	54	14	12	26
Total PCE	*116*	*28*	*144*	*14*	*102*	*116*
Eldorado Substation						
Worker Trips	96	0	96	0	96	96
Truck Trips	14	16	30	7	8	15
Truck PCE	28	32	60	14	16	30
Total PCE	*124*	*32*	*156*	*14*	*112*	*126*

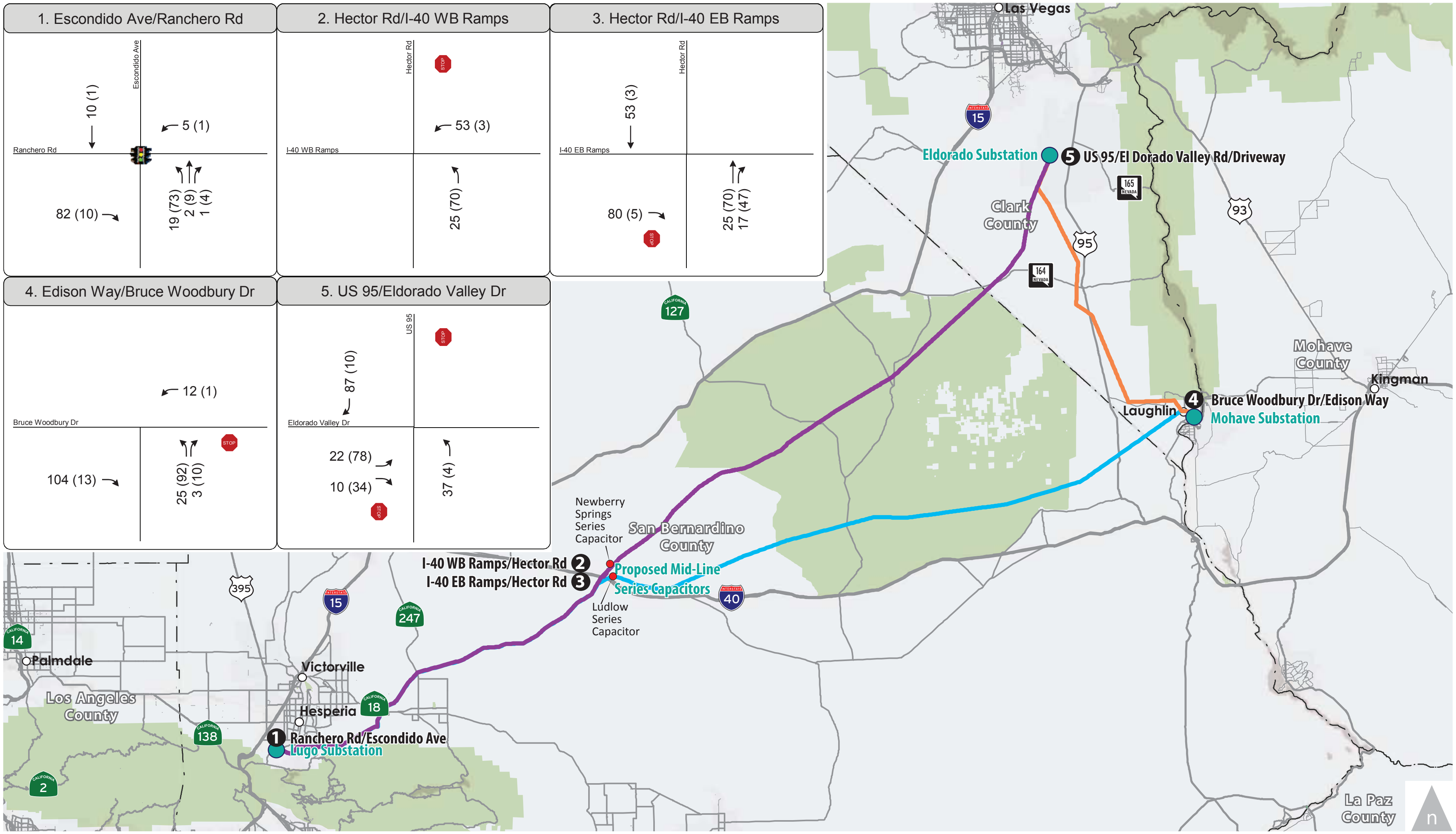
PCE = Passenger Car Equivalent
Total PCE = Worker Trips + Truck PCE
Source: Fehr & Peers, 2017.

LEGEND # Study Intersection — Inbound Route — Outbound Route #% Project Trip Distribution

Figure 3

Project Trip Distribution

WC16-3295_3_TripDistro



LEGEND

XX (YY) AM (PM) Peak Hour Traffic Volumes — Signalized Intersection — Stop Sign

Study Intersection — Substation — Mid-line Capacitors

Eldorado-Lugo 500 kV Transmission Line — Eldorado-Mohave 500 kV Transmission Line — Lugo-Mohave 500 kV Transmission Line

Figure 4

Project Trip Assignment

EXISTING WITH PROJECT CONSTRUCTION CONDITIONS

This section evaluates potential traffic conditions under Existing with Project Construction conditions. The Existing with Project Construction traffic volumes are shown on **Figure 5**. The intersection analysis results of the Existing with Project Construction conditions are presented in **Table 3** and compared to the results for Existing conditions.

As shown in Table 3, the study intersections would operate at LOS C or better with construction traffic generated by the Project. Therefore, the Project would not significantly impact intersection operations adjacent to the project sites.

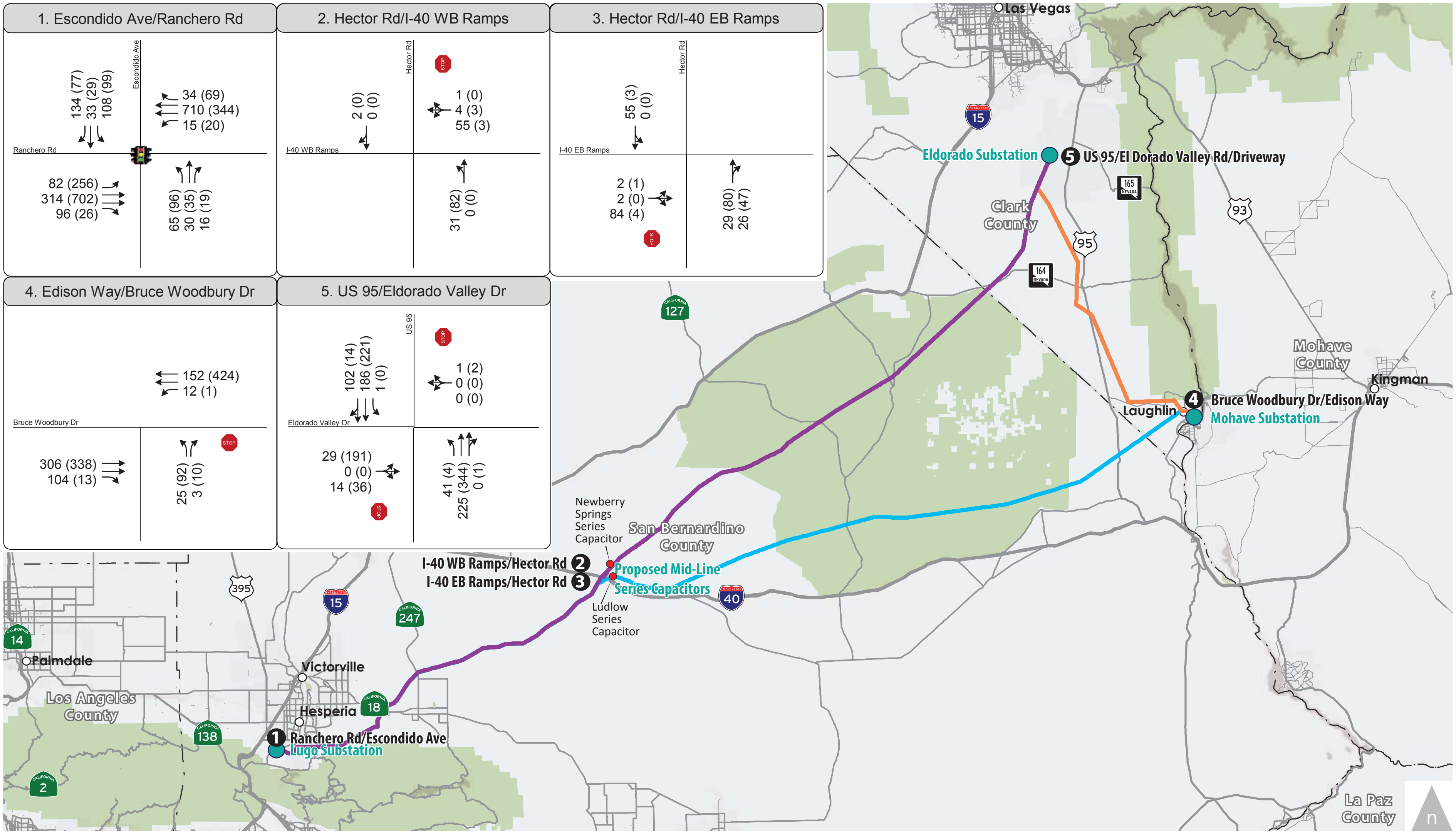
TABLE 3: EXISTING WITH PROJECT CONSTRUCTION PEAK HOUR INTERSECTION LEVEL OF SERVICE

	Intersection	Control[1]	LOS Target[2]	Peak Hour[3]	Existing without Project Construction		Existing with Project Construction		Significant Impact?
					Delay[4]	LOS[5]	Delay[4]	LOS[5]	
Lugo Substation Study Intersections									
1	Escondido Avenue & Ranchero Road	Signal	C	AM PM	15.6 14.0	B B	15.8 14.4	B B	No No
Proposed Mid-Line Series Capacitors Study Intersections									
2	Hector Road & I-40 West Ramps[6]	SSSC	C	AM PM	6.9 (8.9) 7.7 (9.3)	A (A) A (A)	8.5 (9.5) 7.6 (10.4)	A (A) A (B)	No No
3	Hector Road & I-40 East Ramps[6]	SSSC	C	AM PM	3.1 (8.6) 1.1 (8.4)	A (A) A (A)	4.1 (9.2) 0.4 (8.5)	A (A) A (A)	No No
Mohave Substation Study Intersections									
4	Edison Way & Bruce Woodbury Drive	SSSC	C	AM PM	0 (0) 0 (0)	A (A) A (A)	0.7 (12.3) 1.7 (16.0)	A (B) A (C)	No No
Eldorado Substation Study Intersections									
5	US 95 & Eldorado Valley Road	SSSC	D	AM PM	0.3 (10.6) 2.6 (11.8)	A (B) A (B)	1.4 (12.5) 4.5 (15.9)	A (B) A (C)	No No

Notes:

1. Signal = Signalized Intersection; SSSC = Side-Street Stop-Controlled Intersection.
2. LOS targets per San Bernardino County and Clark County; Boulder City does not have an established LOS target—therefore, intersections within Boulder City are evaluated against Clark County LOS targets.
3. AM Peak Hour = 7:00 to 8:00 AM; PM Peak Hour = 5:00 to 6:00 PM.
4. Delay presented in seconds per vehicle; for signalized intersections, delay presented as Intersection Average; for side-street stop-controlled intersections, delay presented as Intersection Average (Worst Movement).
5. LOS = Level of Service.
6. Results generated by HCM 2000 methodology due to limitations in HCM 2010 applications.

Source: Fehr & Peers, 2017.



LEGEND

XX (YY) AM (PM) Peak Hour Traffic Volumes — Signalized Intersection — Stop Sign

Study Intersection — Substation — Mid-line Capacitors

Eldorado-Lugo 500 kV Transmission Line — Eldorado-Mohave 500 kV Transmission Line — Lugo-Mohave 500 kV Transmission Line

Figure 5

Existing with Project Peak Hour Traffic Volumes, Lane Configurations and Traffic Control

WC16-3295_5_Ex+ProjVol

CEQA CHECKLIST

This section evaluates the proposed Project against the CEQA significance criteria.

Criteria 1	*Would the Project conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?*

As previously discussed, the Project would not significantly impact any of the study intersections as all intersections would operate within the LOS targets set by San Bernardino County and Clark County.

Result: Less Than Significant Impact

Criteria 2	*Would the Project conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?*

The San Bernardino Associated Governments (SANBAG) monitors and updates its Congestion Management Program (CMP) of major freeways and arterials in the county, and most recently updated its CMP in June 2016. The CMP has established LOS E as the minimum traffic LOS standard.

Within the Project area, I-15 and I-40 are identified as part of the CMP system; no arterials in the Project area are included in the CMP system. Since the Project sites would not generate traffic on a typical day after construction is complete, it would not trigger the need for CMP analysis.

The sections of I-15 (from SR 138 to I-40) and I-40 (from I-15 and US 95) within the Project area were measured to operate at LOS A or B during both the AM and PM peak periods. During construction of the Project, these freeways would continue to operate at acceptable levels of service.

Result: Less Than Significant Impact

Criteria 3	*Would the Project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?*

The proposed Project is likely to rely heavily on helicopters to string overhead ground wire along the Lugo-Mohave, Eldorado-Lugo, and Eldorado-Mohave 500 kV transmission lines. Helicopter flight patterns will be coordinated with local airports. Further, construction would not take place within the vicinity of any airports.

Result: Less Than Significant

Criteria 4	*Would the Project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?*

The Project would not change any design features to the existing roadway system. Also, the Proposed Project once constructed would not increase the number of commuting workers; it is therefore not expected to generate new traffic on a typical day. As such, the land use is compatible with the area.

Result: No Impact

Criteria 5	*Would the Project result in inadequate emergency access?*

Construction activities completed within the public street right-of-way would require the use of a traffic control service, and all lane closures would be conducted in accordance with applicable requirements. These traffic control measures would be consistent with those published in the *California Joint Utility Traffic Control Manual (CJUTCM)* and the California *Manual on Uniform Traffic Control Devices (MUTCD)*. While traffic control is not expected to occur along state facilities, proper encroachment permits would be obtained by the corresponding jurisdiction if traffic control is needed along state facilities. Since the Project would result in minimal increases in vehicle delay and would maintain vehicle access, the Project would not result in inadequate emergency access.

Result: Less Than Significant Impact

Criteria 6	*Would the Project conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?*

As previously discussed, there are few pedestrian, bicycle, and transit facilities adjacent to the construction areas. Where these facilities do exist, the Project would not impact access or performance of the facilities.

Result: Less Than Significant Impact

Criteria 7	*Would the Project result in significant cumulative impacts in combination with past, present and reasonably foreseeable projects?*

The Project would not generate additional recurring trips after construction. Therefore, under cumulative conditions the Project would not add trips to the system and would not result in significant impacts.

Result: Less Than Significant Impact

Since the Project would not result in any significant impacts, no mitigation measures are required.

APPENDIX A: INTERSECTION LEVEL OF SERVICE METHODS

The operations of roadway facilities are for vehicles described with the term "level of service" (LOS). LOS is a qualitative description of traffic flow based on factors such as speed, travel time, delay, and freedom to maneuver. Six levels of service are defined ranging from LOS A (i.e., free flow conditions) to LOS F (over capacity conditions). LOS E corresponds to operations "at capacity." When volumes exceed capacity, stop-and-go conditions result and operations are designated as LOS F.

Signalized Intersections

Traffic conditions at signalized intersections were evaluated using the method from Chapter 18 of the Transportation Research Board's 2010 *Highway Capacity Manual*. This operations analysis method uses various intersection characteristics (such as traffic volumes, lane geometry, and signal phasing) to estimate the average control delay experienced by motorists traveling through an intersection. Control delay incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. **Table A-1** summarizes the relationship between average delay per vehicle and LOS for signalized intersections.

Unsignalized Intersections

Traffic conditions at unsignalized intersections were evaluated using the method from Chapter 19 of the 2010 *Highway Capacity Manual*. With this method, operations are defined by the average control delay per vehicle (measured in seconds) for each movement that must yield the right-of-way. At two-way or side street-controlled intersections, the control delay (and LOS) is calculated for each controlled movement, as well as the left-turn movement from the major street, and the entire intersection. For controlled approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. The delays for the entire intersection and for the movement or approach with the highest delay are reported. **Table A-2** summarizes the relationship between delay and LOS for unsignalized intersections.

TABLE A-1
SIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	$\leq$ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	> 10.0 to 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20.0 to 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and/or high volume-to-capacity (V/C) ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35.0 to 55.0
E	Operations with long delays indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	> 80.0

Source: *Highway Capacity Manual (*Transportation Research Board, 2010).

TABLE A-2
UNSIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no delays	$\leq$ 10.0
B	Short traffic delays	> 10.0 to 15.0
C	Average traffic delays	> 15.0 to 25.0
D	Long traffic delays	> 25.0 to 35.0
E	Very long traffic delays	> 35.0 to 50.0
F	Extreme traffic delays with intersection capacity exceeded	> 50.0

Source: *Highway Capacity Manual* (Transportation Research Board, 2010).

APPENDIX B: TRAFFIC COUNT WORKSHEETS

ITM Peak Hour Summary

Prepared by:

NDS

National Data & Surveying Services

Escondido Ave and Ranchero Rd , Oak Hills

Date: 1/14/2016

Day: Thursday

Project #: 16-6007-001

City: Oak Hills

AM Peak Hour	700 AM
NOON Peak Hour	
PM Peak Hour	400 PM

N

Escondido Ave

Ranchero Rd

Peak Hour Summary

Southbound Approach

	Left	Through	Right	Out (northbound departure)
Lanes	1	1	1	
AM	134	23	108	142
NOON	0	0	0	0
PM	76	28	99	347

Eastbound Approach

	Lanes	AM	NOON	PM
Out (westbound departure)		883	0	476
Left	1	80	0	253
Through	2	305	0	695
Right	1	14	0	16

Westbound Approach

	AM	NOON	PM	Lanes
Right	34	0	68	1
Through	703	0	377	2
Left	10	0	19	1
Out (eastbound departure)	427	0	809	

CONTROL

Signalized

Northbound Approach

	Out (southbound departure)	Left	Through	Right
AM	47	46	28	14
NOON	0	0	0	0
PM	63	23	26	15
Lanes		1	1	1

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	NONE	NONE
PM	4:00 PM	6:00 PM

Total Ins & Outs

North Leg

AM	265	142
NOON	0	0
PM	203	347

West Leg

AM	NOON	PM
883	0	476
399	0	964

East Leg

AM	NOON	PM
747	0	464
427	0	809

South Leg

AM	47	88
NOON	0	0
PM	63	64

Total Volume Per Leg

North Leg

AM	407
NOON	0
PM	550

West Leg

AM	NOON	PM
1282	0	1440

East Leg

AM	NOON	PM
1174	0	1273

South Leg

AM	135
NOON	0
PM	127

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Hector Rd and I-40 WB Ramps , Ludlow

Date:	1/20/2016
Day:	Wednesday

Project #:	16-6008-003
City:	Ludlow

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	400 PM

Peak Hour Summary

Hector Rd

I-40 WB Ramps

CONTROL

1-Way Stop (WB)

Southbound Approach

	Lanes	0	1	0	(Exiting)
AM		2	0	0	1
NOON		0	0	0	0
PM		0	0	0	0

Eastbound Approach

	AM	NOON	PM
(Exiting)	12	0	14
Left (Lanes 0)	0	0	0
Through (Lanes 0)	0	0	0
Right (Lanes 0)	0	0	0

Westbound Approach

	AM	NOON	PM	Lanes
Right	1	0	0	0
Through	4	0	3	1
Left	2	0	0	0
(Exiting)	0	0	0	

Northbound Approach

	(Exiting)	Left	Through	Right
AM	2	6	0	0
NOON	0	0	0	0
PM	0	11	0	0
Lanes		0	1	0

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	NONE	NONE
PM	4:00 PM	6:00 PM

Total Ins & Outs

North Leg

AM	2	1
NOON	0	0
PM	0	0

West Leg

AM	NOON	PM
12	0	14
0	0	0

East Leg

AM	NOON	PM
7	0	3
0	0	0

South Leg

AM	2	6
NOON	0	0
PM	0	11

Total Volume Per Leg

	North Leg	East Leg	South Leg	West Leg
AM	3	7	8	12
NOON	0	0	0	0
PM	0	3	11	14

ITM Peak Hour Summary

Prepared by:

NDS

National Data & Surveying Services

Hector Rd and I-40 EB Ramps , Ludlow

Date:	1/20/2016
Day:	Wednesday
Project #:	16-6008-002
City:	Ludlow

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	400 PM

Peak Hour Summary

Hector Rd

I-40 EB Ramps

Southbound Approach

	Lanes 0	Lanes 1	Lanes 0	Out
AM	0	2	0	6
NOON	0	0	0	0
PM	0	0	0	11

Eastbound Approach

	AM	NOON	PM
Out	0	0	0

Lanes		AM	NOON	PM
0	Left	2	0	1
1	Through	2	0	0
0	Right	4	0	1

Westbound Approach

	AM	NOON	PM	Lanes
Left	0	0	0	0
Through	0	0	0	0
Right	0	0	0	0
Out	11	0	0	

CONTROL

1-Way Stop (EB)

Northbound Approach

	Out	Left	Through	Right
AM	6	0	4	9
NOON	0	0	0	0
PM	1	0	10	0
Lanes		0	1	0

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	NONE	NONE
PM	4:00 PM	6:00 PM

Total Ins & Outs

North Leg

	In	Out
AM	2	6
NOON	0	0
PM	0	11

East Leg

	AM	NOON	PM
In	0	0	0
Out	11	0	0

West Leg

	AM	NOON	PM
Out	0	0	0
In	8	0	2

South Leg

	Out	In
AM	6	13
NOON	0	0
PM	1	10

Total Volume Per Leg

	North Leg	South Leg
AM	8	19
NOON	0	0
PM	11	11

	West Leg	East Leg
AM	8	11
NOON	0	0
PM	2	0

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Edison Way and Bruce Woodbury Dr , Laughlin

Date: 1/26/2016
Day: Tuesday

Project #: 16-8006-004
City: Laughlin

N

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	400 PM

Peak Hour Summary

Southbound Approach

Edison Way

	Lanes	0	0	0	
AM		0	0	0	0
NOON		0	0	0	0
PM		0	0	0	0

Bruce Woodbury Dr

Eastbound Approach

	AM	NOON	PM
	152	0	424

Lanes	AM	NOON	PM
0	0	0	0
2	306	0	338
1	0	0	0

Westbound Approach

AM	NOON	PM	Lanes
0	0	0	0
152	0	424	2
0	0	0	1

AM	NOON	PM
306	0	338

CONTROL

No Control

Count Periods	Start	End
AM	7:00 AM	10:00 AM
NOON	NONE	NONE
PM	2:00 PM	11:45 PM

AM	0	0	0	0	AM
NOON	0	0	0	0	NOON
PM	0	0	0	0	PM
		0	1	1	Lanes

Northbound Approach

Total Ins & Outs

North Leg

0	0	AM
0	0	NOON
0	0	PM

West Leg

AM	NOON	PM
152	0	424
306	0	338

East Leg

AM	NOON	PM
152	0	424
306	0	338

South Leg

AM	0	0
NOON	0	0
PM	0	0

Total Volume Per Leg

North Leg

0	AM
0	NOON
0	PM

West Leg

AM	NOON	PM
458	0	762

East Leg

AM	NOON	PM
458	0	762

South Leg

AM	0
NOON	0
PM	0

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

I-95 and Eldorado Valley Dr , Las Vegas

Date:	4/5/2016
Day:	Tuesday
Project #:	16-8030-001
City:	Las Vegas

N

I-95

Eldorado Valley Dr

AM Peak Hour	800 AM
NOON Peak Hour	
PM Peak Hour	415 PM

Peak Hour Summary

Southbound Approach

	Right	Thru	Left	Exiting
Lanes	0	2	1	
AM	15	186	1	233
NOON	0	0	0	0
PM	4	170	0	342

Eastbound Approach

	AM	NOON	PM
Exiting	19	0	4

Lanes		AM	NOON	PM
0	Left	7	0	112
1	Thru	0	0	0
0	Right	4	0	2

Westbound Approach

	AM	NOON	PM	Lanes
Right	1	0	2	0
Thru	0	0	0	1
Left	0	0	0	0

	AM	NOON	PM
Exiting	1	0	1

CONTROL

2-Way Stop (EB/WB)

Northbound Approach

	Exiting	Left	Thru	Right
AM	190	4	225	0
NOON	0	0	0	0
PM	172	0	228	1
Lanes		1	2	0

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	NONE	NONE
PM	4:00 PM	6:00 PM

Total Ins & Outs

North Leg

	In	Out
AM	202	233
NOON	0	0
PM	174	342

West Leg

	AM	NOON	PM
Out	19	0	4
In	11	0	114

East Leg

	AM	NOON	PM
In	1	0	2
Out	1	0	1

South Leg

	Out	In
AM	190	229
NOON	0	0
PM	172	229

Total Volume Per Leg

North Leg

AM	435
NOON	0
PM	516

West Leg

AM	NOON	PM
30	0	118

East Leg

AM	NOON	PM
2	0	3

South Leg

AM	419
NOON	0
PM	401

APPENDIX C: LEVEL OF SERVICE ANALYSIS WORKSHEETS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	305	14	10	703	34	46	28	14	108	23	134
Future Volume (veh/h)	80	305	14	10	703	34	46	28	14	108	23	134
Number	5	2	12	1	6	16	3	8	18	7	4	14
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	1845	1845	1900	1900	1881	1881	1900	1900	1827	1900	1900	1900
Adj Flow Rate, veh/h	116	442	11	14	1019	23	67	41	6	157	33	48
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Peak Hour Factor	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Percent Heavy Veh, %	3	3	0	0	1	1	0	0	4	0	0	0
Cap, veh/h	289	1978	912	88	1603	716	369	399	327	372	399	340
Arrive On Green	0.16	0.56	0.56	0.05	0.45	0.45	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1757	3505	1615	1810	3574	1597	1338	1900	1553	1380	1900	1615
Grp Volume(v), veh/h	116	442	11	14	1019	23	67	41	6	157	33	48
Grp Sat Flow(s),veh/h/ln	1757	1752	1615	1810	1787	1597	1338	1900	1553	1380	1900	1615
Q Serve(g_s), s	4.0	4.3	0.2	0.5	14.9	0.5	2.9	1.2	0.2	7.0	0.9	1.6
Cycle Q Clear(g_c), s	4.0	4.3	0.2	0.5	14.9	0.5	3.8	1.2	0.2	8.2	0.9	1.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	289	1978	912	88	1603	716	369	399	327	372	399	340
V/C Ratio(X)	0.40	0.22	0.01	0.16	0.64	0.03	0.18	0.10	0.02	0.42	0.08	0.14
Avail Cap(c_a), veh/h	531	1978	912	547	1976	883	729	910	744	743	910	774
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	25.4	7.4	6.5	31.0	14.4	10.5	23.1	21.6	21.2	24.9	21.5	21.8
Incr Delay (d2), s/veh	0.9	0.1	0.0	0.8	0.6	0.0	0.3	0.2	0.0	1.1	0.1	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	2.0	2.0	0.1	0.3	7.5	0.2	1.1	0.6	0.1	2.8	0.5	0.8
LnGrp Delay(d),s/veh	26.3	7.4	6.5	31.8	15.1	10.5	23.4	21.8	21.3	26.0	21.7	22.1
LnGrp LOS	C	A	A	C	B	B	C	C	C	C	C	C
Approach Vol, veh/h		569			1056			114			238	
Approach Delay, s/veh		11.3			15.2			22.7			24.6	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.3	42.3		18.3	15.2	34.4		18.3
Change Period (Y+Rc), s	4.5	6.5		6.5	4.5	6.5		6.5
Max Green Setting (Gmax), s	20.0	35.0		30.0	20.0	35.0		30.0
Max Q Clear Time (g_c+I1), s	2.5	6.3		10.2	6.0	16.9		5.8
Green Ext Time (p_c), s	0.0	15.0		1.7	0.2	10.9		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	15.6
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	2	4	1	6	0	0	0	0	2
Future Volume (Veh/h)	0	0	0	2	4	1	6	0	0	0	0	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	3	5	1	8	0	0	0	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	21	18	2	18	19	0	3			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	21	18	2	18	19	0	3			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	99	100	100			100		
cM capacity (veh/h)	988	876	1089	998	873	1091	1626			1636		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	9	8	3
Volume Left	3	8	0
Volume Right	1	0	3
cSH	932	1626	1700
Volume to Capacity	0.01	0.00	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.9	7.2	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	7.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	15.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	2	4	0	0	0	0	4	9	0	2	0
Future Volume (Veh/h)	2	2	4	0	0	0	0	4	9	0	2	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	3	3	5	0	0	0	0	5	12	0	3	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	14	20	3	20	14	11	3			17		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	14	20	3	20	14	11	3			17		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	1005	878	1087	991	884	1076	1632			1613		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	11	17	3
Volume Left	3	0	0
Volume Right	5	12	0
cSH	1000	1700	1613
Volume to Capacity	0.01	0.01	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.6	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	306	0	0	152	0	0
Future Vol, veh/h	306	0	0	152	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	480	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	352	0	0	175	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	352	0	439	-
Stage 1	-	-	-	-	352	-
Stage 2	-	-	-	-	87	-
Critical Hdwy	-	-	4.1	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	-
Pot Cap-1 Maneuver	-	-	1218	-	551	0
Stage 1	-	-	-	-	689	0
Stage 2	-	-	-	-	932	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1218	-	551	-
Mov Cap-2 Maneuver	-	-	-	-	551	-
Stage 1	-	-	-	-	689	-
Stage 2	-	-	-	-	932	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	1218	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	0	-	-	0	-
HCM Lane LOS	A	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	0	4	0	0	1	4	225	0	1	186	15
Future Vol, veh/h	7	0	4	0	0	1	4	225	0	1	186	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	479	-	-	500	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	8	0	5	0	0	1	5	259	0	1	214	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	364	493	116	377	501	129	231	0	0	259	0	0
Stage 1	225	225	-	268	268	-	-	-	-	-	-	-
Stage 2	139	268	-	109	233	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.52	6.9	7.5	6.52	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.52	-	6.5	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.52	-	6.5	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.01	3.3	3.5	4.01	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	572	478	921	560	473	903	1349	-	-	1317	-	-
Stage 1	763	719	-	720	688	-	-	-	-	-	-	-
Stage 2	856	688	-	890	713	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	569	476	921	555	471	903	1349	-	-	1317	-	-
Mov Cap-2 Maneuver	569	476	-	555	471	-	-	-	-	-	-	-
Stage 1	760	718	-	717	685	-	-	-	-	-	-	-
Stage 2	852	685	-	885	712	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	9	0.1	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1349	-	-	661	903	1317	-	-
HCM Lane V/C Ratio	0.003	-	-	0.019	0.001	0.001	-	-
HCM Control Delay (s)	7.7	-	-	10.6	9	7.7	-	-
HCM Lane LOS	A	-	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	253	695	16	19	337	68	23	26	15	99	28	76
Future Volume (veh/h)	253	695	16	19	337	68	23	26	15	99	28	76
Number	5	2	12	1	6	16	3	8	18	7	4	14
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	1881	1881	1900	1900	1863	1881	1900	1900	1845	1900	1900	1881
Adj Flow Rate, veh/h	281	772	10	21	374	26	26	29	3	110	31	16
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
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
Percent Heavy Veh, %	1	1	0	0	2	1	0	0	3	0	0	1
Cap, veh/h	387	1793	810	124	1252	565	412	418	345	417	418	352
Arrive On Green	0.22	0.50	0.50	0.07	0.35	0.35	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1792	3574	1615	1810	3539	1597	1380	1900	1568	1399	1900	1599
Grp Volume(v), veh/h	281	772	10	21	374	26	26	29	3	110	31	16
Grp Sat Flow(s),veh/h/ln	1792	1787	1615	1810	1770	1597	1380	1900	1568	1399	1900	1599
Q Serve(g_s), s	8.3	7.8	0.2	0.6	4.4	0.6	0.9	0.7	0.1	3.9	0.7	0.5
Cycle Q Clear(g_c), s	8.3	7.8	0.2	0.6	4.4	0.6	1.6	0.7	0.1	4.6	0.7	0.5
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	387	1793	810	124	1252	565	412	418	345	417	418	352
V/C Ratio(X)	0.73	0.43	0.01	0.17	0.30	0.05	0.06	0.07	0.01	0.26	0.07	0.05
Avail Cap(c_a), veh/h	642	2344	1059	649	2321	1047	893	1080	891	904	1080	909
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	20.8	9.1	7.1	25.1	13.4	12.1	18.3	17.7	17.4	19.5	17.7	17.6
Incr Delay (d2), s/veh	2.6	0.2	0.0	0.6	0.2	0.0	0.1	0.1	0.0	0.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	3.9	0.1	0.3	2.2	0.3	0.3	0.4	0.0	1.6	0.4	0.2
LnGrp Delay(d),s/veh	23.4	9.3	7.2	25.8	13.5	12.2	18.4	17.7	17.4	19.9	17.8	17.6
LnGrp LOS	C	A	A	C	B	B	B	B	B	B	B	B
Approach Vol, veh/h		1063			421			58			157	
Approach Delay, s/veh		13.0			14.1			18.0			19.3	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.9	32.7		16.6	16.4	24.2		16.6
Change Period (Y+Rc), s	4.5	6.5		6.5	4.5	6.5		6.5
Max Green Setting (Gmax), s	20.0	35.0		30.0	20.0	35.0		30.0
Max Q Clear Time (g_c+I1), s	2.6	9.8		6.6	10.3	6.4		3.6
Green Ext Time (p_c), s	0.0	10.6		1.0	0.5	11.2		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	14.0
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	3	0	11	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	0	3	0	11	0	0	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	0	4	0	15	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	32	30	0	30	30	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	32	30	0	30	30	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	99			100		
cM capacity (veh/h)	970	859	1091	977	849	1091	1604			1636		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	4	15	0
Volume Left	0	15	0
Volume Right	0	0	0
cSH	849	1604	1700
Volume to Capacity	0.00	0.01	0.00
Queue Length 95th (ft)	0	1	0
Control Delay (s)	9.3	7.3	0.0
Lane LOS	A	A	
Approach Delay (s)	9.3	7.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	1	0	0	0	0	10	0	0	0	0
Future Volume (Veh/h)	1	0	1	0	0	0	0	10	0	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	1	0	1	0	0	0	0	13	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	13	13	0	14	13	13	0			13		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	13	13	0	14	13	13	0			13		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	1006	885	1091	1006	885	1073	1636			1619		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	2	13	0
Volume Left	1	0	0
Volume Right	1	0	0
cSH	1047	1700	1700
Volume to Capacity	0.00	0.01	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	8.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.4	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	338	0	0	424	0	0
Future Vol, veh/h	338	0	0	424	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	480	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	376	0	0	471	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	376	0	612	-
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	4.1	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	-
Pot Cap-1 Maneuver	-	-	1194	-	430	0
Stage 1	-	-	-	-	670	0
Stage 2	-	-	-	-	787	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1194	-	430	-
Mov Cap-2 Maneuver	-	-	-	-	430	-
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	787	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	1194	-
HCM Lane V/C Ratio	-	-	-	-	-	-
HCM Control Delay (s)	0	0	-	-	0	-
HCM Lane LOS	A	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-	0	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	112	0	2	0	0	2	0	228	1	0	170	4
Future Vol, veh/h	112	0	2	0	0	2	0	228	1	0	170	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	479	-	-	500	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	1	0	0	0	0	0	0	51	0	0	30	1
Mvmt Flow	114	0	2	0	0	2	0	233	1	0	173	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	292	410	89	320	411	117	178	0	0	234	0	0
Stage 1	176	176	-	233	233	-	-	-	-	-	-	-
Stage 2	116	234	-	87	178	-	-	-	-	-	-	-
Critical Hdwy	7.52	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.52	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.52	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.51	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	640	534	958	614	534	919	1410	-	-	1345	-	-
Stage 1	812	757	-	755	716	-	-	-	-	-	-	-
Stage 2	879	715	-	917	756	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	639	534	958	613	534	919	1410	-	-	1345	-	-
Mov Cap-2 Maneuver	639	534	-	613	534	-	-	-	-	-	-	-
Stage 1	812	757	-	755	716	-	-	-	-	-	-	-
Stage 2	877	715	-	915	756	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.8	8.9	0	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1410	-	-	643	919	1345	-	-
HCM Lane V/C Ratio	-	-	-	0.181	0.002	-	-	-
HCM Control Delay (s)	0	-	-	11.8	8.9	0	-	-
HCM Lane LOS	A	-	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.7	0	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	82	314	96	15	710	34	65	30	16	108	33	134
Future Volume (veh/h)	82	314	96	15	710	34	65	30	16	108	33	134
Number	5	2	12	1	6	16	3	8	18	7	4	14
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	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	119	455	130	22	1029	23	94	43	9	157	48	48
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
Peak Hour Factor	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	294	1973	883	121	1627	727	359	406	345	372	406	345
Arrive On Green	0.16	0.55	0.55	0.07	0.45	0.45	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1810	3610	1615	1810	3610	1613	1320	1900	1615	1374	1900	1615
Grp Volume(v), veh/h	119	455	130	22	1029	23	94	43	9	157	48	48
Grp Sat Flow(s),veh/h/ln	1810	1805	1615	1810	1805	1613	1320	1900	1615	1374	1900	1615
Q Serve(g_s), s	4.1	4.5	2.8	0.8	15.2	0.6	4.3	1.3	0.3	7.2	1.4	1.7
Cycle Q Clear(g_c), s	4.1	4.5	2.8	0.8	15.2	0.6	5.7	1.3	0.3	8.5	1.4	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	294	1973	883	121	1627	727	359	406	345	372	406	345
V/C Ratio(X)	0.40	0.23	0.15	0.18	0.63	0.03	0.26	0.11	0.03	0.42	0.12	0.14
Avail Cap(c_a), veh/h	534	1973	883	534	1951	872	695	890	756	722	890	756
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	26.0	8.2	7.8	30.6	14.6	10.6	24.3	22.0	21.6	25.4	22.0	22.1
Incr Delay (d2), s/veh	0.9	0.1	0.1	0.7	0.7	0.0	0.5	0.2	0.0	1.1	0.2	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	2.1	2.2	1.3	0.4	7.7	0.2	1.6	0.7	0.1	2.8	0.8	0.8
LnGrp Delay(d),s/veh	26.9	8.3	7.9	31.3	15.3	10.6	24.9	22.1	21.6	26.4	22.2	22.4
LnGrp LOS	C	A	A	C	B	B	C	C	C	C	C	C
Approach Vol, veh/h		704			1074			146			253	
Approach Delay, s/veh		11.3			15.5			23.9			24.9	
Approach LOS		B			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	41.9		18.8	15.3	35.3		18.8
Change Period (Y+Rc), s	4.5	6.5		6.5	4.5	6.5		6.5
Max Green Setting (Gmax), s	20.0	35.0		30.0	20.0	35.0		30.0
Max Q Clear Time (g_c+I1), s	2.8	6.5		10.5	6.1	17.2		7.7
Green Ext Time (p_c), s	0.0	16.0		2.0	0.2	11.5		2.0

Intersection Summary	
HCM 2010 Ctrl Delay	15.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	55	4	1	31	0	0	0	0	2
Future Volume (Veh/h)	0	0	0	55	4	1	31	0	0	0	0	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	73	5	1	41	0	0	0	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	87	84	2	84	85	0	3			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	87	84	2	84	85	0	3			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	92	99	100	97			100		
cM capacity (veh/h)	881	790	1089	891	789	1091	1632			1636		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	79	41	3
Volume Left	73	41	0
Volume Right	1	0	3
cSH	886	1632	1700
Volume to Capacity	0.09	0.03	0.00
Queue Length 95th (ft)	7	2	0
Control Delay (s)	9.5	7.3	0.0
Lane LOS	A	A	
Approach Delay (s)	9.5	7.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	8.5		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	2	84	0	0	0	0	29	26	0	55	0
Future Volume (Veh/h)	2	2	84	0	0	0	0	29	26	0	55	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	3	3	112	0	0	0	0	39	35	0	73	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	130	147	73	243	130	56	73			74		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	130	147	73	243	130	56	73			74		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	89	100	100	100	100			100		
cM capacity (veh/h)	848	748	995	633	765	1016	1540			1538		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	118	74	73
Volume Left	3	0	0
Volume Right	112	35	0
cSH	982	1700	1538
Volume to Capacity	0.12	0.04	0.00
Queue Length 95th (ft)	10	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	306	104	12	152	25	3
Future Vol, veh/h	306	104	12	152	25	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	480	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	352	120	14	175	29	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	352	0	467	-
Stage 1	-	-	-	-	352	-
Stage 2	-	-	-	-	115	-
Critical Hdwy	-	-	4.1	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	-
Pot Cap-1 Maneuver	-	-	1218	-	530	0
Stage 1	-	-	-	-	689	0
Stage 2	-	-	-	-	903	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1218	-	524	-
Mov Cap-2 Maneuver	-	-	-	-	524	-
Stage 1	-	-	-	-	689	-
Stage 2	-	-	-	-	893	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	524	-	-	-	1218	-
HCM Lane V/C Ratio	0.055	-	-	-	0.011	-
HCM Control Delay (s)	12.3	0	-	-	8	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	0	14	0	0	1	41	225	0	1	186	102
Future Vol, veh/h	29	0	14	0	0	1	41	225	0	1	186	102
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	479	-	-	500	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	33	0	16	0	0	1	47	259	0	1	214	117

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	499	628	166	462	686	129	331	0	0	259	0	0
Stage 1	275	275	-	353	353	-	-	-	-	-	-	-
Stage 2	224	353	-	109	333	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	459	402	856	488	373	903	1240	-	-	1317	-	-
Stage 1	713	686	-	642	634	-	-	-	-	-	-	-
Stage 2	764	634	-	890	647	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	445	386	856	465	359	903	1240	-	-	1317	-	-
Mov Cap-2 Maneuver	445	386	-	465	359	-	-	-	-	-	-	-
Stage 1	686	685	-	618	610	-	-	-	-	-	-	-
Stage 2	734	610	-	873	647	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	9	1.2	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1240	-	-	527	903	1317	-	-
HCM Lane V/C Ratio	0.038	-	-	0.094	0.001	0.001	-	-
HCM Control Delay (s)	8	-	-	12.5	9	7.7	-	-
HCM Lane LOS	A	-	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	256	702	26	20	344	69	96	35	19	99	29	77
Future Volume (veh/h)	256	702	26	20	344	69	96	35	19	99	29	77
Number	5	2	12	1	6	16	3	8	18	7	4	14
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	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	284	780	21	22	382	27	107	39	7	110	32	18
Adj No. of Lanes	1	2	1	1	2	1	1	1	1	1	1	1
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
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	389	1808	809	128	1286	574	410	418	355	406	418	355
Arrive On Green	0.22	0.50	0.50	0.07	0.36	0.36	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1810	3610	1615	1810	3610	1613	1376	1900	1615	1381	1900	1615
Grp Volume(v), veh/h	284	780	21	22	382	27	107	39	7	110	32	18
Grp Sat Flow(s),veh/h/ln	1810	1805	1615	1810	1805	1613	1376	1900	1615	1381	1900	1615
Q Serve(g_s), s	8.4	7.9	0.4	0.7	4.4	0.6	3.8	0.9	0.2	4.0	0.8	0.5
Cycle Q Clear(g_c), s	8.4	7.9	0.4	0.7	4.4	0.6	4.6	0.9	0.2	4.9	0.8	0.5
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	389	1808	809	128	1286	574	410	418	355	406	418	355
V/C Ratio(X)	0.73	0.43	0.03	0.17	0.30	0.05	0.26	0.09	0.02	0.27	0.08	0.05
Avail Cap(c_a), veh/h	645	2354	1053	645	2354	1052	885	1074	913	883	1074	913
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	21.0	9.1	7.3	25.1	13.3	12.1	19.6	17.9	17.6	19.8	17.8	17.7
Incr Delay (d2), s/veh	2.6	0.2	0.0	0.6	0.2	0.0	0.5	0.1	0.0	0.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	4.0	0.2	0.4	2.2	0.3	1.5	0.5	0.1	1.6	0.4	0.2
LnGrp Delay(d),s/veh	23.6	9.4	7.3	25.8	13.5	12.2	20.1	18.0	17.6	20.3	17.9	17.8
LnGrp LOS	C	A	A	C	B	B	C	B	B	C	B	B
Approach Vol, veh/h		1085			431			153			160	
Approach Delay, s/veh		13.1			14.1			19.5			19.5	
Approach LOS		B			B			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	32.8		16.6	16.4	24.5		16.6				
Change Period (Y+Rc), s	4.5	6.5		6.5	4.5	6.5		6.5				
Max Green Setting (Gmax), s	20.0	35.0		30.0	20.0	35.0		30.0				
Max Q Clear Time (g_c+I1), s	2.7	9.9		6.9	10.4	6.4		6.6				
Green Ext Time (p_c), s	0.0	10.8		1.5	0.5	11.5		1.5				
Intersection Summary												
HCM 2010 Ctrl Delay			14.4									
HCM 2010 LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	3	3	0	82	0	0	0	0	0
Future Volume (Veh/h)	0	0	0	3	3	0	82	0	0	0	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	0	0	0	4	4	0	109	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	220	218	0	218	218	0	0			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	220	218	0	218	218	0	0			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	99	99	100	93			100		
cM capacity (veh/h)	699	638	1091	705	638	1091	1636			1636		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	109	0
Volume Left	4	109	0
Volume Right	0	0	0
cSH	670	1636	1700
Volume to Capacity	0.01	0.07	0.00
Queue Length 95th (ft)	1	5	0
Control Delay (s)	10.4	7.4	0.0
Lane LOS	B	A	
Approach Delay (s)	10.4	7.4	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	14.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	6	0	0	0	0	80	47	0	3	0
Future Volume (Veh/h)	1	0	6	0	0	0	0	80	47	0	3	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	1	0	8	0	0	0	0	107	63	0	4	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	142	174	4	150	142	138	4			170		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	142	174	4	150	142	138	4			170		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	100	100			100		
cM capacity (veh/h)	832	723	1085	816	752	915	1631			1420		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	9	170	4
Volume Left	1	0	0
Volume Right	8	63	0
cSH	1050	1700	1420
Volume to Capacity	0.01	0.10	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.5	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	17.1%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	338	13	1	424	92	10
Future Vol, veh/h	338	13	1	424	92	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	480	200	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	376	14	1	471	102	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	376	0	614	-
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	238	-
Critical Hdwy	-	-	4.1	-	6.8	-
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	-
Pot Cap-1 Maneuver	-	-	1194	-	428	0
Stage 1	-	-	-	-	670	0
Stage 2	-	-	-	-	785	0
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1194	-	428	-
Mov Cap-2 Maneuver	-	-	-	-	428	-
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	784	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	428	-	-	-	1194	-
HCM Lane V/C Ratio	0.239	-	-	-	0.001	-
HCM Control Delay (s)	16	0	-	-	8	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	0.9	-	-	-	0	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	191	0	36	0	0	2	4	344	1	0	221	14
Future Vol, veh/h	191	0	36	0	0	2	4	344	1	0	221	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	479	-	-	500	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	195	0	37	0	0	2	4	351	1	0	226	14

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	417	593	120	473	600	176	240	0	0	352	0	0
Stage 1	233	233	-	360	360	-	-	-	-	-	-	-
Stage 2	184	360	-	113	240	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	525	421	915	479	417	843	1339	-	-	1218	-	-
Stage 1	755	716	-	636	630	-	-	-	-	-	-	-
Stage 2	806	630	-	886	711	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	523	420	915	459	416	843	1339	-	-	1218	-	-
Mov Cap-2 Maneuver	523	420	-	459	416	-	-	-	-	-	-	-
Stage 1	753	716	-	634	628	-	-	-	-	-	-	-
Stage 2	802	628	-	850	711	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.9	9.3	0.1	0
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1339	-	-	561	843	1218	-	-
HCM Lane V/C Ratio	0.003	-	-	0.413	0.002	-	-	-
HCM Control Delay (s)	7.7	-	-	15.9	9.3	0	-	-
HCM Lane LOS	A	-	-	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	2	0	0	-	-