JANUARY 2020

UPDATED TRAFFIC IMPACT STUDY

CHICK-FIL-A KINGSTON PIKE REDEVELOPMENT KNOXVILLE, TENNESSEE

PREPARED FOR:
INTERPLAN, LLC

KCI TECHNOLOGIES

500 11TH AVENUE NORTH, SUITE 290
NASHVILLE, TENNESSEE 37203

TRAFFIC IMPACT STUDY
CHICK-FIL-A KINGSTON PIKE REDEVELOPMENT
KNOXVILLE, TENNESSEE

PREPARED FOR:
INTERPLAN, LLC

PREPARED BY:

KCI TECHNOLOGIES, INC
500 11th Avenue North, Suite 290
Nashville, TN 37203
615.370.8410 office 615.370.8455 fax
www.kci.com

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

1. INTRODUCTION AND PROJECT DESCRIPTION 1

2. EXISTING CONDITIONS 3

2.1 Existing Roadway Network 3

2.2 Existing Traffic Volumes 7

2.3 Existing Traffic Operations 9

3. BACKGROUND TRAFFIC VOLUMES 11

3.1 Establishing Background Volumes 11

3.1 Background Traffic Operations 13

4. IMPACTS 15

4.1 Trip Generation 15

4.2 Trip Distribution and Traffic Assignment 16

4.3 Capacity / Level of Service Analyses 19

5. ANALYSIS OF SITE PLAN 23

5.1 Site Access Review 23

5.2 Pedestrian, Bicycle, and Transit Access 23

5.3 Parking Analysis 23

5.4 Drive-Thru Queue Analysis 23

6. CONCLUSIONS AND RECOMMENDATIONS 28

APPENDICES 29

LIST OF FIGURES

FIGURE 1. LOCATION OF THE PROJECT SITE 2
FIGURE 2. EXISTING LANEAGE 6
FIGURE 3. EXISTING PEAK HOUR TRAFFIC VOLUMES 8
FIGURE 4. BACKGROUND PEAK HOUR TRAFFIC VOLUMES 12
FIGURE 5. DISTRIBUTION OF TRAFFIC GENERATED BY THE PROJECT SITE 17
FIGURE 6. ASSIGNMENT OF TRAFFIC GENERATED BY THE PROJECT SITE 18
FIGURE 7. TOTAL PROJECTED PEAK HOUR TRAFFIC VOLUMES 20
FIGURE 8A. EXISTING AM OBSERVED QUEUE LENGTH 24
FIGURE 8B. EXISTING MIDDAY OBSERVED QUEUE LENGTH 24
FIGURE 8C. EXISTING PM OBSERVED QUEUE LENGTH 25
FIGURE 9A. PROJECTED AM QUEUE LENGTH 26
FIGURE 9B. PROJECTED MIDDAY QUEUE LENGTH 26
FIGURE 9C. PROJECTED PM OBSERVED QUEUE LENGTH 27

LIST OF TABLES

TABLE 1. TDOT COUNT STATION DATA 7

TABLE 2. DESCRIPTIONS OF LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS 9

TABLE 3. DESCRIPTIONS OF LEVEL OF SERVICE FOR UNSIGNALIZED INTERSECTIONS 10

TABLE 4. EXISTING PEAK HOUR LEVELS OF SERVICE 10

TABLE 5A. BACKGROUND AM PEAK HOUR LEVELS OF SERVICE 13

TABLE 5B. BACKGROUND MIDDAY PEAK HOUR LEVELS OF SERVICE 13

TABLE 5C. BACKGROUND PM PEAK HOUR LEVELS OF SERVICE 14

TABLE 6. DEVELOPMENT TRIP GENERATION 15

TABLE 7A. PROJECTED AM PEAK HOUR LEVELS OF SERVICE 21

TABLE 7B. PROJECTED MIDDAY PEAK HOUR LEVELS OF SERVICE 21

TABLE 7C. PROJECTED PM PEAK HOUR LEVELS OF SERVICE 22

EXECUTIVE SUMMARY

Project Description

The proposed Chick-fil-A Kingston Pike redevelopment is located southwest of the intersection of Kingston Pike and Kingston Overlook in Knoxville, Tennessee. According to the developer, Interplan, LLC, the redevelopment is proposed to consist of approximately 5,000 square feet of a Chick-fil-A fast food restaurant. Approximately 56 surface parking spaces are planned to accommodate the Chick-fil-A customers. The purpose of this study is to analyze the access plan and the traffic impacts associated with the proposed development.

Data Collection

In order to provide data for the traffic impact analysis, manual traffic counts were conducted at the following intersections:

- Kingston Pike and Kingston Overlook (signalized)
- Kingston Overlook and Site Entrance 1 (unsignalized)
- Kingston Overlook and Site Entrance/Exit 2 (unsignalized)
- Kingston Overlook and Site Exit 3 (unsignalized)

Specifically, KCI Technologies, Inc. conducted the traffic counts from 7:00 – 9:00 AM, 11:00 AM – 1:00 PM, and 4:00 – 6:00 PM on a typical weekday in January 2019 while local schools were in session. From the counts, it was determined that the peak hours of traffic flow occurred from 7:45 – 8:45 AM, 12:00 – 1:00 PM, and 4:30 – 5:30 PM.

Projection of Future Traffic Volumes

In order to account for the traffic growth prior to the completion of the proposed project, background traffic volumes were established, which include a background growth rate to account for general traffic growth within the study area based on the Tennessee Department of Transportation (TDOT) count station data. Then the estimated project-generated traffic volumes were added to the background peak hour traffic volumes in order to obtain the total projected peak hour traffic volumes for the study area intersections.

Conclusions and Recommendations

The analyses presented in this study indicate that the impacts of the proposed project on the existing street network will be manageable by providing the recommendations below. These specific recommendations will provide safe and efficient traffic operations within the study area following the completion of the proposed project. The recommendations are as follows:

General

- As part of the construction, all site accesses should be designed such that the departure sight triangles, as specified by AASHTO, will be clear of all sight obstructions, including landscaping, existing vegetation, monument signs/walls, fences, etc. According to field measurements, adequate intersection sight distance is available for turning left and right out all proposed site accesses.

Site Access

- The east access should be designed and reconstructed to include sufficient width for one entering lane.
- The southeast access should be designed and reconstructed to include sufficient width for one entering lane and one exiting lane.
- The southwest access should be designed and reconstructed to include sufficient width for one exiting lane.
- All proposed site access points should be signed appropriately with entrance and exit-only signage to indicate vehicle right-of-way.

Site Circulation

- As illustrated in the attached site plan, two drive-thru lanes should be utilized around the exterior of the project site to accommodate the current and future drive-thru queues.

In summary, based on the analyses conducted, no further recommendations are presented for the proposed Chick-fil-A Kingston Pike Redevelopment.

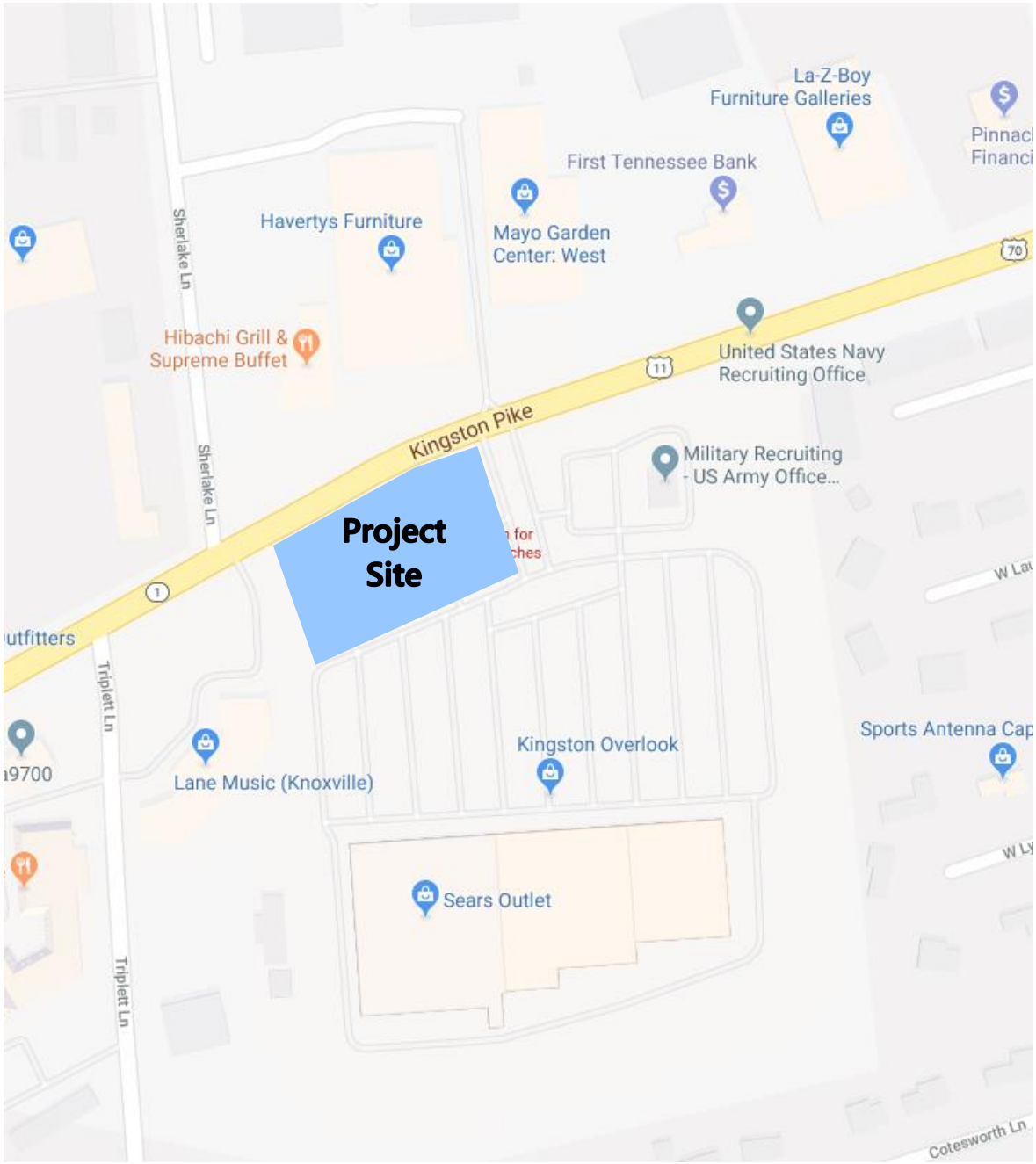
1. INTRODUCTION AND PROJECT DESCRIPTION

The purpose of this study is to analyze the traffic related impacts and access plan associated with the proposed Chick-fil-A Kingston Pike redevelopment located southwest of the intersection of Kingston Pike and Kingston Overlook in Knoxville, Tennessee. According to the developer, Interplan, LLC, the redevelopment is proposed to consist of approximately 5,000 square feet of a Chick-fil-A fast food restaurant.

As shown in Figure 1, the property is bounded on the north by Kingston Pike, on the east by Kingston Overlook, on the south by existing commercial properties, and on the west by existing commercial properties. The proposed development is located within an area that is characterized primarily by commercial land uses.

Three vehicular access driveways to the development are planned to be provided, one existing entrance-only access to the east along Kingston Overlook and two to the south along Kingston Overlook, one existing full access and one relocated exit-only access. According to the developer, the existing exit-only access drive is proposed to be relocated approximated 78 feet to the east of the current location. Approximately 56 surface parking spaces are planned to accommodate the development. The current site plan for the redevelopment is shown in Appendix A.

In this study, the current operating characteristics of the adjacent roadways and intersections in the vicinity of the project site are evaluated. The expected trips generated by the proposed development are determined and distributed to the roadway network. The adjacent roadways and intersections are then re-evaluated to determine the anticipated traffic impacts of the project. Finally, recommendations are presented, including roadway improvements and/or traffic control improvements that are needed to accommodate the expected traffic.



N

Location of the Project Site
(Not to Scale)

Figure 1.

2. EXISTING CONDITIONS

2.1 Existing Roadway Network

Kingston Pike and the internal road of Kingston Overlook will provide local access to the site. A description of these roadways within the project vicinity is as follows:

Kingston Pike (US-11) is a two-way roadway that generally travels in an east-west direction. Near the project site, Kingston Pike consists of two travel lanes in each direction separated by a two-way left-turn lane. Near the project site, Kingston Pike provides connection between Pellissippi Parkway to the west and Bridgewater Road to the east. According to the *2018 Major Road Plan for Knoxville*, Kingston Pike is categorized as a major arterial near the project site. The posted speed limit is 45 mph near the project site. No sidewalk is provided on either side of Kingston Pike near the project site. The Knoxville KAT route #16 (Cedar Bluff Connector) has stops along Kingston Pike 0.5 miles east of the project site. Stops along this route occur hourly. This route offers no service on Sundays or holidays.

Kingston Pike looking west, east of the Project Site

Kingston Overlook is a two-way roadway that generally travels in an east-west direction with two travel lanes in each direction near the project site. Kingston Overlook provides connection between Kingston Pike to the north and commercial property to the south. No speed limit is marked on the roadway near the project site. No pedestrian, transit, bicycle, or on-street parking facilities are provided on Kingston Overlook near the project site.

Kingston Overlook looking south, east of the Project Site

The study area includes one existing intersection and three site access drives described as follows:

Kingston Pike and Kingston Overlook is a signalized intersection with four approaches. The eastbound approach of Kingston Pike includes one exclusive right-turn lane with approximately 125 feet of storage, two through lanes, and one exclusive left-turn lane with approximately 175 feet of storage. The westbound approach of Kingston Pike includes two through lanes and one exclusive left-turn lane with approximately 175 feet of storage. The southbound approach provides access to commercial property and includes one lane. The northbound approach of Kingston Overlook includes one exclusive left turn lane, one shared through/left-turn lane, and one exclusive right-turn lane with approximately 90 feet of storage. Protected-permitted left-turn signal phasing is provided for each approach.

Looking north on Kingston Overlook at Kingston Pike

Kingston Overlook and Existing Site Access 1 is an unsignalized intersection with one approach. The southbound approach of Kingston Overlook includes one through lanes and one shared through/right-turn lane. The existing site access is exclusively for traffic entering the project site.

Looking west on Kingston Overlook at Existing Site Access 1

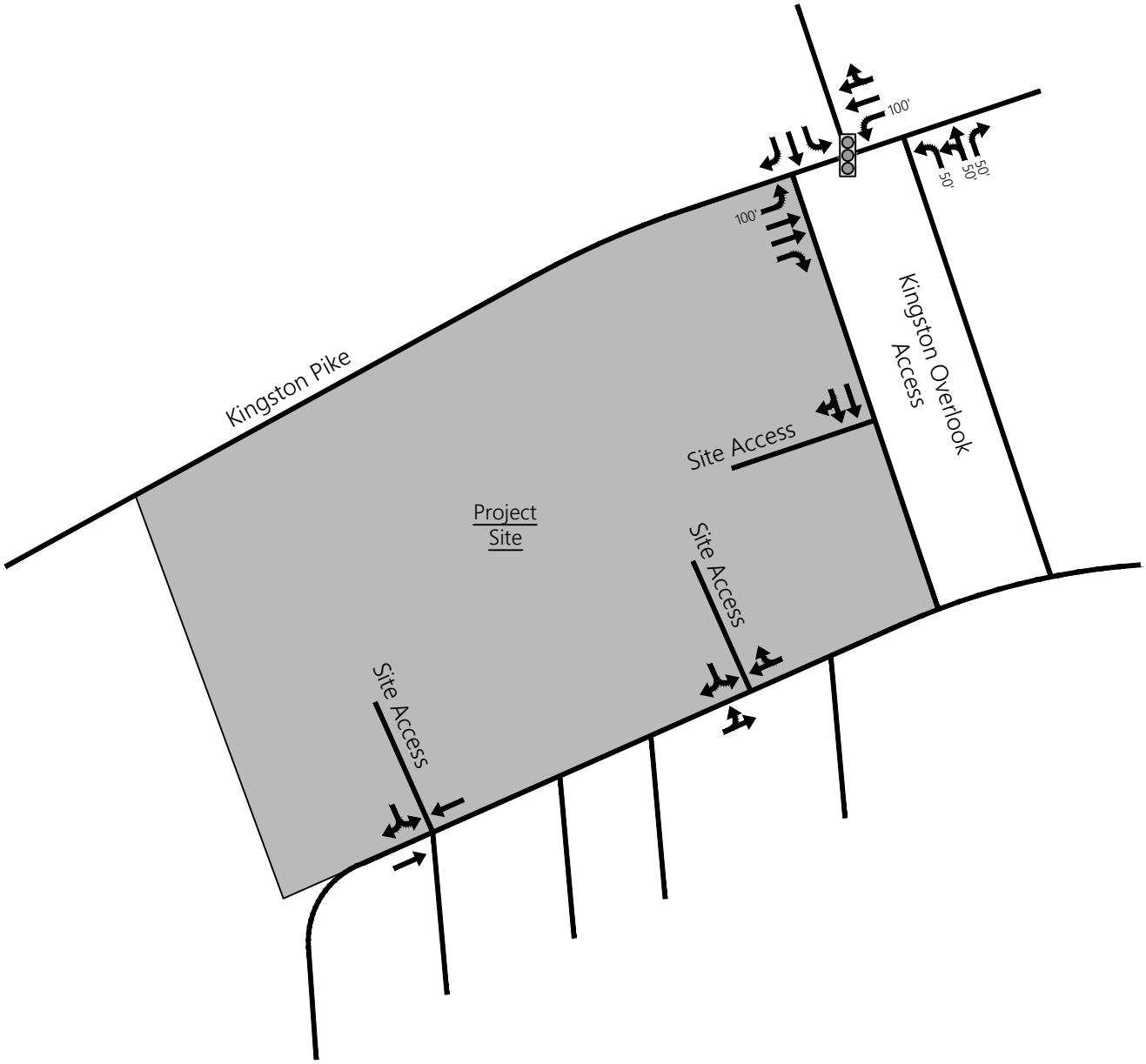
Kingston Overlook and Existing Site Access 2 is an unsignalized intersection with three approaches. The eastbound approach of Kingston Overlook includes one shared through/left-turn lane. The westbound approach of Kingston Overlook includes one shared through/right-turn lane. The southbound approach of Existing Site Access 2 includes one shared left-turn/right-turn lane with approximately 30 feet of storage.

Looking south on Site Access 2 at Kingston Overlook

Kingston Overlook and Existing Site Access 3 is an unsignalized intersection with three approaches. The eastbound and westbound approach of Kingston Overlook includes one through lane in each direction. The southbound approach of Existing Site Access 2 includes one shared left-turn/right-turn lane with approximately 30 feet of storage. The existing site access is exclusively for exiting traffic only.

Looking northon Kingston Overlook at Existing Site Access 3

The existing laneage at the study intersections is illustrated in Figure 2.



- Traffic Signal
XX' - Storage Length

N

Existing Laneage
(Not to Scale)

Figure 2.

2.2 Existing Traffic Volumes

In order to provide data for the traffic impact analysis, manual traffic counts were conducted at the following intersections:

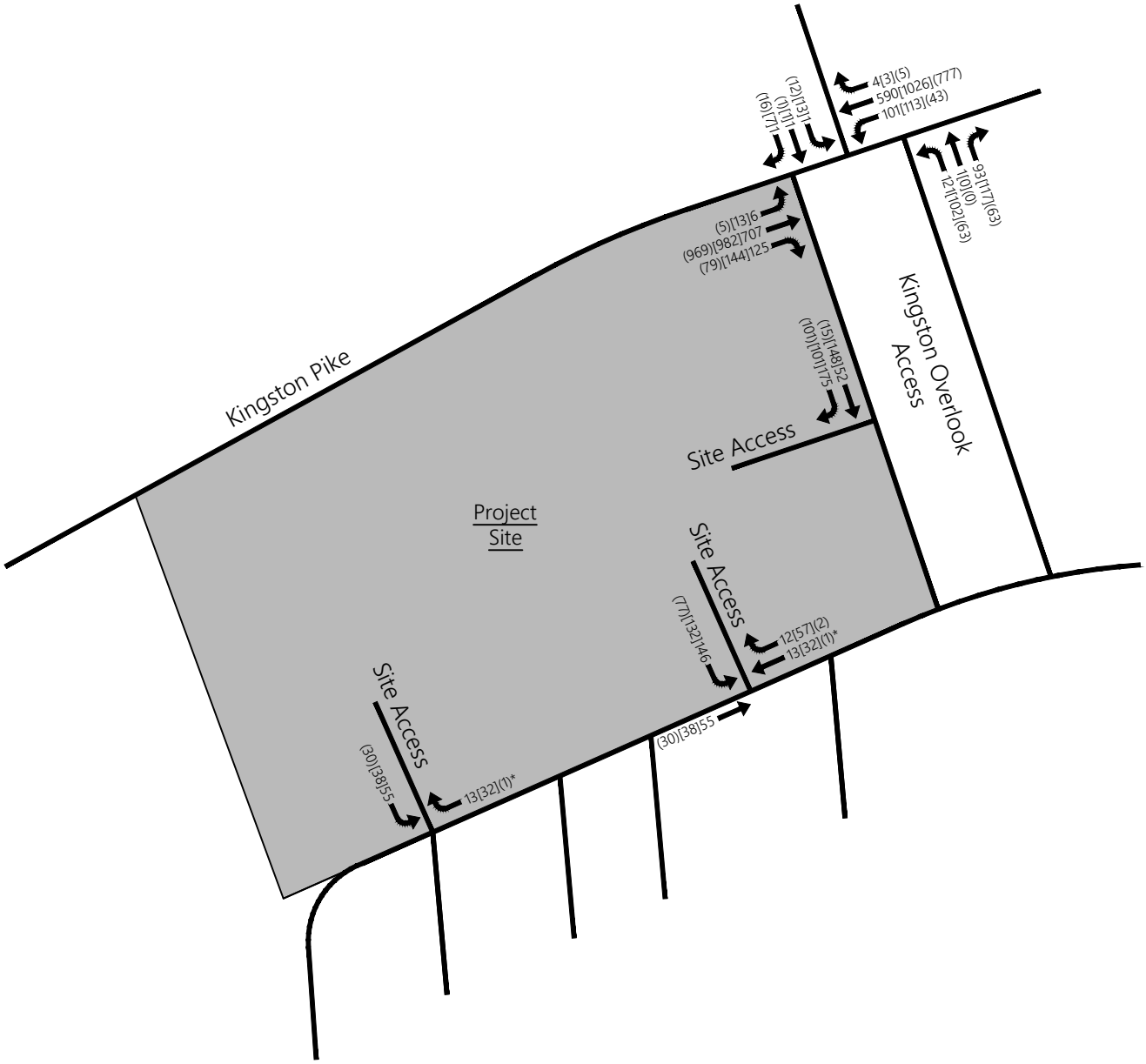
- Kingston Pike and Kingston Overlook (signalized)
- Kingston Overlook and Site Entrance 1 (unsignalized)
- Kingston Overlook and Site Entrance/Exit 2 (unsignalized)
- Kingston Overlook and Site Exit 3 (unsignalized)

Specifically, KCI Technologies, Inc. conducted the traffic counts from 7:00 – 9:00 AM, 11:00 AM – 1:00 PM, and 4:00 – 6:00 PM on a typical weekday in January 2018 while local schools were in session. From the counts, it was determined that the peak hours of traffic flow occurred from 7:45 – 8:45 AM, 12:00 – 1:00 PM, and 4:30 – 5:30 PM. The existing peak hour turning movement volumes are presented in Figure 3. A detailed summary of the turning movement counts is included in Appendix B.

Average daily traffic volumes were also obtained from TDOT. Three (3) TDOT count stations are located in the project vicinity. The specific locations and 2018 average annual daily traffic (AADT) for each station are listed below in Table 1. Additional count station data is included in Appendix C.

TABLE 1. TDOT COUNT STATION DATA

ROADWAY	LOCATION	STATION	2018 AADT (vpd)
Kingston Pike	South of Andrew Jackson Lake; Between Market Pl Blvd/Moss Grove Blvd and Essex Rd/Essex Dr	128	25,708
Mabry Hood Road NW	South of I-40; Between Parkside Dr NW and Kingston Pike	296	7,053
N Cedar Bluff Rd NW	South of I-40; Between N Peters Rd NW and Kingston Pike	350	19,696



XXX - AM Peak Hour Traffic Volumes
[XXX] - Midday Peak Hour Traffic Volumes
(XXX) - PM Peak Hour Traffic Volumes

* Exit-only but vehicles were observed entering

N

Existing Peak Hour Traffic Volumes
(Not to Scale)

Figure 3.

2.3 Existing Traffic Operations

To determine the current operation of the study intersections, capacity analyses were performed for the AM, Midday, and PM peak hours. The capacity calculations were performed according to the methods outlined in the *Highway Capacity Manual*, TRB 2010. The capacity analyses result in the determination of a Level of Service (LOS) for an intersection. The LOS is a concept used to describe how well an intersection or roadway operates. LOS A is the best, while LOS F is the worst. Table 2 presents the descriptions of LOS for signalized intersections. Table 3 presents the descriptions of LOS for unsignalized intersections.

TABLE 2. DESCRIPTIONS OF LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (sec/veh)
A	Operations with very low delay. This occurs when progression is extremely favorable. Most vehicles do not stop at all.	≤ 10
B	Operations with stable flows. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	>10 and ≤ 20
C	Operations with stable flow. Occurs with fair progression and/or longer cycle lengths. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	>20 and ≤ 35
D	Approaching unstable flow. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop.	>35 and ≤ 55
E	Unstable flow. This is considered to be the limit for acceptable delay. These high delays generally indicate poor progression, long cycle lengths, and high V/C ratios.	>55 and ≤ 80
F	Unacceptable delay. This condition often occurs with over saturation or with high V/C ratios. Poor progression and long cycle lengths may also cause such delay levels.	>80.0

Source: *Highway Capacity Manual*, TRB 2010

TABLE 3. DESCRIPTIONS OF LEVEL OF SERVICE FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DESCRIPTION	CONTROL DELAY (sec/veh)
A	Little or no delay	≤ 10.0
B	Short traffic delay	>10 and ≤ 15
C	Average traffic delay	>15 and ≤ 25
D	Long traffic delay	>25 and ≤ 35
E	Very long traffic delay	>35 and ≤ 50
F	Extreme traffic delay	> 50.0

Source: *Highway Capacity Manual*, TRB 2010

The signal timing and phasing plan for the signalized intersection of Kingston Pike and Kingston Overlook were obtained from the City of Knoxville and were utilized for the capacity analyses. The signal timing data is included in Appendix D.

The results of the capacity analyses for the existing conditions at the four study intersections are presented in Table 4. As shown, all intersections and critical movements operate at LOS B or better in the AM, Midday, and PM peak hours. Capacity analyses worksheets are included in Appendix E.

TABLE 4. EXISTING PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh)		
		AM	Midday	PM
Kingston Pike and Kingston Overlook	Overall Intersection	B (13.8)	B (15.2)	B (12.9)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.7)	A (9.8)	A (9.0)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.8)	A (8.8)	A (8.6)

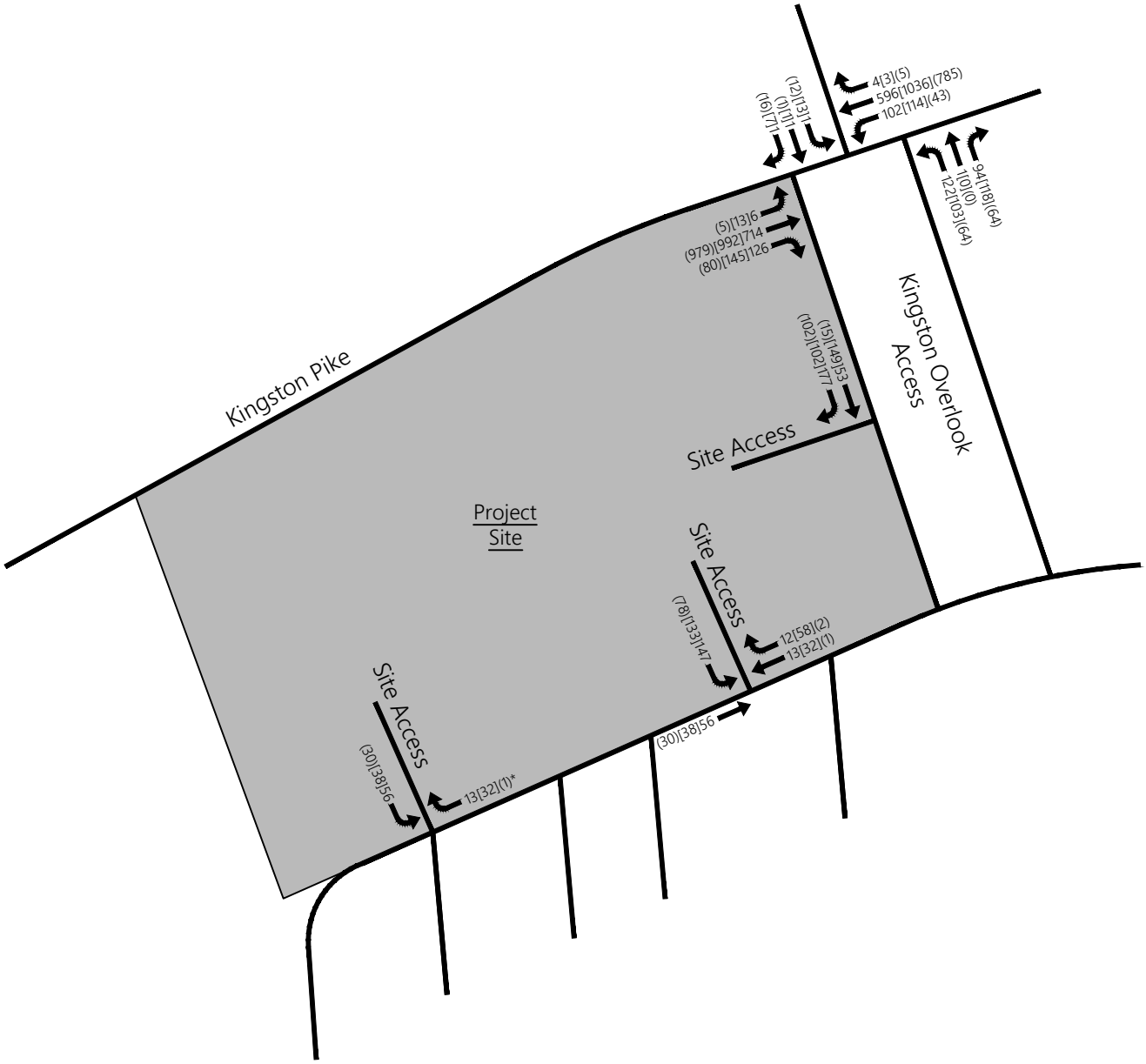
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.

3. BACKGROUND TRAFFIC VOLUMES

3.1 Establishing Background Volumes

In order to account for the traffic growth prior to the completion of the proposed project, background traffic volumes were established. For the purposes of this traffic study, the proposed development was assumed to be completed by the year 2020, which is a one-year horizon. Historical daily traffic volumes were obtained from the TDOT count stations located near the project site. Since 2018, the combined traffic at the TDOT count stations has decreased by approximately 3.5%. The TDOT count station data is included in Appendix C.

A growth factor was applied to the existing peak hour traffic volumes to account for background growth for the background conditions. The existing peak hour traffic volumes at the study intersection were conservatively increased by 1% per year for one year to account for the background traffic growth within the study area. The background peak hour traffic volumes are presented in Figure 4. These volumes represent the peak hour traffic that is expected to be on the roadway in 2020 even if the proposed development is not completed.



XXX - AM Peak Hour Traffic Volumes
[XXX] - Midday Peak Hour Traffic Volumes
(XXX) - PM Peak Hour Traffic Volumes

* Exit-only but vehicles were observed entering

N

Background Peak Hour Traffic Volumes
(Not to Scale) Figure 4.

3.1 Background Traffic Operations

To determine the operation of the study intersections under background conditions, capacity analyses were performed for the AM and PM peak hours. The analyses for the background conditions were based on the same lane configurations as the existing conditions.

As shown in Tables 5A, 5B, and 5C, under background conditions the capacity analyses indicate that the operational performances of the critical movements at the study intersections are expected to operate at the same levels of service as under existing conditions. Capacity analysis worksheets are included in Appendix E.

TABLE 5A. BACKGROUND AM PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh) EXISTING	BACKGROUND
Kingston Pike and Kingston Overlook	Overall Intersection	B (13.8)	B (13.9)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.7)	A (9.7)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.8)	A (8.8)
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.			

TABLE 5B. BACKGROUND MIDDAY PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh) EXISTING	BACKGROUND
Kingston Pike and Kingston Overlook	Overall Intersection	B (15.2)	B (15.3)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.8)	A (9.8)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.8)	A (8.8)
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.			

TABLE 5C. BACKGROUND PM PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh) EXISTING	BACKGROUND
Kingston Pike and Kingston Overlook	Overall Intersection	B (12.9)	B (13.0)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.0)	A (9.0)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.6)	A (8.6)
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.			

4. IMPACTS

4.1 Trip Generation

A traffic generation process was used to estimate the amount of traffic expected to be generated by the Chick-fil-A redevelopment. As previously discussed, the development is planned to consist of a reconfiguration of the parking lot, a relocation of an existing access drive, and an approximately 5,000 square-foot reconstruction for a Chick-fil-A fast food.

Factors for the trip generation were taken from ITE's *Trip Generation,* 10th Edition. Based on the popularity of Chick-fil-A, however, the existing volume was also taken into consideration. The existing volume was compared to the existing square footage and then grown linearly based on the proposed growth in square footage. The linear growth factor was determined to be 1.42. This linear growth factor was then compared to the trip generation calculated using ITE's *Trip Generation*. The linear growth is more conservative than ITE's *Trip Generation*; therefore, existing volumes were multiplied by 1.42 to represent the growth in the square footage of the restaurant. The calculations for trip generation are included in Appendix F.

Table 6 presents the daily, AM, Midday, and PM peak hour trip generation for the proposed redevelopment. As shown, the AM, Midday, and PM peak hour trips generated will equal approximately 174, 153, and 92 new trips, respectively. These trips represent the new traffic that will be generated by the proposed redevelopment.

TABLE 6. DEVELOPMENT TRIP GENERATION

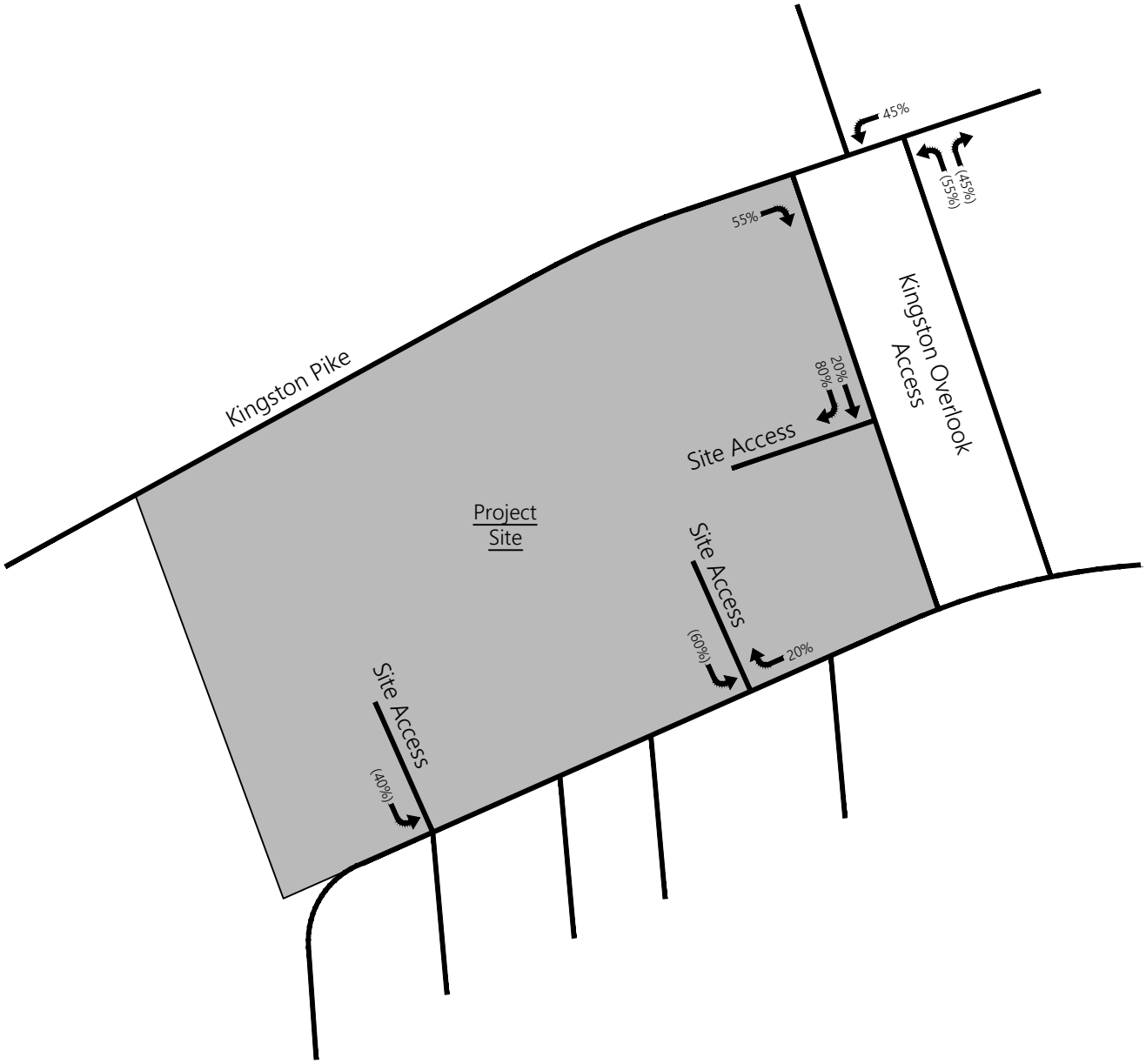
LAND USE	CONDITION	SIZE	DAILY TRAFFIC	GENERATED TRAFFIC					
				AM PEAK		MIDDAY PEAK		PM PEAK	
				Enter	Exit	Enter	Exit	Enter	Exit
Fast-Food Restaurant with Drive-Through Window	Existing	3,509 SF	--	210	201	190	170	101	116
	Linear Growth	4,996 SF	--	299	286	271	242	144	165
	ITE Trip Generation		2355	133	122	--	--	131	126
NEW TRIPS			--	**89**	**85**	**81**	**72**	**43**	**49**
				174		**153**		**92**	

Source: *Trip Generation*, 10th Edition

4.2 Trip Distribution and Traffic Assignment

A directional distribution of traffic generated by the proposed project was established based on the existing accesses, existing roadway network, and the existing travel patterns developed from the existing peak hour traffic counts. As previously discussed, three existing vehicular access points to the development are planned to be provided, one to the east and two to the south from Kingston Overlook. Site Access 1 is planned to operate as an entrance-only access, Site Access 2 is planned to operate as full access, and Site Access 3 is planned to operate as an exit-only.

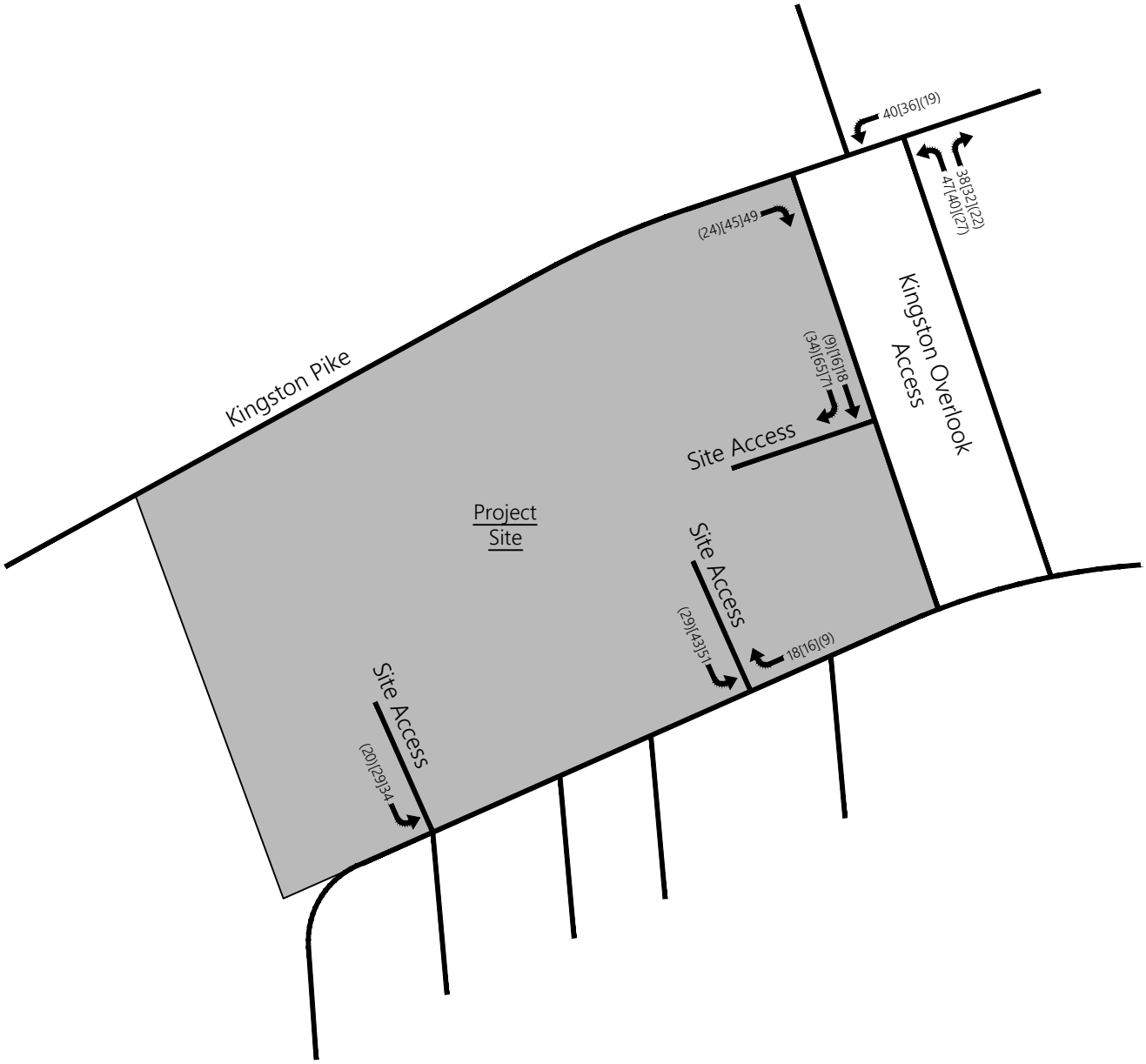
The directional distribution for the proposed development is shown in Figure 5. As shown in the figure, 100% of the traffic generated by the development will be oriented to the north on Kingston Pike, 45% to the east and 55% to the west. Based on this directional distribution, the project-generated traffic was assigned to the roadway network. The traffic assignment for the proposed development is shown in Figure 6.



XX% - Enter
(XX%) - Exit

N

Distribution of Peak Hour Traffic Volumes Generated by the Project Site
(Not to Scale) Figure 5.



XXX - AM Peak Hour Traffic Volumes
[XXX] - Midday Peak Hour Traffic Volumes
(XXX) - PM Peak Hour Traffic Volumes

N

Assignment of Peak Hour Traffic Volumes Generated by the Project Site

(Not to Scale) Figure 6.

4.3 Capacity / Level of Service Analyses

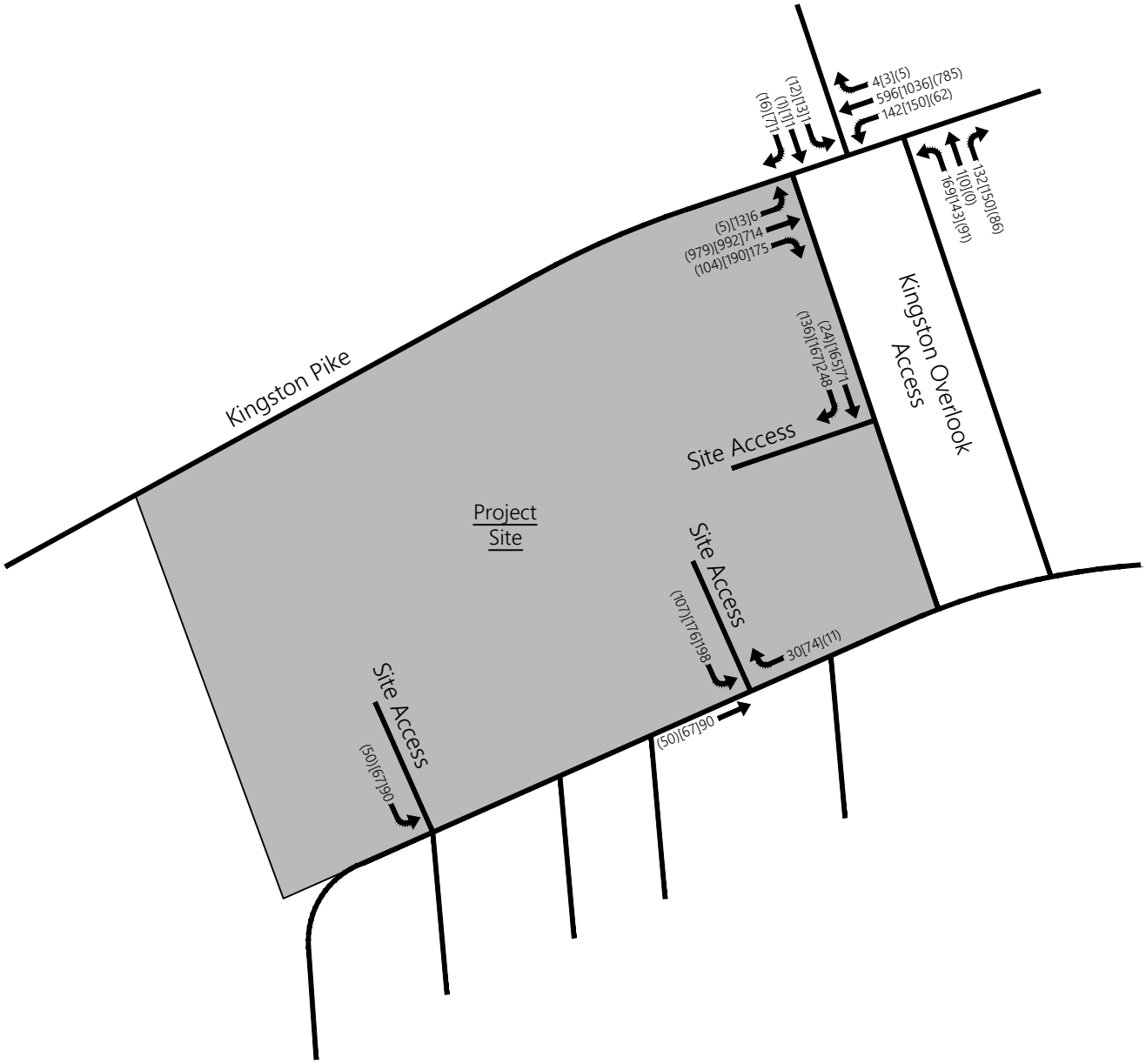
The new site-generated traffic volumes were added to the existing peak hour traffic volumes for the proposed development in order to obtain the total projected traffic volumes for the study intersections. Figure 7 presents the total projected AM, Midday, and PM peak hour traffic volumes expected at the completion of the proposed development.

Capacity analyses were performed in order to determine the impact of the project on the study intersections. These capacity analyses were also used to evaluate the need for roadway and traffic control improvements at the intersections studied. The capacity calculations were performed according to the methods outlined in the *Highway Capacity Manual*, TRB 2010. The results of the capacity analyses for the projected conditions at the study area intersections are presented in Tables 7A, 7B, and 7C. For the analyses, the intersection configurations and signal timings were the same as the existing and background conditions. All the site accesses are analyzed as stop-controlled intersections with the entering and exiting configurations as shown in the proposed site plan.

As shown in Tables 7A, 7B, and 7C, under projected conditions the capacity analyses indicate that the operations of the study intersections are expected to continue to operate at the same level of service as background conditions with the following exceptions:

- The southbound approach of Kingston Overlook and Site Access 2 is expected to deteriorate from LOS A to LOS B in the AM and Midday peak hours. Is should be noted that while the LOS is expected to deteriorate from LOS A to LOS B, the overall increase in delay is only 0.7 seconds in the AM peak hour and 0.4 seconds in the Midday peak hour.

Capacity analyses worksheets are included in Appendix E.



XXX - AM Peak Hour Traffic Volumes
[XXX] - Midday Peak Hour Traffic Volumes
(XXX) - PM Peak Hour Traffic Volumes

N

Total Projected Peak Hour Traffic Volumes
(Not to Scale) Figure 7.

TABLE 7A. PROJECTED AM PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh)		
		EXISTING	BACKGROUND	PROJECTED
Kingston Pike and Kingston Overlook	Overall Intersection	B (13.8)	B (13.9)	B (15.5)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.7)	A (9.7)	B (10.4)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.8)	A (8.8)	A (8.9)
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.				

TABLE 7B. PROJECTED MIDDAY PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh)		
		EXISTING	BACKGROUND	PROJECTED
Kingston Pike and Kingston Overlook	Overall Intersection	B (15.2)	B (15.3)	B (16.9)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.8)	A (9.8)	B (10.2)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.8)	A (8.8)	A (8.8)
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.				

TABLE 7C. PROJECTED PM PEAK HOUR LEVELS OF SERVICE

INTERSECTION	TURNING MOVEMENT	LEVEL OF SERVICE (Average Approach Delay in sec/veh)		
		EXISTING	BACKGROUND	PROJECTED
Kingston Pike and Kingston Overlook	Overall Intersection	B (12.9)	B (13.0)	B (14.4)
Kingston Overlook and Existing Site Access 1	Southbound Right-Turn	A (0.0)	A (0.0)	A (0.0)
Kingston Overlook and Existing Site Access 2	Southbound Approach	A (9.0)	A (9.0)	A (9.3)
Kingston Overlook and Existing Site Access 3	Southbound Approach	A (8.6)	A (8.6)	A (8.7)
Note: For signalized intersections, an overall LOS is presented. For stop-controlled intersections, an LOS is presented for each critical turning movement. The capacity calculations were performed according to the methods outlined in the Highway Capacity Manual, TRB 2010.				

5. ANALYSIS OF SITE PLAN

5.1 Site Access Review

According to the developer, the development is planned to consist of a redevelopment of the Chick-fil-A fast-food restaurant, drive-thru window, and parking lot. Three vehicular access points to the development are planned to be provided. The east access point will include one lane for entering vehicles only. There are two south access points, one access point with one lane for entering vehicles and one lane for exiting vehicles and one access point with one lane for exiting vehicles only.

5.2 Pedestrian, Bicycle, and Transit Access

No pedestrian, bicycle facilities, or transit service are provided near the project site.

5.3 Parking Analysis

City of Knoxville's current *Code of Ordinances* was reviewed to determine if the appropriate number of parking spaces are planned to be provided. According to the 2019 *Code of Ordinances*, a minimum of 6 parking spaces are required for every 1,000 SF GFA, and a maximum of 12 parking spaces per 1,000 SF GFA is enforced. The proposed Chick-fil-A is planned to include approximately 5,000 square feet of building area; therefore, a minimum of 30 parking spaces are required per the ordinance, and no more than 60 parking spaces may be provided. The current site plan, included in Appendix A, indicates that 56 spaces will be provided.

5.4 Drive-Thru Queue Analysis

In addition to the capacity analyses at the study intersections, the drive-thru queue lengths during the AM, Midday, and PM peak hours were evaluated for the site access located on the east side of the project site. The available queueing space for vehicles within the development is approximately 300 feet based on the current layout. This layout accommodates approximately 12 vehicles through the one drive-through lane. Approximately 150 feet of queuing is available prior to entering the drive-through lane, this space accommodates approximately six vehicles. Additional queueing was observed along Kingston Overlook and the right-turn lane of Kingston Pike. Once the queue on Kingston Pike reached approximately four vehicles in length, vehicles were overserved changing direction or exiting the queue. Figures 8A, 8B, and 8C presents the drive-thru vehicle queuing observed for the current site plan during the AM, Midday, and PM peak hours.

FIGURE 8A. EXISTING AM OBSERVED QUEUE LENGTH

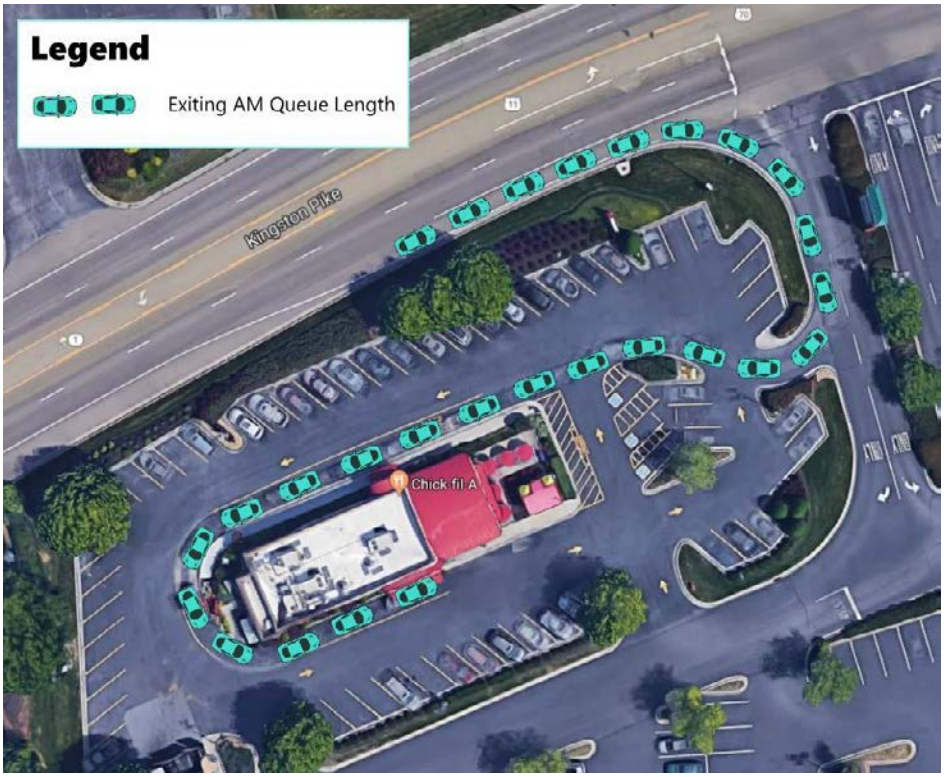


FIGURE 8B. EXISTING MIDDAY OBSERVED QUEUE LENGTH

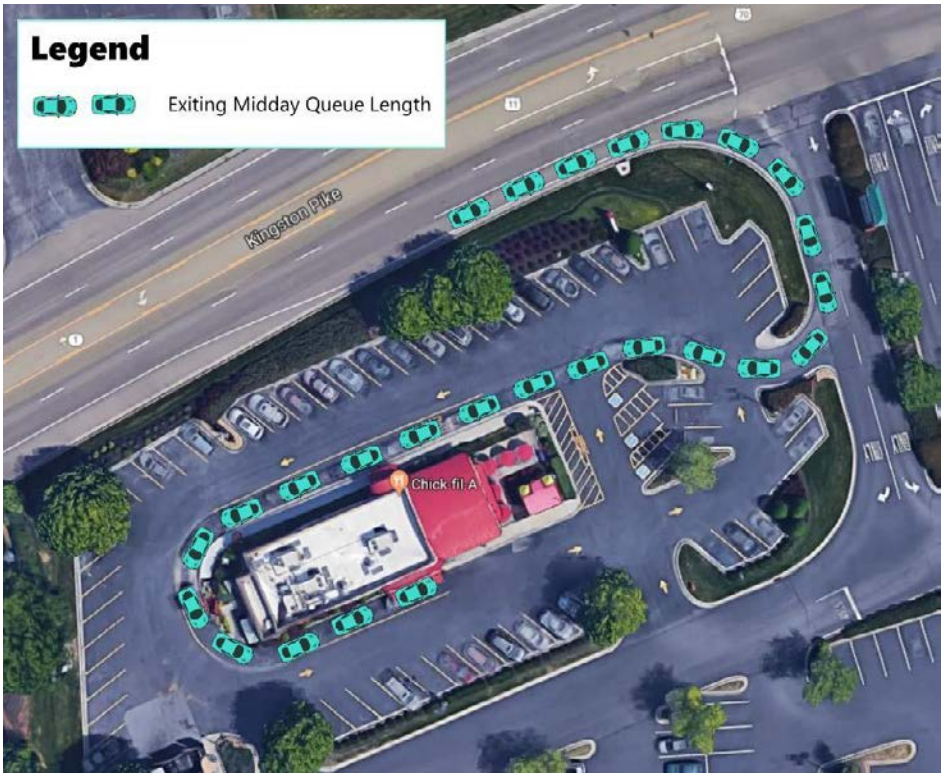
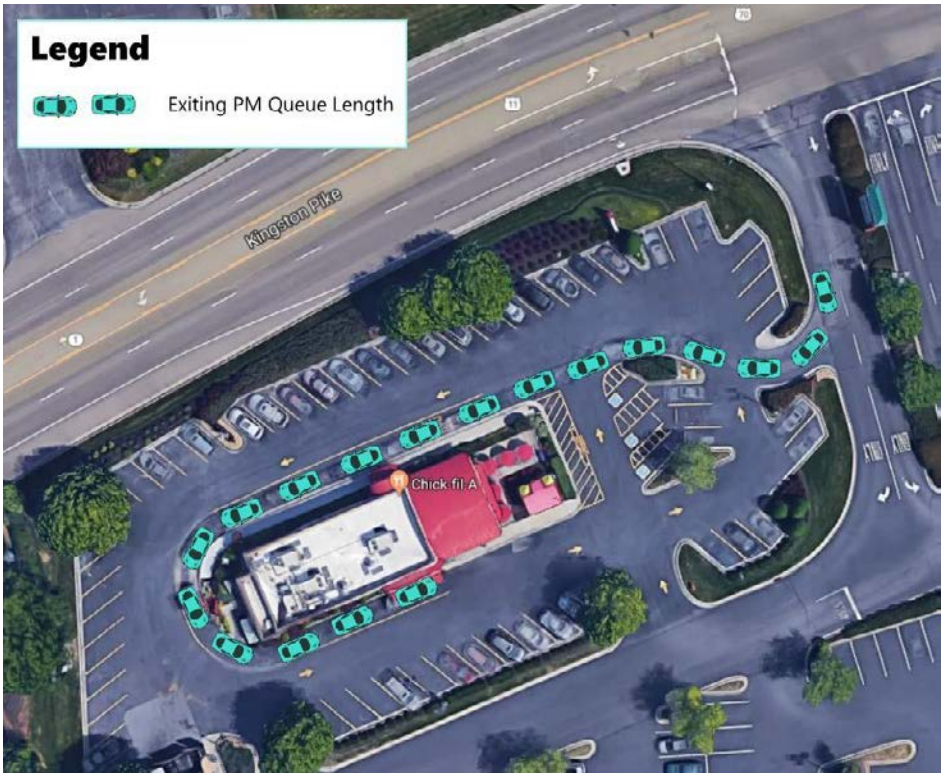


FIGURE 8C. EXISTING PM OBSERVED QUEUE LENGTH



Within the Chick-Fil-A site, the drive-through queue space increases in the projected condition, so there is more space for vehicles to queue on-site. The available queueing space for vehicles within the development is approximately 650 feet based on the proposed layout. This layout accommodates approximately 26 vehicles through two drive-through lanes. Approximately 75 feet of queuing is available prior to entering the drive-through lanes, this space accommodates approximately three vehicles. Figures 9A, 9B, and 9C presents the current overserved drive-thru vehicle queuing under proposed conditions for the AM, Midday, and PM peak hours.

While there is a growth in the overall square footage of the proposed redevelopment, the majority of the additional square footage is additional kitchen space that will be utilized to service customers faster. Additionally, Chick-fil-A has service policies in place to reduce the duration of customer wait times. Because of these polices and the additional development being additional kitchen space, the queue length is not expected to experience additional growth.

Based on the results of this analysis, the queues are anticipated to be better contained on site due to the proposed changes. Capacity analyses worksheets are included in Appendix E.

FIGURE 9A. PROJECTED AM QUEUE LENGTH

FIGURE 9B. PROJECTED MIDDAY QUEUE LENGTH

FIGURE 9C. PROJECTED PM OBSERVED QUEUE LENGTH

6. CONCLUSIONS AND RECOMMENDATIONS

The Chick-fil-A Redevelopment is located southwest of the intersection of Kingston Pike and Kingston Overlook located in Knoxville, TN. According to the developer, the proposed development is planned to consist of approximately 5,000 square feet of a Chick-fil-A fast food restaurant. The analyses presented in this study indicate that the impacts of the proposed project on the existing street network will be manageable by providing the recommendations below. These specific recommendations will provide safe and efficient traffic operations within the study area following the completion of the proposed project. The recommendations are as follows:

General

- As part of the construction, all site accesses should be designed such that the departure sight triangles, as specified by AASHTO, will be clear of all sight obstructions, including landscaping, existing vegetation, monument signs/walls, fences, etc. According to field measurements, adequate intersection sight distance is available for turning left and right out all proposed site accesses.

Site Access

- The east access should be designed and reconstructed to include sufficient width for one entering lane.
- The southeast access should be designed and reconstructed to include sufficient width for one entering lane and one exiting lane.
- The southwest access should be designed and reconstructed to include sufficient width for one exiting lane.
- All proposed site access points should be signed appropriately with entrance and exit-only signage to indicate vehicle right-of-way.

Site Circulation

- As illustrated in the attached site plan, two drive-thru lanes should be utilized around the exterior of the project site to accommodate the current and future drive-thru queues.

In summary, based on the analyses conducted, no further recommendations are presented for the proposed Chick-fil-A Kingston Pike Redevelopment.

APPENDICES

APPENDIX A
PRELIMINARY SITE PLAN

APPENDIX B
DETAILED TURNING MOVEMENT COUNTS

APPENDIX C
TDOT COUNT DATA

APPENDIX D
KNOXVILLE SIGNAL TIMING

APPENDIX E
CAPACITY ANALYSIS

APPENDIX G
TRIP GENERATION CALCULATIONS

PROJECTED CONDITIONS CAPACITY ANALYSES

PROJECTED WITH IMPROVEMENTS CONDITIONS CAPACITY ANALYSES

APPENDIX A
PRELIMINARY SITE PLAN

LEGEND

- (6) PARKING SPACE TOTALS
- (2 / C4) DETAIL NUMBER / SHEET NUMBER
- TRAFFIC DIRECTIONAL ARROW

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE	TANGENT
C1	45.00'	76.71'	67.75'	S 64°57'27" E	97°40'05"	51.46'
C2	44.86'	64.28'	58.92'	S 24°58'40" W	82°06'23"	39.07'

SITE NOTES:

1. REPOSITION OR RELOCATE SECURITY/OPERATIONAL CAMERAS AT SERVICE YARD AREA.
2. EXISTING ASPHALT PAVEMENT TO BE RESEALED WITH ASPHALT SEALANT AT END OF PROJECT. EXISTING STRIPING AND PAVEMENT MARKINGS TO BE REPAINTED.
3. REPAINT SITE METALS (SIGN POSTS, BOLLARDS, DUMPSTER COPING, LIGHT POLES, GAS PIPING) DARK BRONZE COLOR.

AS-BUILT NOTE:

AS-BUILT DOCUMENTS WERE NOT AVAILABLE FOR THE PREPARATION OF THESE PLANS. CONTRACTOR SHALL FIELD VERIFY EXISTING SITE CONDITIONS, UTILITY LOCATIONS, AND PAVEMENT ELEVATIONS PRIOR TO START OF CONSTRUCTION AND REPORT ANY CONFLICTS TO THE ENGINEER.

NOTICE: PEDESTRIAN SAFETY

1. THE CONTRACTOR SHALL TAKE NECESSARY MEASURES TO SEPARATE EACH WORK AREA FROM PEDESTRIAN TRAFFIC AND TO INSURE SAFE PEDESTRIAN PASSAGE AT ALL TIMES.
2. THE CONTRACTOR SHALL ALSO UTILIZE SAFE WARNING SIGNS, BARRICADES AND OTHER RELATED MEASURES, AS NECESSARY. THE CONTRACTOR SHALL COORDINATE PERIODICALLY WITH THE PROJECT MANAGER TO REVIEW SAFETY CONCERNS AND ADVISE OF ACTIVE WORK AREAS.

NORTH

20' 0 20' 40'

GRAPHIC SCALE

SITE DIMENSION PLAN

1" = 20'

SITE PLAN DESIGN NOTES & KEY PLAN

1. DIRECTIONAL ARROW
2. DRIVE-THRU GRAPHICS
3. STOP LINE GRAPHIC
4. PAINTED HANDICAP PARKING SYMBOL
5. STANDARD PARKING STALL
6. DIRECTIONAL SIGNAGE

NOTES: 1. ALL SIGNS SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" BY THE U.S. DEPARTMENT OF TRANSPORTATION.
2. SIGNS SHALL BE PROVIDED AND INSTALLED BY CHICK-FIL-A GENERAL CONTRACTOR.

- 6A STOP SIGN
- 6B HANDICAPPED PARKING SIGN
- 6C "CIRCLE BUILDING FOR DRIVE-THRU" SIGN **(NOT USED)**
- 6D "NO RIGHT-TURN" SIGN
- 6E "ONE WAY" WITH ARROW SIGN
- 6F "LEFT TURN ONLY" SIGN **(NOT USED)**
- 6G "DO NOT ENTER" SIGN
- 6H ADA (HANDICAP PARKING)
- 6I ADA (WITH VAN ACCESS)
- 6J DRIVE THRU RIGHT ARROW
- 6K MOBILE PICK-UP SIGN

7. SIDEWALK HANDICAPPED RAMP
8. SIDEWALK HANDICAPPED RAMP PER TN INDEX
9. RETURNED CURBED HANDICAPPED RAMP
10. TRUNCATED DOMES - CAST IN PLACE
11. TYPICAL CONCRETE SIDEWALK
12. SIDEWALK WITH CURB AND GUTTER
13. DRIVE-THRU PLAN
14. DRIVE-THRU ISOMETRIC
15. LANDSCAPE AND IRRIGATION PROTECTOR **(NOT USED)**
16. 24" CONCRETE CURB AND GUTTER
17. REFUSE ENCLOSURE FOUNDATION PLAN
18. REFUSE ENCLOSURE ALTERNATE DRAINAGE PLAN **(NOT USED)**
19. CONCRETE BOLLARD
20. TYPICAL PAVEMENT SECTION
21. PAVEMENT EDGE
22. TRANSVERSE AND LONGITUDINAL CONTRACTION JOINT
22A. TRANSVERSE & LONGITUDINAL DOWELED CONST. JOINT
23. BUTT JOINT
24. CONCRETE APRON AT DUMPSTER ENCLOSURE
24A. CONCRETE PAVING AT DRIVE-THRU LANE
25. ALUMINUM HANDRAIL
26. CHICK-FIL-A MONUMENT SIGN
27. MULTI-LANE DIRECTIONAL GRAPHICS
28. CROSSWALK **(NOT USED)**
29. DRIVE-THRU ORDER POINT ISLAND CURB
30. MENU BOARD LOOP DETECTION SYSTEM
31. MENU BOARD & CANOPY ORDERING STATION
32. GREASE INTERCEPTOR **(REFER TO SHEET PS-1.0)**
33. TYPICAL LIGHT POLE BASE
34. PAD MOUNTED TRANSFORMER
35. 2 FT. CHAMFER ON CONCRETE PAVEMENT
36. 4" WIDE WHITE STRIPING (SEE PAINT ADDITIVE NOTE, DETAIL 5, SHEET C-4.0)
37. PAINTED DIAGONAL / CHEVRON STRIPING
38. FLAG POLE (50')
39. SINGLE CLEARANCE BARS
40. CONCRETE PAD FOR CASH STATION
41. ORDER MEAT DELIVERY DELINEATORS (REFER TO ARCH'L PLAN)
42. LANDSCAPE AREA (REF. LANDSCAPE PLAN)
43. SCRIPT SIGN 5.0"x11'-9" (37.71 SQ FT)
44. TYPICAL CONCRETE SIDEWALK
45. CURB AND GUTTER
46. GAS METER
47. MDP PANEL
48. PATIO AREA (6) TABLE AND (24) CHAIRS (REFER TO ARCH'L PLAN)
49. RETAINING WALL
50. FDC (FIRE DEPARTMENT CONNECTION)
51. DRAINAGE STRUCTURE (REFER TO GRADING PLAN, SHEET No. C-3.0)
52. BICYCLE RACK (ITEM NO. 398-8005) ON A FOUR INCH (4") THICK CONCRETE SLAB

Chick-fil-A
5200 Buffington Road
Atlanta, Georgia 30349-2998

INTERPLAN
ARCHITECTURE
ENGINEERING
INTERIOR DESIGN
PROJECT MANAGEMENT

AA 003420
CA 8660

604 COURTLAND STREET
SUITE 100
ORLANDO, FLORIDA 32804
PH 407.645.5008
FX 407.629.9124

SEAL:
THIS DOCUMENT IS "NOT FOR CONSTRUCTION" UNLESS THE ARCHITECT OR ENGINEER'S SIGNATURE AND SEAL APPEAR BELOW.

STUART ANDERSON, P.E.
TN REG.# 117177

CHICK-FIL-A
SAR 0425 FSR
9646 KINGSTON PIKE
KNOXVILLE, TN 37922

FSR# 0994

REVISION SCHEDULE

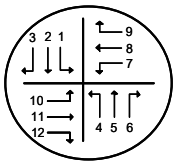
NO.	DATE	DESCRIPTION

CONSULTANT PROJECT #	2017.0425
PRINTED FOR	Permit
DATE	2017/07/31
DRAWN BY	SEF
CHECKED BY	RV

SHEET
COVER SHEET

SHEET NUMBER
C-2.0

APPENDIX B
DETAILED TURNING MOVEMENT COUNTS

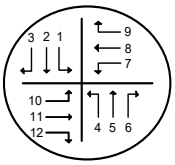


North

INTERSECTION TRAFFIC VOLUME COUNTS

LOCATION: ChickFila East access & Shopping Center Entrance
DATE: AM, MID-DAY: 1/31/2019 & PM: 1/30/2019
RECORDER: ZHIWAR RASHID/DARRYL
NOTES: Some cars go through and use the next chic fil a entrance because of the line at this entrance.

	Southbound			Northbound			Westbound			Eastbound			
LOCATION	shopping entrance			NA			NA			NA			
TIME	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
6:00-6:15 AM		5	9										**86**
6:15-6:30		3	18										**110**
6:30-6:45		1	22										**128**
6:45-7:00		2	26										**162**
7:00-7:15		5	33										**189**
7:15-7:30		2	37										**214**
7:30-7:45		8	49										**232**
7:45-8:00		9	46										**227**
8:00-8:15		8	55										**222**
8:15-8:30		22	35										**159**
8:30-8:45		13	39										**102**
8:45-9:00		10	40										**50**
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00													
10:00-10:15													
10:15-10:30													**46**
10:30-10:45													**84**
10:45-11:00													**131**
11:00-11:15		7	39										**183**
11:15-11:30		8	30										**201**
11:30-11:45		16	31										**226**
11:45-12:00 PM		29	23										**240**
12:00-12:15		39	25										**249**
12:15-12:30		38	25										**185**
12:30-12:45		37	24										**122**
12:45-1:00		34	27										**61**
1:00-1:15													
1:15-1:30													
1:30-1:45													
1:45-2:00													
2:00-2:15													
2:15-2:30													
2:30-2:45													
2:45-3:00													
3:00-3:15													
3:15-3:30													**36**
3:30-3:45													**66**
3:45-4:00													**96**
4:00-4:15		10	26										**126**
4:15-4:30		8	22										**117**
4:30-4:45		5	25										**116**
4:45-5:00		5	25										**123**
5:00-5:15		3	24										**126**
5:15-5:30		2	27										**99**
5:30-5:45		2	35										**70**
5:45-6:00		1	32										**33**
6:00-6:15													
6:15-6:30													
6:30-6:45													
6:45-7:00													
7:00-7:15													
7:15-7:30													
7:30-7:45													
7:45-8:00													
8:00-8:15													
8:15-8:30													
8:30-8:45													
8:45-9:00													
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00 PM													
TOTAL		332	849										
AM PK HR		52	175										7:45 AM - 8:45 AM
MID PK HR		148	101										12:00 PM - 1:00 PM
PM PK HR		15	101										4:30 PM - 5:30 PM

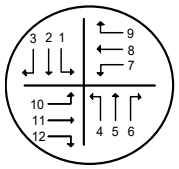


North

INTERSECTION TRAFFIC VOLUME COUNTS

LOCATION: 2)SOUTHEAST ACCESS
DATE: AM, MID-DAY: 1/31/2019 & PM: 1/30/2019
RECORDER: ZHIWAR RASHID
NOTES: Almost all cars turn left when exiting. Eb R=exit
EB L, WB R= exit
Some cars are going against the arrows when exiting and in general

	Southbound			Northbound			Westbound			Eastbound			
LOCATION	Road A						SE ENTRANCE			SE ENTRANCE/EXIT			
TIME	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
6:00-6:15 AM												9	**65**
6:15-6:30												12	**73**
6:30-6:45												22	**90**
6:45-7:00												22	**96**
7:00-7:15												17	**119**
7:15-7:30												29	**139**
7:30-7:45												28	**150**
7:45-8:00									1			44	**158**
8:00-8:15									1	1		35	**140**
8:15-8:30									3	1		36	**103**
8:30-8:45									5			31	**63**
8:45-9:00												27	**27**
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00													
10:00-10:15													
10:15-10:30													**13**
10:30-10:45													**50**
10:45-11:00													**82**
11:00-11:15												13	**115**
11:15-11:30									2			35	**156**
11:30-11:45									6			26	**172**
11:45-12:00 PM									7			26	**185**
12:00-12:15									19			35	**189**
12:15-12:30									19			34	**135**
12:30-12:45									10			35	**82**
12:45-1:00									9			28	**37**
1:00-1:15													
1:15-1:30													
1:30-1:45													
1:45-2:00													
2:00-2:15													
2:15-2:30													
2:30-2:45													
2:45-3:00													
3:00-3:15													
3:15-3:30													**19**
3:30-3:45													**35**
3:45-4:00													**59**
4:00-4:15												19	**71**
4:15-4:30												16	**73**
4:30-4:45									1			23	**79**
4:45-5:00												12	**75**
5:00-5:15												21	**88**
5:15-5:30										1		21	**67**
5:30-5:45										1		19	**45**
5:45-6:00												25	**25**
6:00-6:15													
6:15-6:30													
6:30-6:45													
6:45-7:00													
7:00-7:15													
7:15-7:30													
7:30-7:45													
7:45-8:00													
8:00-8:15													
8:15-8:30													
8:30-8:45													
8:45-9:00													
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00 PM													
TOTAL									83	4		700	
AM PK HR									10	2		146	7:45 AM - 8:45 AM
MID PK HR									57			132	12:00 PM - 1:00 PM
PM PK HR									1	1		77	4:30 PM - 5:30 PM

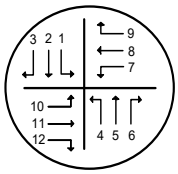


North

INTERSECTION TRAFFIC VOLUME COUNTS

LOCATION: 3) southwest access
DATE: AM, MID-DAY: 1/31/2019 & PM: 1/30/2019
RECORDER: zhiwar rashid
NOTES: wb entrance not allowed
pm starts at 4:08
Most cars turn left when exiting.

	Southbound			Northbound			Westbound			Eastbound			
LOCATION	Road A			Road B			SW entrance			SW exit			
TIME	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
6:00-6:15 AM													**9**
6:15-6:30												1	**13**
6:30-6:45									1			3	**20**
6:45-7:00												4	**22**
7:00-7:15												4	**32**
7:15-7:30												8	**41**
7:30-7:45									1			5	**58**
7:45-8:00									1			13	**68**
8:00-8:15									2			11	**68**
8:15-8:30									6			19	**55**
8:30-8:45									4			12	**30**
8:45-9:00									2			12	**14**
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00													
10:00-10:15													
10:15-10:30													**7**
10:30-10:45													**14**
10:45-11:00													**29**
11:00-11:15												7	**45**
11:15-11:30									1			6	**53**
11:30-11:45												15	**58**
11:45-12:00 PM									11			5	**62**
12:00-12:15									5			10	**70**
12:15-12:30									6			6	**55**
12:30-12:45									7			12	**43**
12:45-1:00									14			10	**24**
1:00-1:15													
1:15-1:30													
1:30-1:45													
1:45-2:00													
2:00-2:15													
2:15-2:30													
2:30-2:45													
2:45-3:00													
3:00-3:15													
3:15-3:30													**5**
3:30-3:45													**8**
3:45-4:00													**20**
4:00-4:15												5	**25**
4:15-4:30												3	**25**
4:30-4:45												12	**31**
4:45-5:00												5	**23**
5:00-5:15									1			4	**29**
5:15-5:30												9	**24**
5:30-5:45									1			3	**15**
5:45-6:00									1			10	**11**
6:00-6:15													
6:15-6:30													
6:30-6:45													
6:45-7:00													
7:00-7:15													
7:15-7:30													
7:30-7:45													
7:45-8:00													
8:00-8:15													
8:15-8:30													
8:30-8:45													
8:45-9:00													
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00 PM													
TOTAL									64			214	
AM PK HR									13			55	7:45 AM - 8:45 AM
MID PK HR									32			38	12:00 PM - 1:00 PM
PM PK HR									1			30	4:30 PM - 5:30 PM



North

INTERSECTION TRAFFIC VOLUME COUNTS

LOCATION: KINGSTON PK & SHOPPING ACCESS
DATE: AM, MID-DAY: 1/31/2019 & PM: 1/30/2019
RECORDER: ZHIWAR RASHID
NOTES:

	Southbound			Northbound			Westbound			Eastbound			
LOCATION	**SHOPPING ACCESS**			**SHOPPING ACCESS**			**kingston pk**			**kingston pk**			
TIME	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	
6:00-6:15 AM				6		6	6	25		1	33	7	**540**
6:15-6:30				7		7	7	31			41	15	**673**
6:30-6:45				11		11	12	64			47	11	**859**
6:45-7:00				15		16	11	63			69	18	**1,080**
7:00-7:15				13		7	17	89			71	20	**1,343**
7:15-7:30				21		15	20	121			99	18	**1,553**
7:30-7:45				19		18	25	136			146	33	**1,705**
7:45-8:00				32		22	27	143			200	31	**1,751**
8:00-8:15				27		27	26	133	2		176	36	**1,729**
8:15-8:30		1		33		25	22	172	1		162	30	**1,302**
8:30-8:45	1		1	29	1	19	26	142	1	6	169	28	**856**
8:45-9:00			1	22	1	23	17	157	6	2	174	30	**433**
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00													
10:00-10:15													
10:15-10:30													**533**
10:30-10:45													**1,034**
10:45-11:00													**1,648**
11:00-11:15				10		14	20	221	1	2	241	24	**2,224**
11:15-11:30	2			26		23	10	203	1	1	218	17	**2,343**
11:30-11:45				20		28	24	250	2	1	256	33	**2,443**
11:45-12:00 PM	3	1	2	22		21	17	225	2	2	252	29	**2,510**
12:00-12:15			2	20		30	30	252	1	2	271	44	**2,521**
12:15-12:30	5	1	2	18		35	26	245		4	230	35	**1,869**
12:30-12:45	5		1	29		36	23	270	2	4	273	38	**1,268**
12:45-1:00	3		2	35		16	34	259		3	208	27	**587**
1:00-1:15													
1:15-1:30													
1:30-1:45													
1:45-2:00													
2:00-2:15													
2:15-2:30													
2:30-2:45													
2:45-3:00													
3:00-3:15													
3:15-3:30													**506**
3:30-3:45													**1,021**
3:45-4:00													**1,485**
4:00-4:15	1	1	1	15		16	14	236		3	206	13	**2,001**
4:15-4:30	1			17		21	18	212	2	1	230	13	**2,039**
4:30-4:45	1		1	19		9	8	190		1	217	18	**2,033**
4:45-5:00	5		3	12		17	6	173	1	2	269	28	**2,034**
5:00-5:15	2		6	15		19	13	202	2	1	267	17	**1,993**
5:15-5:30	4	1	6	17		18	16	212	2	1	216	16	**1,449**
5:30-5:45	2		1	14		17	17	193	2	1	201	17	**940**
5:45-6:00	1		3	18		22	20	221	1	2	162	25	**475**
6:00-6:15													
6:15-6:30													
6:30-6:45													
6:45-7:00													
7:00-7:15													
7:15-7:30													
7:30-7:45													
7:45-8:00													
8:00-8:15													
8:15-8:30													
8:30-8:45													
8:45-9:00													
9:00-9:15													
9:15-9:30													
9:30-9:45													
9:45-10:00 PM													
TOTAL	36	5	32	542	2	538	512	4,840	29	40	5,104	671	
AM PK HR	1	1	1	121	1	93	101	590	4	6	707	125	7:45 AM - 8:45 AM
MID PK HR	13	1	7	102		117	113	1,026	3	13	982	144	12:00 PM - 1:00 PM
PM PK HR	12	1	16	63		63	43	777	5	5	969	79	4:30 PM - 5:30 PM

APPENDIX C
TDOT COUNT DATA

TDOT AADT DATA

Station	296	128	350
Route	5917	SR001	1053
Location	SOUTH OF I-40	S. OF ANDREW JACKSON LAKE	CEDAR BLUFF ROAD
County	Knox	Knox	Knox
2018	6,943	25,708	21,059
2017	7,053	29,058	19,696
2016	6,935	28,758	19,501
2015	6,538	28,450	19,139
2014	6,103	27,306	18,508
2013	6,302	27,441	19,243
2012	6,140	26,019	17,047
2011	6,168	27,957	16,169
2010	5,946	24,388	15,360
2009	5,757	24,173	15,451
2008	6,691	25,714	16,092
2007	6,479	27,777	17,328
2006	6,483	27,738	16,443

APPENDIX D
KNOXVILLE SIGNAL TIMING

Database Printout of 1880EL Local Page: 1
Filename: DATA\INT#3313.EL
Intersection: KINGSTON OVERLOOK Sun Jan 02 23:33:16 2005
ſſſ

Startup Data:

Ring 1 - 2
Start Phases 2 6
UCF Entry Phases 4 0
UCF Exit Phases 2 6

Start Overlaps Yellow at Power-up? NO
Start in All Red at Power-up? NO
Zone ID: 0
Controller ID: 0
Hold 2 sec. Minimum Red Revert? YES Red Revert Time: 4.0 sec.
Override Holds if
Uniform Code Flash Active? YES
Dual Entry 1256? YES
Dual Entry 3478? NO
Passage Interval Sequential? YES
Simultaneous Gap? NO
Conditional Service set by Input? NO
Conditional Service 1256? NO
Conditional Service 3478? NO

Timing Data:

Interval Time by Phase (sec.)

	1	2	3	4	5	6	7	8
Initial	6	18	8	8	6	18	0	0
Passage	2.0	3.0	3.0	2.0	2.0	3.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	4.0	4.0	0.0	0.0
Red Clear	1.5	1.5	2.5	2.0	1.5	1.5	0.0	0.0
Max 1	20	50	30	15	20	50	0	0
Max 2	25	55	25	30	25	55	0	0
Walk	0	18	0	0	0	18	0	0
Ped Clear	0	0	0	0	0	0	0	0

Max 3 Parameters

	1	2	3	4	5	6	7	8
Adjust (sec.)	0	0	0	0	0	0	0	0
Limit (sec.)	0	0	0	0	0	0	0	0
Set (max outs)	0	0	0	0	0	0	0	0
Clr (gap outs)	0	0	0	0	0	0	0	0

Functions:

	1	2	3	4	5	6	7	8
Min. Recall	N	Y	N	N	N	Y	N	N
Max. Recall	N	Y	N	N	N	Y	N	N
Ped. Recall	N	N	N	N	N	N	N	N
Det. Non-lock	Y	N	Y	Y	Y	N	N	N
CNA I Active	N	Y	N	N	N	Y	N	N

Filename: DATA\INT#3313.EL
Intersection: KINGSTON OVERLOOK Sun Jan 02 23:33:16 2005
ÍÍ

CNA II Active	N	N	N	N	N	N	N	N
Flashing Walks	N	N	N	N	N	N	N	N
Phase Omitted	N	N	N	N	N	N	Y	Y
Ped Omitted	Y	N	Y	Y	Y	N	Y	Y
Soft Recall	N	N	N	N	N	N	N	N
Ped Cl thru Yel	N	N	N	N	N	N	N	N
Ped Cl thru Red	N	N	N	N	N	N	N	N

Density:

Last Car Passage Active: YES

	1	2	3	4	5	6	7	8
Density Active	N	N	N	N	N	N	N	N
Added Initial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max. Initial	0	0	0	0	0	0	0	0
Time to Reduce	0	0	0	0	0	0	0	0
Time bef. Red.	0	0	0	0	0	0	0	0
Minimum Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Begin Daylight Savings in week: 21
End Daylight Savings in week: 45

Time of Day Changepoints:
Base Day Plan 1

Time	Cycle	Offset	Ckt 1 (Flash)	Ckt 0 (Free)	Ckt 9
00:00	1	3	.	X	.
06:00	2	1	.	.	.
09:30	3	1	.	.	.
14:00	3	2	.	.	.
18:30	1	1	.	.	.
23:00	1	3	.	X	.

Base Day Plan 2

Time	Cycle	Offset	Ckt 1 (Flash)	Ckt 0 (Free)	Ckt 9
00:00	1	3	.	X	.
07:00	1	1	.	.	.
08:00	4	1	.	.	.
21:00	1	1	.	.	.
23:00	1	3	.	X	.

Week Plan:

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Plan: 0	2	1	1	1	1	1	2
Plan: 1	0	0	0	0	0	0	0
Plan: 2	0	0	0	0	0	0	0
Plan: 3	0	0	0	0	0	0	0

Plan: 4	0	0	0	0	0	0	0
Plan: 5	0	0	0	0	0	0	0
Plan: 6	0	0	0	0	0	0	0
Plan: 7	0	0	0	0	0	0	0
Plan: 8	0	0	0	0	0	0	0
Plan: 9	0	0	0	0	0	0	0

Week Plan Implementation:

Week 1: 0	Week 14: 0	Week 27: 0	Week 40: 0
Week 2: 0	Week 15: 0	Week 28: 0	Week 41: 0
Week 3: 0	Week 16: 0	Week 29: 0	Week 42: 0
Week 4: 0	Week 17: 0	Week 30: 0	Week 43: 0
Week 5: 0	Week 18: 0	Week 31: 0	Week 44: 0
Week 6: 0	Week 19: 0	Week 32: 0	Week 45: 0
Week 7: 0	Week 20: 0	Week 33: 0	Week 46: 0
Week 8: 0	Week 21: 0	Week 34: 0	Week 47: 0
Week 9: 0	Week 22: 0	Week 35: 0	Week 48: 0
Week 10: 0	Week 23: 0	Week 36: 0	Week 49: 0
Week 11: 0	Week 24: 0	Week 37: 0	Week 50: 0
Week 12: 0	Week 25: 0	Week 38: 0	Week 51: 0
Week 13: 0	Week 26: 0	Week 39: 0	Week 52: 0

Special Day Plan Implementation (Plan-Week-Day):

Slot 1 0 - 0 - 0 Slot 18 0 - 0 - 0 Slot 35 0 - 0 - 0
Slot 2 0 - 0 - 0 Slot 19 0 - 0 - 0 Slot 36 0 - 0 - 0
Slot 3 0 - 0 - 0 Slot 20 0 - 0 - 0 Slot 37 0 - 0 - 0
Slot 4 0 - 0 - 0 Slot 21 0 - 0 - 0 Slot 38 0 - 0 - 0
Slot 5 0 - 0 - 0 Slot 22 0 - 0 - 0 Slot 39 0 - 0 - 0
Slot 6 0 - 0 - 0 Slot 23 0 - 0 - 0 Slot 40 0 - 0 - 0
Slot 7 0 - 0 - 0 Slot 24 0 - 0 - 0 Slot 41 0 - 0 - 0
Slot 8 0 - 0 - 0 Slot 25 0 - 0 - 0 Slot 42 0 - 0 - 0
Slot 9 0 - 0 - 0 Slot 26 0 - 0 - 0 Slot 43 0 - 0 - 0
Slot 10 0 - 0 - 0 Slot 27 0 - 0 - 0 Slot 44 0 - 0 - 0
Slot 11 0 - 0 - 0 Slot 28 0 - 0 - 0 Slot 45 0 - 0 - 0
Slot 12 0 - 0 - 0 Slot 29 0 - 0 - 0 Slot 46 0 - 0 - 0
Slot 13 0 - 0 - 0 Slot 30 0 - 0 - 0 Slot 47 0 - 0 - 0
Slot 14 0 - 0 - 0 Slot 31 0 - 0 - 0 Slot 48 0 - 0 - 0
Slot 15 0 - 0 - 0 Slot 32 0 - 0 - 0 Slot 49 0 - 0 - 0
Slot 16 0 - 0 - 0 Slot 33 0 - 0 - 0 Slot 50 0 - 0 - 0
Slot 17 0 - 0 - 0 Slot 34 0 - 0 - 0

Coordination Operating Modes:

4 Splits / 4 Cycles? NO
Unused Cycle Time to Side St.? NO
Ckt 4 enables Aux TOD? NO

ÍÍ

Offset Interruption?	NO
Cycle 4 = 2 A.M. Sync?	NO
Split 2 = 2 A.M. Sync?	NO
Flash with Ckt 1?	NO
Invert Free Output?	NO
Auto Permissive?	YES
Cycle 4 = Flash?	NO
Enable Max 2 with Ckt 9?	NO
Conditional Service with Ckt 9?	NO
Invert Free Input?	NO
Activate CNA 1?	YES
Activate Walk Rest Modifier?	YES
Inhibit Max Termination?	YES
Enhanced Permissive?	NO
Use Split Matrix?	YES
Use Yellow Offset Timer?	NO
Interconnect?	NO
Maximum Dwell Time:	25 sec.
Full Dwell?	NO
Short Route?	NO

Phase Relationships:

Ring 1 - 2	
Hold 1 Phases	2 - 6
Hold 1 Omit Phases	0 - 0
Hold 2 Omit Phases	0 - 0
Hold 3 Omit Phases	0 - 0
Hold 3 Omit Phases	0 - 0
Hold 3 Omit Phases	0 - 0
Hold 3 Ped Omit	0 - 0
Non Early Release Phases	0 - 0
Non Early Release Phases	0 - 0
Non Early Release Phases	0 - 0
Phases Omitted w/ Ckt 9	0 - 0
Phases Omitted w/ Ckt 9	0 - 0
Peds Omitted w/ Ckt 9	0 - 0

Phase Reverse by	Cyc - Ofst
1 - 2	0 - 0
1 - 2	0 - 0
5 - 6	0 - 0
5 - 6	0 - 0
3 - 4	0 - 0
3 - 4	0 - 0
7 - 8	0 - 0
7 - 8	0 - 0

ÍÍÍ

Split Plans:

	Percent per Phase								Permissives					
	1	2	3	4	5	6	7	8	Begin	End	Begin	End	Begin	End
Split 1	16	44	22	18	20	40	22	18	0	30	0	40	0	50
Split 2	16	46	20	18	16	46	20	18	0	30	0	40	0	50
Split 3	13	55	18	14	19	49	18	14	0	30	0	40	0	50
Split 4	15	52	18	15	15	52	18	15	0	30	0	40	0	50
Split 5	13	57	16	14	22	48	16	14	0	30	0	40	0	50
Split 6	13	56	16	15	14	55	16	15	0	30	0	40	0	50
Split 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Split 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Split Matrix:

Offset Cycle	1	2	3	4	5
1	1	0	0	0	0
2	2	0	0	0	0
3	3	4	0	0	0
4	5	0	0	0	0
5	6	0	0	0	0
6	0	0	0	0	0

Offset Times:

Offset Cycle	1	2	3	4	5
1	37	0	0	0	0
2	59	0	0	0	0
3	48	16	0	0	0
4	14	0	0	0	0
5	92	0	0	0	0
6	0	0	0	0	0

Cycle Times:

Cycle	
1	95 sec.
2	100 sec.
3	120 sec.

4 125 sec.
5 135 sec.
6 0 sec.

Sync Reference:

Time: 00:00
Sync with Event Time? NO

City Zero:

Active? NO

Cycle	Reference Time
1	0
2	0
3	0
4	0
5	0
6	0

Closed Loop Options:

TOD Flash/Aux? NO
Free w/ Ckt 0? YES

Report Channel Failures to Central

Conflict Flash	(3) Occurence and Resume Normal
Manual/Auto Flash	(3) Occurence and Resume Normal
MCE	(3) Occurence and Resume Normal
Preempt	(0) Auto-log only
Channel# 5	(0) Auto-log only
Channel# 6	(0) Auto-log only
Channel# 7	(0) Auto-log only
Channel# 8	(0) Auto-log only
Door Open	(3) Occurence and Resume Normal

Main Street Phs for Out of Step Test
Ring 1 - 2
2 - 6

Speed Trap Sensor Pairs
1-2 3-4 5-6 7-8
NO NO NO NO

Standard Overlaps:

Internal Overlap Program? YES

Phase
Program 1 2 3 4 5 6 7 8

Ovl A . . . .
Ovl B . . . .
Ovl C . . . .
Ovl D . . . .

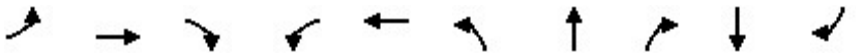
Reverse Phases 1 - 2 3 - 4 5 - 6 7 - 8
NO NO NO NO

Detector Switching:

Programmed Active? NO
No Detector Switching is Programmed

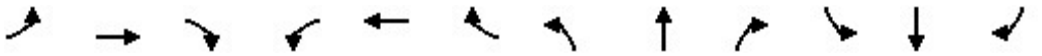
APPENDIX E
CAPACITY ANALYSIS

EXISTING CONDITIONS CAPACITY ANALYSES



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	7	768	136	110	645	66	67	101	2	1
v/c Ratio	0.01	0.34	0.13	0.22	0.25	0.40	0.41	0.34	0.01	0.00
Control Delay	5.7	10.6	1.7	5.6	6.6	49.1	49.3	5.1	42.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Delay	5.7	10.6	1.7	5.6	6.6	49.1	49.3	5.3	42.5	0.0
Queue Length 50th (ft)	1	96	0	13	44	42	43	0	1	0
Queue Length 95th (ft)	7	222	21	50	169	84	85	15	8	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	664	2235	1060	539	2585	226	227	346	218	329
Starvation Cap Reductn	0	0	0	0	0	0	0	38	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.34	0.13	0.20	0.25	0.29	0.30	0.33	0.01	0.00

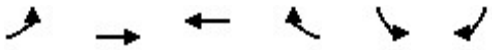
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	707	125	101	590	4	121	1	93	1	1	1
Future Volume (vph)	6	707	125	101	590	4	121	1	93	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1687	1583		1817	1583
Flt Permitted	0.41	1.00	1.00	0.29	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (perm)	758	3539	1583	545	3536		1681	1687	1583		1817	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	768	136	110	641	4	132	1	101	1	1	1
RTOR Reduction (vph)	0	0	57	0	0	0	0	0	91	0	0	1
Lane Group Flow (vph)	7	768	79	110	645	0	66	67	10	0	2	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	59.6	58.4	58.4	70.6	63.9		9.8	9.8	9.8		1.6	1.6
Effective Green, g (s)	59.6	58.4	58.4	70.6	63.9		9.8	9.8	9.8		1.6	1.6
Actuated g/C Ratio	0.60	0.58	0.58	0.71	0.64		0.10	0.10	0.10		0.02	0.02
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	463	2066	924	466	2259		164	165	155		29	25
v/s Ratio Prot	0.00	c0.22		c0.02	c0.18		0.04	c0.04			c0.00	
v/s Ratio Perm	0.01		0.05	0.15					0.01			0.00
v/c Ratio	0.02	0.37	0.09	0.24	0.29		0.40	0.41	0.06		0.07	0.00
Uniform Delay, d1	8.2	11.1	9.1	5.5	8.0		42.4	42.4	40.9		48.5	48.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.5	0.2	0.1	0.3		1.6	1.6	0.2		0.4	0.0
Delay (s)	8.2	11.6	9.3	5.6	8.3		44.0	44.0	41.1		48.8	48.4
Level of Service	A	B	A	A	A		D	D	D		D	D
Approach Delay (s)		11.2			7.9			42.7			48.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	13	55	0
Future Volume (Veh/h)	0	0	0	13	55	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	14	60	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)			280			
pX, platoon unblocked						
vC, conflicting volume	14				7	7
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	14				7	7
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1604				1014	1075

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	14	60
Volume Left	0	0	60
Volume Right	0	14	0
cSH	1700	1700	1014
Volume to Capacity	0.00	0.01	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	8.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

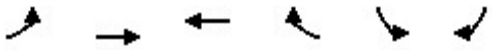
Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	13	55	0
Future Vol, veh/h	0	0	0	13	55	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	14	60	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	7	7
Stage 1	-	-	-	-	7	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	-	1014	1075
Stage 1	0	-	-	-	1016	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	1014	1075
Mov Cap-2 Maneuver	-	-	-	-	1014	-
Stage 1	-	-	-	-	1016	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1014
HCM Lane V/C Ratio	-	-	-	0.059
HCM Control Delay (s)	-	-	-	8.8
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	55	13	12	146	0
Future Volume (Veh/h)	0	55	13	12	146	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	60	14	13	159	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)			116			
pX, platoon unblocked						
vC, conflicting volume	27				80	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27				80	20
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				83	100
cM capacity (veh/h)	1587				922	1057

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	60	27	159
Volume Left	0	0	159
Volume Right	0	13	0
cSH	1587	1700	922
Volume to Capacity	0.00	0.02	0.17
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.0	9.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	55	13	12	146	0
Future Vol, veh/h	0	55	13	12	146	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	60	14	13	159	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	27	0	-	0	81	21
Stage 1	-	-	-	-	21	-
Stage 2	-	-	-	-	60	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1587	-	-	-	921	1056
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1587	-	-	-	921	1056
Mov Cap-2 Maneuver	-	-	-	-	921	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	963	-

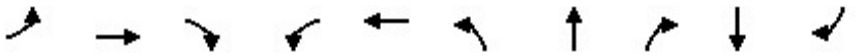
Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1587	-	-	-	921
HCM Lane V/C Ratio	-	-	-	-	0.172
HCM Control Delay (s)	0	-	-	-	9.7
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	52	175
Future Volume (Veh/h)	0	0	0	0	52	175
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	57	190
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	57	57	247			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	57	57	247			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	944	997	1316			

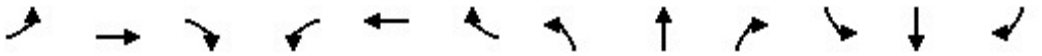
Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	57	190
Volume Left	0	0	0	0
Volume Right	0	0	0	190
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.03	0.11
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	14	1067	157	123	1118	55	56	127	15	8
v/c Ratio	0.04	0.50	0.15	0.35	0.45	0.35	0.36	0.44	0.11	0.03
Control Delay	6.8	14.3	2.6	8.2	9.2	48.3	48.5	9.4	44.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	6.8	14.3	2.6	8.2	9.2	48.3	48.5	9.5	44.6	0.1
Queue Length 50th (ft)	1	146	0	14	87	35	35	0	9	0
Queue Length 95th (ft)	11	340	32	53	328	73	75	36	29	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	438	2131	1018	398	2503	226	226	346	213	329
Starvation Cap Reductn	0	0	0	0	0	0	0	18	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.50	0.15	0.31	0.45	0.24	0.25	0.39	0.07	0.02

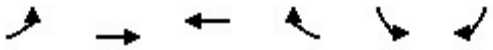
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	982	144	113	1026	3	102	0	117	13	1	7
Future Volume (vph)	13	982	144	113	1026	3	102	0	117	13	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3538		1681	1681	1583		1780	1583
Flt Permitted	0.23	1.00	1.00	0.18	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	420	3539	1583	341	3538		1681	1681	1583		1780	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	1067	157	123	1115	3	111	0	127	14	1	8
RTOR Reduction (vph)	0	0	68	0	0	0	0	0	115	0	0	8
Lane Group Flow (vph)	14	1067	89	123	1118	0	55	56	12	0	15	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	57.8	56.6	56.6	69.4	62.7		9.4	9.4	9.4		3.2	3.2
Effective Green, g (s)	57.8	56.6	56.6	69.4	62.7		9.4	9.4	9.4		3.2	3.2
Actuated g/C Ratio	0.58	0.57	0.57	0.69	0.63		0.09	0.09	0.09		0.03	0.03
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	258	2003	895	340	2218		158	158	148		56	50
v/s Ratio Prot	0.00	c0.30		c0.03	c0.32		0.03	c0.03			c0.01	
v/s Ratio Perm	0.03		0.06	0.22					0.01			0.00
v/c Ratio	0.05	0.53	0.10	0.36	0.50		0.35	0.35	0.08		0.27	0.01
Uniform Delay, d1	9.2	13.5	10.0	7.6	10.2		42.4	42.5	41.4		47.3	46.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	1.0	0.2	0.2	0.8		1.3	1.4	0.2		0.9	0.0
Delay (s)	9.2	14.5	10.2	7.8	11.0		43.8	43.8	41.6		48.2	46.9
Level of Service	A	B	B	A	B		D	D	D		D	D
Approach Delay (s)		13.9			10.7			42.6			47.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	32	38	0
Future Volume (Veh/h)	0	0	0	32	38	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	35	41	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)			280			
pX, platoon unblocked						
vC, conflicting volume	35				18	18
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	35				18	18
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				96	100
cM capacity (veh/h)	1576				1000	1061

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	35	41
Volume Left	0	0	41
Volume Right	0	35	0
cSH	1700	1700	1000
Volume to Capacity	0.00	0.02	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	8.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

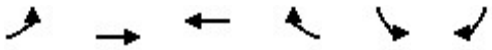
Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	32	38	0
Future Vol, veh/h	0	0	0	32	38	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	35	41	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	18	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	-	1000	1061
Stage 1	0	-	-	-	1005	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	1000	1061
Mov Cap-2 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1000
HCM Lane V/C Ratio	-	-	-	0.041
HCM Control Delay (s)	-	-	-	8.8
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	38	32	57	132	0
Future Volume (Veh/h)	0	38	32	57	132	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	41	35	62	143	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)			116			
pX, platoon unblocked						
vC, conflicting volume	97				107	66
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	97				107	66
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				84	100
cM capacity (veh/h)	1496				891	998

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	41	97	143
Volume Left	0	0	143
Volume Right	0	62	0
cSH	1496	1700	891
Volume to Capacity	0.00	0.06	0.16
Queue Length 95th (ft)	0	0	14
Control Delay (s)	0.0	0.0	9.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	38	32	57	132	0
Future Vol, veh/h	0	38	32	57	132	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	41	35	62	143	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	97	0	-	0	107	66
Stage 1	-	-	-	-	66	-
Stage 2	-	-	-	-	41	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1496	-	-	-	891	998
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	981	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1496	-	-	-	891	998
Mov Cap-2 Maneuver	-	-	-	-	891	-
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	981	-

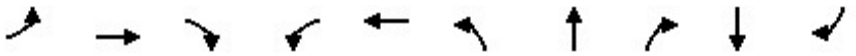
Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1496	-	-	-	891
HCM Lane V/C Ratio	-	-	-	-	0.161
HCM Control Delay (s)	0	-	-	-	9.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	148	101
Future Volume (Veh/h)	0	0	0	0	148	101
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	161	110
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	161	161	271			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	161	161	271			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	814	855	1289			

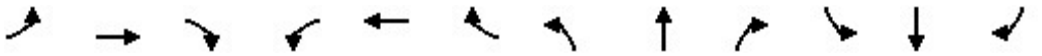
Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	161	110
Volume Left	0	0	0	0
Volume Right	0	0	0	110
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.09	0.06
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	11.1%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	5	1053	86	47	850	34	34	68	14	17
v/c Ratio	0.01	0.44	0.08	0.13	0.33	0.24	0.24	0.25	0.10	0.06
Control Delay	6.6	12.0	0.1	6.7	8.2	46.7	46.7	2.2	44.5	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.6	12.0	0.1	6.7	8.2	46.7	46.7	2.2	44.5	0.4
Queue Length 50th (ft)	1	216	0	9	114	22	22	0	8	0
Queue Length 95th (ft)	5	292	0	23	218	53	53	0	28	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	549	2409	1130	434	2574	226	226	346	213	329
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.44	0.08	0.11	0.33	0.15	0.15	0.20	0.07	0.05

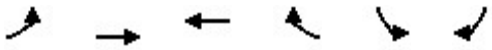
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	969	79	43	777	5	63	0	63	12	1	16
Future Volume (vph)	5	969	79	43	777	5	63	0	63	12	1	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1681	1583		1780	1583
Flt Permitted	0.31	1.00	1.00	0.21	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	578	3539	1583	393	3536		1681	1681	1583		1780	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1053	86	47	845	5	68	0	68	13	1	17
RTOR Reduction (vph)	0	0	33	0	0	0	0	0	63	0	0	16
Lane Group Flow (vph)	5	1053	53	47	850	0	34	34	5	0	14	1
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	62.3	61.1	61.1	67.3	63.6		6.9	6.9	6.9		4.8	4.8
Effective Green, g (s)	62.3	61.1	61.1	67.3	63.6		6.9	6.9	6.9		4.8	4.8
Actuated g/C Ratio	0.62	0.61	0.61	0.67	0.64		0.07	0.07	0.07		0.05	0.05
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	374	2162	967	315	2248		115	115	109		85	75
v/s Ratio Prot	0.00	c0.30		c0.01	0.24		c0.02	0.02			c0.01	
v/s Ratio Perm	0.01		0.03	0.09					0.00			0.00
v/c Ratio	0.01	0.49	0.05	0.15	0.38		0.30	0.30	0.04		0.16	0.01
Uniform Delay, d1	7.2	10.8	7.8	6.6	8.7		44.2	44.2	43.5		45.7	45.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.8	0.1	0.1	0.5		1.4	1.4	0.2		0.3	0.0
Delay (s)	7.2	11.6	7.9	6.7	9.2		45.7	45.7	43.6		46.0	45.4
Level of Service	A	B	A	A	A		D	D	D		D	D
Approach Delay (s)		11.3			9.1			44.7			45.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	1	30	0
Future Volume (Veh/h)	0	0	0	1	30	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	33	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)			280			
pX, platoon unblocked						
vC, conflicting volume	1				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1622				1023	1084

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	1	33
Volume Left	0	0	33
Volume Right	0	1	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.03
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	8.6
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	8.4		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

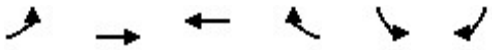
Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	1	30	0
Future Vol, veh/h	0	0	0	1	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	33	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	-	1022	1084
Stage 1	0	-	-	-	1022	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1022
HCM Lane V/C Ratio	-	-	-	0.032
HCM Control Delay (s)	-	-	-	8.6
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	30	1	2	77	0
Future Volume (Veh/h)	0	30	1	2	77	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	1	2	84	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)			116			
pX, platoon unblocked						
vC, conflicting volume	3				35	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3				35	2
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				91	100
cM capacity (veh/h)	1619				978	1082

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	33	3	84
Volume Left	0	0	84
Volume Right	0	2	0
cSH	1619	1700	978
Volume to Capacity	0.00	0.00	0.09
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	9.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.0
Approach LOS			A

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	30	1	2	77	0
Future Vol, veh/h	0	30	1	2	77	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	1	2	84	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3	0	-	0	35	2
Stage 1	-	-	-	-	2	-
Stage 2	-	-	-	-	33	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1619	-	-	-	978	1082
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	989	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1619	-	-	-	978	1082
Mov Cap-2 Maneuver	-	-	-	-	978	-
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	989	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

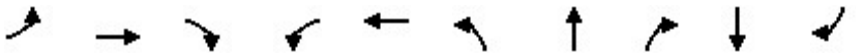
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1619	-	-	-	978
HCM Lane V/C Ratio	-	-	-	-	0.086
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	15	101
Future Volume (Veh/h)	0	0	0	0	15	101
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	16	110
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	16	16	126			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	16	16	126			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1000	1059	1458			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	16	110
Volume Left	0	0	0	0
Volume Right	0	0	0	110
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.06
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

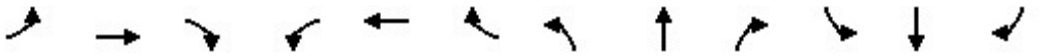
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	9.6%	ICU Level of Service	A
Analysis Period (min)	15		

BACKGROUND CONDITIONS CAPACITY ANALYSES



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	7	776	137	111	652	66	68	102	2	1
v/c Ratio	0.01	0.35	0.13	0.23	0.25	0.40	0.41	0.35	0.01	0.00
Control Delay	5.7	10.7	1.7	5.7	6.6	48.9	49.3	5.3	42.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Delay	5.7	10.7	1.7	5.7	6.6	48.9	49.3	5.5	42.5	0.0
Queue Length 50th (ft)	1	97	0	13	45	42	44	0	1	0
Queue Length 95th (ft)	7	224	22	50	171	84	86	17	8	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	661	2233	1059	533	2583	226	227	346	218	329
Starvation Cap Reductn	0	0	0	0	0	0	0	37	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.35	0.13	0.21	0.25	0.29	0.30	0.33	0.01	0.00

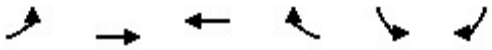
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	714	126	102	596	4	122	1	94	1	1	1
Future Volume (vph)	6	714	126	102	596	4	122	1	94	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1687	1583		1817	1583
Flt Permitted	0.40	1.00	1.00	0.29	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (perm)	753	3539	1583	539	3536		1681	1687	1583		1817	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	776	137	111	648	4	133	1	102	1	1	1
RTOR Reduction (vph)	0	0	57	0	0	0	0	0	92	0	0	1
Lane Group Flow (vph)	7	776	80	111	652	0	66	68	10	0	2	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	59.5	58.3	58.3	70.5	63.8		9.9	9.9	9.9		1.6	1.6
Effective Green, g (s)	59.5	58.3	58.3	70.5	63.8		9.9	9.9	9.9		1.6	1.6
Actuated g/C Ratio	0.60	0.58	0.58	0.70	0.64		0.10	0.10	0.10		0.02	0.02
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	460	2063	922	462	2255		166	167	156		29	25
v/s Ratio Prot	0.00	c0.22		c0.02	c0.18		0.04	c0.04			c0.00	
v/s Ratio Perm	0.01		0.05	0.15					0.01			0.00
v/c Ratio	0.02	0.38	0.09	0.24	0.29		0.40	0.41	0.06		0.07	0.00
Uniform Delay, d1	8.2	11.1	9.2	5.5	8.0		42.3	42.3	40.9		48.5	48.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.5	0.2	0.1	0.3		1.6	1.6	0.2		0.4	0.0
Delay (s)	8.2	11.7	9.3	5.6	8.4		43.8	43.9	41.0		48.8	48.4
Level of Service	A	B	A	A	A		D	D	D		D	D
Approach Delay (s)		11.3			8.0			42.6			48.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	13	56	0
Future Volume (Veh/h)	0	0	0	13	56	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	14	61	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)			280			
pX, platoon unblocked						
vC, conflicting volume	14				7	7
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	14				7	7
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	100
cM capacity (veh/h)	1604				1014	1075

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	14	61
Volume Left	0	0	61
Volume Right	0	14	0
cSH	1700	1700	1014
Volume to Capacity	0.00	0.01	0.06
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	8.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

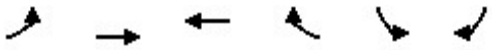
Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	13	56	0
Future Vol, veh/h	0	0	0	13	56	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	14	61	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	7	7
Stage 1	-	-	-	-	7	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	-	1014	1075
Stage 1	0	-	-	-	1016	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	1014	1075
Mov Cap-2 Maneuver	-	-	-	-	1014	-
Stage 1	-	-	-	-	1016	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1014
HCM Lane V/C Ratio	-	-	-	0.06
HCM Control Delay (s)	-	-	-	8.8
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	56	13	12	147	0
Future Volume (Veh/h)	0	56	13	12	147	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	61	14	13	160	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)			116			
pX, platoon unblocked						
vC, conflicting volume	27				82	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27				82	20
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				83	100
cM capacity (veh/h)	1587				921	1057

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	61	27	160
Volume Left	0	0	160
Volume Right	0	13	0
cSH	1587	1700	921
Volume to Capacity	0.00	0.02	0.17
Queue Length 95th (ft)	0	0	16
Control Delay (s)	0.0	0.0	9.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	56	13	12	147	0
Future Vol, veh/h	0	56	13	12	147	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	61	14	13	160	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	27	0	-	0	82	21
Stage 1	-	-	-	-	21	-
Stage 2	-	-	-	-	61	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1587	-	-	-	920	1056
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	962	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1587	-	-	-	920	1056
Mov Cap-2 Maneuver	-	-	-	-	920	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	962	-

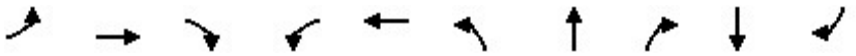
Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1587	-	-	-	920
HCM Lane V/C Ratio	-	-	-	-	0.174
HCM Control Delay (s)	0	-	-	-	9.7
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	23	177
Future Volume (Veh/h)	0	0	0	0	23	177
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	25	192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	25	25	217			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	25	25	217			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	987	1045	1350			

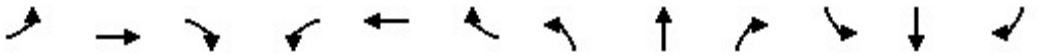
Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	25	192
Volume Left	0	0	0	0
Volume Right	0	0	0	192
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.11
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	14	1078	158	124	1129	56	56	128	15	8
v/c Ratio	0.04	0.51	0.16	0.35	0.45	0.36	0.36	0.45	0.11	0.03
Control Delay	6.8	14.5	2.7	8.3	9.3	48.5	48.5	9.6	44.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	6.8	14.5	2.7	8.3	9.3	48.5	48.5	9.7	44.6	0.1
Queue Length 50th (ft)	1	148	0	14	88	35	35	0	9	0
Queue Length 95th (ft)	11	347	32	53	332	75	75	37	29	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	434	2127	1017	396	2503	226	226	346	213	329
Starvation Cap Reductn	0	0	0	0	0	0	0	17	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.51	0.16	0.31	0.45	0.25	0.25	0.39	0.07	0.02

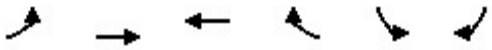
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	992	145	114	1036	3	103	0	118	13	1	7
Future Volume (vph)	13	992	145	114	1036	3	103	0	118	13	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3538		1681	1681	1583		1780	1583
Flt Permitted	0.22	1.00	1.00	0.18	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	414	3539	1583	334	3538		1681	1681	1583		1780	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	1078	158	124	1126	3	112	0	128	14	1	8
RTOR Reduction (vph)	0	0	69	0	0	0	0	0	116	0	0	8
Lane Group Flow (vph)	14	1078	89	124	1129	0	56	56	12	0	15	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	57.7	56.5	56.5	69.4	62.7		9.4	9.4	9.4		3.2	3.2
Effective Green, g (s)	57.7	56.5	56.5	69.4	62.7		9.4	9.4	9.4		3.2	3.2
Actuated g/C Ratio	0.58	0.56	0.56	0.69	0.63		0.09	0.09	0.09		0.03	0.03
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	255	1999	894	338	2218		158	158	148		56	50
v/s Ratio Prot	0.00	c0.30		c0.03	c0.32		c0.03	0.03			c0.01	
v/s Ratio Perm	0.03		0.06	0.23					0.01			0.00
v/c Ratio	0.05	0.54	0.10	0.37	0.51		0.35	0.35	0.08		0.27	0.01
Uniform Delay, d1	9.2	13.6	10.0	7.7	10.2		42.5	42.5	41.4		47.3	46.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	1.0	0.2	0.2	0.8		1.4	1.4	0.2		0.9	0.0
Delay (s)	9.3	14.7	10.3	8.0	11.1		43.8	43.8	41.6		48.2	46.9
Level of Service	A	B	B	A	B		D	D	D		D	D
Approach Delay (s)		14.0			10.7			42.6			47.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	32	38	0
Future Volume (Veh/h)	0	0	0	32	38	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	35	41	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)			280			
pX, platoon unblocked						
vC, conflicting volume	35				18	18
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	35				18	18
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				96	100
cM capacity (veh/h)	1576				1000	1061

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	35	41
Volume Left	0	0	41
Volume Right	0	35	0
cSH	1700	1700	1000
Volume to Capacity	0.00	0.02	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	0.0	0.0	8.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

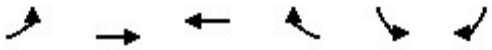
Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	32	38	0
Future Vol, veh/h	0	0	0	32	38	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	35	41	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	18	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	-	1000	1061
Stage 1	0	-	-	-	1005	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	1000	1061
Mov Cap-2 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1000
HCM Lane V/C Ratio	-	-	-	0.041
HCM Control Delay (s)	-	-	-	8.8
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	38	32	58	133	0
Future Volume (Veh/h)	0	38	32	58	133	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	41	35	63	145	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)			116			
pX, platoon unblocked						
vC, conflicting volume	98				108	66
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	98				108	66
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				84	100
cM capacity (veh/h)	1495				890	997

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	41	98	145
Volume Left	0	0	145
Volume Right	0	63	0
cSH	1495	1700	890
Volume to Capacity	0.00	0.06	0.16
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.0	0.0	9.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay		5.0	
Intersection Capacity Utilization		19.3%	ICU Level of Service A
Analysis Period (min)		15	

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	38	32	58	133	0
Future Vol, veh/h	0	38	32	58	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	41	35	63	145	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	98	0	-	0	108	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	41	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1495	-	-	-	889	997
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	981	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1495	-	-	-	889	997
Mov Cap-2 Maneuver	-	-	-	-	889	-
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	981	-

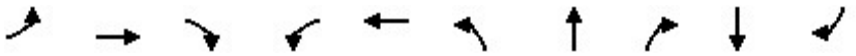
Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1495	-	-	-	889
HCM Lane V/C Ratio	-	-	-	-	0.163
HCM Control Delay (s)	0	-	-	-	9.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	149	102
Future Volume (Veh/h)	0	0	0	0	149	102
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	162	111
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	162	162	273			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	162	162	273			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	813	854	1287			

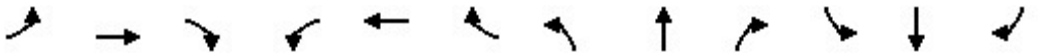
Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	162	111
Volume Left	0	0	0	0
Volume Right	0	0	0	111
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.10	0.07
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	11.2%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	5	1064	87	47	858	35	35	70	14	17
v/c Ratio	0.01	0.44	0.08	0.13	0.33	0.24	0.24	0.25	0.10	0.06
Control Delay	6.6	12.1	0.1	6.8	8.2	46.8	46.8	2.2	44.5	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.6	12.1	0.1	6.8	8.2	46.8	46.8	2.2	44.5	0.4
Queue Length 50th (ft)	1	220	0	9	115	22	22	0	8	0
Queue Length 95th (ft)	5	297	0	23	221	54	54	0	28	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	544	2408	1129	430	2573	226	226	346	213	329
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.44	0.08	0.11	0.33	0.15	0.15	0.20	0.07	0.05

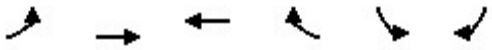
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	979	80	43	785	5	64	0	64	12	1	16
Future Volume (vph)	5	979	80	43	785	5	64	0	64	12	1	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1681	1583		1780	1583
Flt Permitted	0.31	1.00	1.00	0.21	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	572	3539	1583	386	3536		1681	1681	1583		1780	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1064	87	47	853	5	70	0	70	13	1	17
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	65	0	0	16
Lane Group Flow (vph)	5	1064	53	47	858	0	35	35	5	0	14	1
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	62.3	61.1	61.1	67.3	63.6		6.9	6.9	6.9		4.8	4.8
Effective Green, g (s)	62.3	61.1	61.1	67.3	63.6		6.9	6.9	6.9		4.8	4.8
Actuated g/C Ratio	0.62	0.61	0.61	0.67	0.64		0.07	0.07	0.07		0.05	0.05
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	370	2162	967	310	2248		115	115	109		85	75
v/s Ratio Prot	0.00	c0.30		c0.01	0.24		c0.02	0.02			c0.01	
v/s Ratio Perm	0.01		0.03	0.10					0.00			0.00
v/c Ratio	0.01	0.49	0.05	0.15	0.38		0.30	0.30	0.04		0.16	0.01
Uniform Delay, d1	7.2	10.8	7.8	6.7	8.7		44.3	44.3	43.5		45.7	45.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.8	0.1	0.1	0.5		1.5	1.5	0.2		0.3	0.0
Delay (s)	7.2	11.6	7.9	6.7	9.2		45.8	45.8	43.6		46.0	45.4
Level of Service	A	B	A	A	A		D	D	D		D	D
Approach Delay (s)		11.3			9.1			44.7			45.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	1	30	0
Future Volume (Veh/h)	0	0	0	1	30	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	33	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)			280			
pX, platoon unblocked						
vC, conflicting volume	1				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1622				1023	1084

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	1	33
Volume Left	0	0	33
Volume Right	0	1	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.03
Queue Length 95th (ft)	0	0	2
Control Delay (s)	0.0	0.0	8.6
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	8.4		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

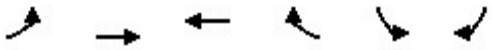
Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	1	30	0
Future Vol, veh/h	0	0	0	1	30	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	1	33	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	-	1022	1084
Stage 1	0	-	-	-	1022	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1022
HCM Lane V/C Ratio	-	-	-	0.032
HCM Control Delay (s)	-	-	-	8.6
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	30	1	2	78	0
Future Volume (Veh/h)	0	30	1	2	78	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	1	2	85	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)			116			
pX, platoon unblocked						
vC, conflicting volume	3				35	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3				35	2
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				91	100
cM capacity (veh/h)	1619				978	1082

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	33	3	85
Volume Left	0	0	85
Volume Right	0	2	0
cSH	1619	1700	978
Volume to Capacity	0.00	0.00	0.09
Queue Length 95th (ft)	0	0	7
Control Delay (s)	0.0	0.0	9.0
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.0
Approach LOS			A

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	30	1	2	78	0
Future Vol, veh/h	0	30	1	2	78	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	1	2	85	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3	0	-	0	35	2
Stage 1	-	-	-	-	2	-
Stage 2	-	-	-	-	33	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1619	-	-	-	978	1082
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	989	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1619	-	-	-	978	1082
Mov Cap-2 Maneuver	-	-	-	-	978	-
Stage 1	-	-	-	-	1021	-
Stage 2	-	-	-	-	989	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

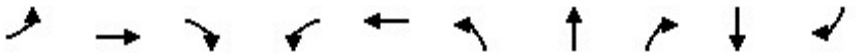
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1619	-	-	-	978
HCM Lane V/C Ratio	-	-	-	-	0.087
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	15	102
Future Volume (Veh/h)	0	0	0	0	15	102
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	16	111
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	16	16	127			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	16	16	127			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1000	1059	1457			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	16	111
Volume Left	0	0	0	0
Volume Right	0	0	0	111
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.01	0.07
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	9.6%	ICU Level of Service	A
Analysis Period (min)	15		

PROJECTED CONDITIONS CAPACITY ANALYSES



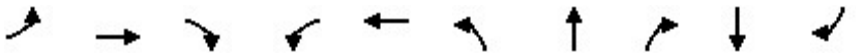
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	7	776	190	154	652	92	93	143	2	1
v/c Ratio	0.01	0.36	0.18	0.32	0.26	0.51	0.51	0.47	0.01	0.00
Control Delay	6.2	11.6	2.6	6.6	6.9	51.7	51.8	11.1	42.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.0	0.0
Total Delay	6.2	11.6	2.6	6.6	6.9	52.0	52.2	11.2	42.5	0.0
Queue Length 50th (ft)	1	105	0	20	48	58	60	0	1	0
Queue Length 95th (ft)	7	235	38	67	173	109	110	48	8	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	649	2177	1047	525	2550	226	227	346	218	329
Starvation Cap Reductn	0	0	0	0	0	15	15	15	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.36	0.18	0.29	0.26	0.44	0.44	0.43	0.01	0.00

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	714	175	142	596	4	169	1	132	1	1	1
Future Volume (vph)	6	714	175	142	596	4	169	1	132	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1686	1583		1817	1583
Flt Permitted	0.40	1.00	1.00	0.28	1.00		0.95	0.95	1.00		0.98	1.00
Satd. Flow (perm)	753	3539	1583	530	3536		1681	1686	1583		1817	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	776	190	154	648	4	184	1	143	1	1	1
RTOR Reduction (vph)	0	0	82	0	0	0	0	0	128	0	0	1
Lane Group Flow (vph)	7	776	108	154	652	0	92	93	15	0	2	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	57.9	56.7	56.7	69.6	62.9		10.8	10.8	10.8		1.6	1.6
Effective Green, g (s)	57.9	56.7	56.7	69.6	62.9		10.8	10.8	10.8		1.6	1.6
Actuated g/C Ratio	0.58	0.57	0.57	0.70	0.63		0.11	0.11	0.11		0.02	0.02
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	448	2006	897	460	2224		181	182	170		29	25
v/s Ratio Prot	0.00	c0.22		c0.02	0.18		0.05	c0.06			c0.00	
v/s Ratio Perm	0.01		0.07	0.21					0.01			0.00
v/c Ratio	0.02	0.39	0.12	0.33	0.29		0.51	0.51	0.09		0.07	0.00
Uniform Delay, d1	8.9	12.0	10.1	6.1	8.4		42.1	42.1	40.2		48.5	48.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.6	0.3	0.2	0.3		2.2	2.4	0.2		0.4	0.0
Delay (s)	8.9	12.6	10.3	6.3	8.8		44.3	44.5	40.4		48.8	48.4
Level of Service	A	B	B	A	A		D	D	D		D	D
Approach Delay (s)		12.1			8.3			42.7			48.7	
Approach LOS		B			A			D			D	

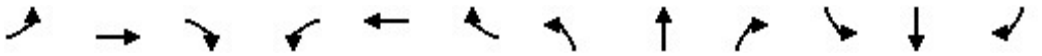
Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	14	1078	207	163	1129	77	78	163	15	8
v/c Ratio	0.04	0.53	0.21	0.45	0.46	0.45	0.45	0.53	0.11	0.03
Control Delay	7.6	16.6	4.9	10.1	9.9	49.9	50.2	13.2	44.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.0	0.0
Total Delay	7.6	16.6	4.9	10.1	9.9	50.2	50.4	13.3	44.6	0.1
Queue Length 50th (ft)	2	168	9	20	97	49	50	0	9	0
Queue Length 95th (ft)	11	376	61	71	344	95	95	58	29	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	429	2043	983	391	2471	226	226	354	213	329
Starvation Cap Reductn	0	0	0	0	0	14	14	9	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.53	0.21	0.42	0.46	0.36	0.37	0.47	0.07	0.02

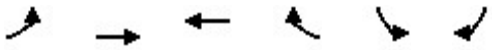
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	992	190	150	1036	3	143	0	150	13	1	7
Future Volume (vph)	13	992	190	150	1036	3	143	0	150	13	1	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3538		1681	1681	1583		1780	1583
Flt Permitted	0.23	1.00	1.00	0.17	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	421	3539	1583	319	3538		1681	1681	1583		1780	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	1078	207	163	1126	3	155	0	163	14	1	8
RTOR Reduction (vph)	0	0	75	0	0	0	0	0	146	0	0	8
Lane Group Flow (vph)	14	1078	132	163	1129	0	77	78	17	0	15	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	55.3	54.1	54.1	68.5	61.8		10.3	10.3	10.3		3.2	3.2
Effective Green, g (s)	55.3	54.1	54.1	68.5	61.8		10.3	10.3	10.3		3.2	3.2
Actuated g/C Ratio	0.55	0.54	0.54	0.68	0.62		0.10	0.10	0.10		0.03	0.03
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	249	1914	856	347	2186		173	173	163		56	50
v/s Ratio Prot	0.00	c0.30		c0.04	c0.32		0.05	c0.05			c0.01	
v/s Ratio Perm	0.03		0.08	0.28					0.01			0.00
v/c Ratio	0.06	0.56	0.15	0.47	0.52		0.45	0.45	0.10		0.27	0.01
Uniform Delay, d1	10.2	15.2	11.5	8.8	10.7		42.2	42.2	40.7		47.3	46.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	1.2	0.4	0.4	0.9		1.8	1.9	0.3		0.9	0.0
Delay (s)	10.3	16.4	11.9	9.2	11.6		44.0	44.1	40.9		48.2	46.9
Level of Service	B	B	B	A	B		D	D	D		D	D
Approach Delay (s)		15.6			11.3			42.4			47.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	67	0
Future Volume (Veh/h)	0	0	0	0	67	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	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)			280			
pX, platoon unblocked						
vC, conflicting volume	0				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	100
cM capacity (veh/h)	1623				1023	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	0	73
Volume Left	0	0	73
Volume Right	0	0	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	8.8
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay	8.8		
Intersection Capacity Utilization	7.0%	ICU Level of Service	A
Analysis Period (min)	15		

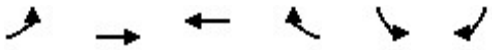
Intersection	
Int Delay, s/veh	8.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↱	
Traffic Vol, veh/h	0	0	0	0	67	0
Future Vol, veh/h	0	0	0	0	67	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	73	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	1022	1084
Stage 1	0	-	-	0	1022	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	1022
HCM Lane V/C Ratio	-	-	0.071
HCM Control Delay (s)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	67	0	74	176	0
Future Volume (Veh/h)	0	67	0	74	176	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	73	0	80	191	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)			116			
pX, platoon unblocked						
vC, conflicting volume	80				113	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	80				113	40
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				78	100
cM capacity (veh/h)	1518				884	1031

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	73	80	191
Volume Left	0	0	191
Volume Right	0	80	0
cSH	1518	1700	884
Volume to Capacity	0.00	0.05	0.22
Queue Length 95th (ft)	0	0	20
Control Delay (s)	0.0	0.0	10.2
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.2
Approach LOS			B

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	67	0	74	176	0
Future Vol, veh/h	0	67	0	74	176	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	73	0	80	191	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	80	0	-	0	113	40
Stage 1	-	-	-	-	40	-
Stage 2	-	-	-	-	73	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1518	-	-	-	884	1031
Stage 1	-	-	-	-	982	-
Stage 2	-	-	-	-	950	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1518	-	-	-	884	1031
Mov Cap-2 Maneuver	-	-	-	-	884	-
Stage 1	-	-	-	-	982	-
Stage 2	-	-	-	-	950	-

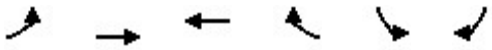
Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1518	-	-	-	884
HCM Lane V/C Ratio	-	-	-	-	0.216
HCM Control Delay (s)	0	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	165	167
Future Volume (Veh/h)	0	0	0	0	165	167
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	179	182
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	179	179	361			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	179	179	361			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	793	833	1194			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	179	182
Volume Left	0	0	0	0
Volume Right	0	0	0	182
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.11	0.11
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	13.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	90	0
Future Volume (Veh/h)	0	0	0	0	90	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	98	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)			280			
pX, platoon unblocked						
vC, conflicting volume	0				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	100
cM capacity (veh/h)	1623				1023	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	0	98
Volume Left	0	0	98
Volume Right	0	0	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	0.0	0.0	8.9
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.9
Approach LOS			A

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	8.3%	ICU Level of Service	A
Analysis Period (min)	15		

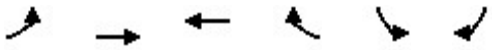
Intersection	
Int Delay, s/veh	8.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↱	
Traffic Vol, veh/h	0	0	0	0	90	0
Future Vol, veh/h	0	0	0	0	90	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	98	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	1022	1084
Stage 1	0	-	-	0	1022	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	1022
HCM Lane V/C Ratio	-	-	0.096
HCM Control Delay (s)	-	-	8.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.3



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	90	0	30	198	0
Future Volume (Veh/h)	0	90	0	30	198	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	98	0	33	215	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)			116			
pX, platoon unblocked						
vC, conflicting volume	33				114	16
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33				114	16
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				76	100
cM capacity (veh/h)	1579				882	1063

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	98	33	215
Volume Left	0	0	215
Volume Right	0	33	0
cSH	1579	1700	882
Volume to Capacity	0.00	0.02	0.24
Queue Length 95th (ft)	0	0	24
Control Delay (s)	0.0	0.0	10.4
Lane LOS			B
Approach Delay (s)	0.0	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	90	0	30	198	0
Future Vol, veh/h	0	90	0	30	198	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	98	0	33	215	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	33	0	-	0	115	17
Stage 1	-	-	-	-	17	-
Stage 2	-	-	-	-	98	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1579	-	-	-	881	1062
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	926	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1579	-	-	-	881	1062
Mov Cap-2 Maneuver	-	-	-	-	881	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	926	-

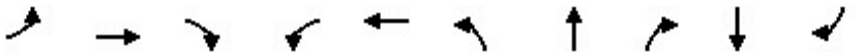
Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1579	-	-	-	881
HCM Lane V/C Ratio	-	-	-	-	0.244
HCM Control Delay (s)	0	-	-	-	10.4
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	71	248
Future Volume (Veh/h)	0	0	0	0	71	248
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	77	270
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	77	77	347			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	77	77	347			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	917	968	1209			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	77	270
Volume Left	0	0	0	0
Volume Right	0	0	0	270
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.05	0.16
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		



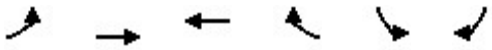
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	5	1064	113	67	858	49	50	93	14	17
v/c Ratio	0.01	0.46	0.10	0.19	0.34	0.32	0.33	0.33	0.10	0.06
Control Delay	7.0	13.6	0.9	7.5	8.6	47.9	48.1	4.3	44.5	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Total Delay	7.0	13.6	0.9	7.5	8.6	47.9	48.1	4.5	44.5	0.4
Queue Length 50th (ft)	1	221	0	14	116	31	32	0	8	0
Queue Length 95th (ft)	5	313	10	32	228	68	69	9	28	0
Internal Link Dist (ft)		494			389		58		115	
Turn Bay Length (ft)	175		150	100				100		
Base Capacity (vph)	547	2299	1085	414	2554	226	226	346	213	329
Starvation Cap Reductn	0	0	0	0	0	0	0	35	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.46	0.10	0.16	0.34	0.22	0.22	0.30	0.07	0.05

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	979	104	62	785	5	91	0	86	12	1	16
Future Volume (vph)	5	979	104	62	785	5	91	0	86	12	1	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1681	1583		1780	1583
Flt Permitted	0.31	1.00	1.00	0.20	1.00		0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	584	3539	1583	366	3536		1681	1681	1583		1780	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1064	113	67	853	5	99	0	93	13	1	17
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	86	0	0	16
Lane Group Flow (vph)	5	1064	67	67	858	0	49	50	7	0	14	1
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		3	3		4	4	
Permitted Phases	2		2	6					3			4
Actuated Green, G (s)	60.2	59.0	59.0	68.2	63.0		7.5	7.5	7.5		4.8	4.8
Effective Green, g (s)	60.2	59.0	59.0	68.2	63.0		7.5	7.5	7.5		4.8	4.8
Actuated g/C Ratio	0.60	0.59	0.59	0.68	0.63		0.08	0.08	0.08		0.05	0.05
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5		6.5	6.5	6.5		6.0	6.0
Vehicle Extension (s)	2.0	3.0	3.0	2.0	3.0		3.0	3.0	3.0		2.0	2.0
Lane Grp Cap (vph)	365	2088	933	322	2227		126	126	118		85	75
v/s Ratio Prot	0.00	c0.30		c0.01	c0.24		0.03	c0.03			c0.01	
v/s Ratio Perm	0.01		0.04	0.13					0.00			0.00
v/c Ratio	0.01	0.51	0.07	0.21	0.39		0.39	0.40	0.06		0.16	0.01
Uniform Delay, d1	8.0	12.0	8.8	6.9	9.0		44.1	44.1	43.0		45.7	45.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.9	0.1	0.1	0.5		2.0	2.1	0.2		0.3	0.0
Delay (s)	8.0	12.9	8.9	7.0	9.5		46.1	46.1	43.2		46.0	45.4
Level of Service	A	B	A	A	A		D	D	D		D	D
Approach Delay (s)		12.5			9.4			44.7			45.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.5
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	50	0
Future Volume (Veh/h)	0	0	0	0	50	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	54	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)			280			
pX, platoon unblocked						
vC, conflicting volume	0				0	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				0	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	100
cM capacity (veh/h)	1623				1023	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	0	54
Volume Left	0	0	54
Volume Right	0	0	0
cSH	1700	1700	1023
Volume to Capacity	0.00	0.00	0.05
Queue Length 95th (ft)	0	0	4
Control Delay (s)	0.0	0.0	8.7
Lane LOS			A
Approach Delay (s)	0.0	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay	8.7		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

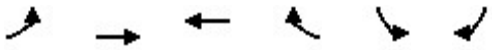
Intersection	
Int Delay, s/veh	8.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↱	
Traffic Vol, veh/h	0	0	0	0	50	0
Future Vol, veh/h	0	0	0	0	50	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	54	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	0	-	-	0	1022	1084
Stage 1	0	-	-	0	1022	-
Stage 2	0	-	-	0	-	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	1022	1084
Mov Cap-2 Maneuver	-	-	-	-	1022	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	1022
HCM Lane V/C Ratio	-	-	0.053
HCM Control Delay (s)	-	-	8.7
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	50	0	11	107	0
Future Volume (Veh/h)	0	50	0	11	107	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	54	0	12	116	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)			116			
pX, platoon unblocked						
vC, conflicting volume	12				60	6
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12				60	6
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				88	100
cM capacity (veh/h)	1607				947	1077

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	54	12	116
Volume Left	0	0	116
Volume Right	0	12	0
cSH	1607	1700	947
Volume to Capacity	0.00	0.01	0.12
Queue Length 95th (ft)	0	0	10
Control Delay (s)	0.0	0.0	9.3
Lane LOS			A
Approach Delay (s)	0.0	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	50	0	11	107	0
Future Vol, veh/h	0	50	0	11	107	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	54	0	12	116	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	12	0	-	0	60	6
Stage 1	-	-	-	-	6	-
Stage 2	-	-	-	-	54	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1607	-	-	-	947	1077
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	969	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1607	-	-	-	947	1077
Mov Cap-2 Maneuver	-	-	-	-	947	-
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	969	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1607	-	-	-	947
HCM Lane V/C Ratio	-	-	-	-	0.123
HCM Control Delay (s)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	24	136
Future Volume (Veh/h)	0	0	0	0	24	136
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	26	148
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				86	138	
pX, platoon unblocked						
vC, conflicting volume	26	26	174			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26	26	174			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	986	1044	1400			

Direction, Lane #	NB 1	NB 2	SB 1	SB 2
Volume Total	0	0	26	148
Volume Left	0	0	0	0
Volume Right	0	0	0	148
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.02	0.09
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS				
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	11.8%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX G
TRIP GENERATION CALCULATIONS

TRIP GENERATION

Fast-Food Restaurant with Drive-Through Window

934 ITE Land Code

4.996 k.s.f.

Average Daily Traffic:

T = 470.95 * (X)

T = 470.95 * (4.996)

T = 2353

A.M. Peak Hour:

T = 50.97 * (X)

T = 50.97 * (4.996)

T = 255

Enter =	133	52%
Exit =	122	48%

P.M. Peak Hour:

T = 51.36 * (X)

T = 51.36 * (4.996)

T = 257

Enter =	131	51%
Exit =	126	49%