Transportation Impact Study

Landmark Small Area Plan Update

City of Alexandria, Virginia

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Prepared for:
Howard Hughes Corporation
One Galleria Tower
13355 Noel Road, 22nd Floor
Dallas, TX 75240

GOROVE / SLADE
Transportation Planners and Engineers

Prepared by:

GOROVE / SLADE
Transportation Planners and Engineers

1140 Connecticut Avenue
Suite 600
Washington, DC 20036
Tel: 202.296.8625
Fax: 202.785.1276

3914 Centreville Road
Suite 330
Chantilly, VA 20151
Tel: 703.787.9595
Fax: 703.787.9905

15125 Washington Street
Suite 212
Haymarket, VA 20169
Tel: 571.248.0992
Fax: 703.787.9905

www.goroveslade.com

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INTRODUCTION AND SUMMARY

Purpose and Study Objective

This report presents the findings of a Transportation Impact Study (TIS) conducted for the proposed change in the densities for the 2009 previously approved Landmark Small Area plan. The existing Landmark Mall site is generally situated north of Duke Street (Rte. 236), east of the I-395 Interchange, and west of Van Dorn Street (Rte. 401) in the west end of the City of Alexandria. The TIS evaluates the 2019 proposed development program and compares transportation operations when to the 2009 approved development program.

The mall site currently consists of approximately 900 ksf of leasable retail space; however, approximately two-thirds of the space is currently unoccupied. The 2009 Small Area Plan development program for the project site included a total of approximately 3,106 ksf of office, 1,000 ksf of retail, and 1,500 apartment dwelling units. The current re-planning effort anticipates a more complete mix of uses that is more integrated across the site and more balanced between residential and non-residential uses. The 2019 proposed development program includes a total of approximately 3,100 apartment dwelling units, a hotel, movie theater, 150,000 sf of health and fitness club, 344,000 sf of retail, and 860,000 sf of employment uses.

Currently, the access to the Landmark Mall is provided along Duke street at one signalized exit-only driveway, one right-in access, one right-out access and one left-in grade-separated access and along Van Dorn Street at a full access signalized entrance. With the redevelopment of the site, this study assumes the conversion the Duke Street access configuration to three signalized at-grade intersections, including removal of the flyover ramp. The exiting access on Van Dorn Street will remain and an additional full-access is planned to the north of this existing intersection.

The following tasks were completed as part of this study:

- A scoping meeting was held with City of Alexandria staff, which included discussions about the parameters of the study and relevant background information. A copy of the signed scoping document for this traffic impact study is included in Appendix A.
- Field reconnaissance in the vicinity of the site was performed in order to collect information related to existing traffic controls, roadway geometry, and traffic flow characteristics within the surrounding vicinity of the site.
- Traffic counts were conducted at the existing study intersections on Tuesday, June 16, 2018 during the weekday morning (AM) and weekday afternoon (PM) peak periods.
- The Future Conditions without Development traffic volumes were projected based on an inherent growth of 0.9% compounded annually to account for regional growth and any potential background developments along the roadway network.
- Proposed site traffic volumes were derived based on the methodology outlined in the Institute of Transportation Engineers' (ITE's) Trip Generation Manual, 10th Edition publication.
- The Future Conditions with Development traffic volumes were projected based on existing traffic counts, regional growth, existing regional and site traffic patterns, the removal of existing trips associated with the current development at the site and the approved/proposed development plan.
- Intersection capacity analyses and queuing analyses were performed for the Existing Conditions (2018), Future Conditions without Development (2040), and Future Conditions with Development (2040) with the 2009 approved

development program and Future Conditions with Development (2040) with 2019 proposed development program during the weekday morning (AM) and weekday afternoon (PM) peak hours at the study intersections. The intersection capacity and queuing analyses were conducted based on the methodology outlined in the Highway Capacity Manual, using Synchro, version 10.

Sources of data for this study include City of Alexandria, VDOT, and the office files and field reconnaissance efforts by Gorove/Slade Associates, Inc.

Executive Summary

Site Location and Study Area

The existing Landmark Mall site is generally situated north of Duke Street (Rte. 236), east of the I-395 Interchange, and west of Van Dorn Street (Rte. 401) in the west end of the City of Alexandria. The study area consists of three existing intersections. With the planned redevelopment of the site, a total of five access points would be provided.

The study intersections are as follows:

1. Duke Street and S. Walker Street (existing signalized intersection; future full access),
2. Van Dorn Street and Duke Street EB Ramps (existing signalized intersection),
3. Van Dorn Street and Duke Street WB Ramps (existing signalized intersection; future full access),
4. Duke Street and East Site Access (future signalized intersection, future full access),
5. Duke Street and Center Access (future signalized intersection, future full access), and
6. Van Dorn Street and North Site Access (future signalized intersection, future full access)

Description of Proposed Development

The mall site currently consists of approximately 900 ksf of leasable retail space; however, approximately two-thirds of the space is currently unoccupied. The redevelopment of the project site is anticipated to be complete by 2040. The 2009 Small Area Plan development program for the project site included a total of approximately 3,106 ksf of office, 1,000 ksf of retail, and 1,500 apartment dwelling units. The current re-planning effort anticipates a more complete mix of uses that is more integrated across the site and more balanced between residential and non-residential uses. The 2019 proposed development program includes a total of approximately 3,100 apartment dwelling units, a hotel, movie theater, 150,000 sf of health and fitness club, 344,000 sf of retail, and 860,000 sf of employment uses.

Principal Findings, Conclusions and Recommendations

The analysis contained herein presents the Existing Conditions (2018), Future Conditions without Development (2040), Future Conditions with Development (2040) with 2009 approved development program and Future Conditions with Development (2040) with 2019 proposed development program. Based on the above guidelines, the analysis presented in this report supports the following conclusions:

Existing Conditions (2018)

- Analysis of the existing traffic count data found the following system peak hours:
  - AM Peak Hour: 7:30 AM to 8:30 AM
  - PM Peak Hour: 5:00 PM to 6:00 PM
- Based on the capacity analysis, all of the study intersections had approaches that operate at LOS E during at least one peak hour, with the overall intersections operating at LOS D or better.
- In general, the study intersections operate with high delays for the side-streets and mainline left turn movements. These conditions are typical of commuter corridors and reflect the prioritization of through traffic flow along the mainlines over access from individual properties and side-streets in order to accommodate the largest possible volume of through traffic in the area, and thereby, have a better overall traffic operation than if all movements were prioritized equally.
- All left and right turn lanes have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the eastbound left-turn movement at the intersection of the EB Duke Street Off-Ramp and Van Dorn Street.

Future Conditions without Development (2040)

- As a basis for performing the future without development analyses, it was assumed that the existing Landmark Mall would continue to remain similar in 2040.
- Based on the capacity analysis, all of the study intersections will continue to operate with overall LOS D or better with LOS E or F on some movements and approaches.
- All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the eastbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

Future Conditions with Development (2040) with 2009 Approved Development Program

- The redevelopment of the site with 2009 approved development program will generate approximately 2,054 new trips during the AM peak hour, 2,984 new trips during the PM peak hour, and 31,775 new weekday daily trips.
- Under the 2040 future with development with 2009 approved development program scenario, all of the study intersections will continue to have approaches that do operate with LOS E or F during at least one peak hour and show a considerable increase in delay when compared to Future Conditions without the development.
- All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the northbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

Future Conditions with Development (2040) with 2019 Proposed Development Program

- The redevelopment of the site with 2019 proposed development program will generate approximately 1,333 new trips during the AM peak hour, 2,059 new trips during the PM peak hour, and 25,995 new weekday daily trips. This represents significantly fewer trips than the approved 2009 plan density.

- Under the 2040 future with development with 2019 proposed development program scenario, all of the study intersections would operate with overall LOS D conditions and some LOS E movements and approaches. This scenario shows a considerable reduction in delay when compared to future conditions with 2009 approved development program and represents a balance in the prioritization of vehicular and non-motorized travel.
- All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the northbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.
- The proposed removal of auto-oriented uses and highway structures and redevelopment of the Landmark Mall site with a network of complete street connections will contribute to the mobility of all modes of travel in the area and the small area plan vision for a vibrant West End community.

BACKGROUND INFORMATION: PROPOSED DEVELOPMENT (SITE AND NEARBY)

Site Location and Major Transportation Features

This study was performed in order to analyze the potential traffic impact with respect to the 2009 previously approved development program and 2019 proposed development program for the Landmark Mall site, located north of Duke Street (Rte. 236), east of the I-395 Interchange, and west of Van Dorn Street (Rte. 401) in the west end of the City of Alexandria.

Currently, access to the Landmark Mall is provided with one signalized exit only entrance, one right-in access, one -right-out access and one left-in flyover access along the Duke Street and a full access entrance along the Van Dorn Street. With the redevelopment of the site, this study assumes the conversion the Duke Street access configuration to three signalized at-grade intersections, including removal of the flyover ramp. The exiting access on Van Dorn Street will remain and an additional full-access is planned to the north of this existing intersection.

The study intersections are described in the *Scope of Study* section of this report. A site location map is shown in Figure 1 and the site's conceptual development plan is shown in Figure 2. The development is anticipated to be complete in 2040.

Scope of Study

The study area consists of three existing intersections and three future intersections. Of the existing intersections, two intersection will be used as future access points for the development. The following intersections were identified for inclusion in this study:

1. Duke Street and S. Walker Street (existing signalized intersection; future full access),
2. Van Dorn Street and Duke Street EB Ramps (existing signalized intersection),
3. Van Dorn Street and Duke Street WB Ramps (existing signalized intersection; future full access),
4. Duke Street and East Site Access (future signalized intersection, future full access),
5. Duke Street and Center Access (future signalized intersection, future full access), and
6. Van Dorn Street and North Site Access (future signalized intersection, future full access)

Figure 1: Area Map and Site Location

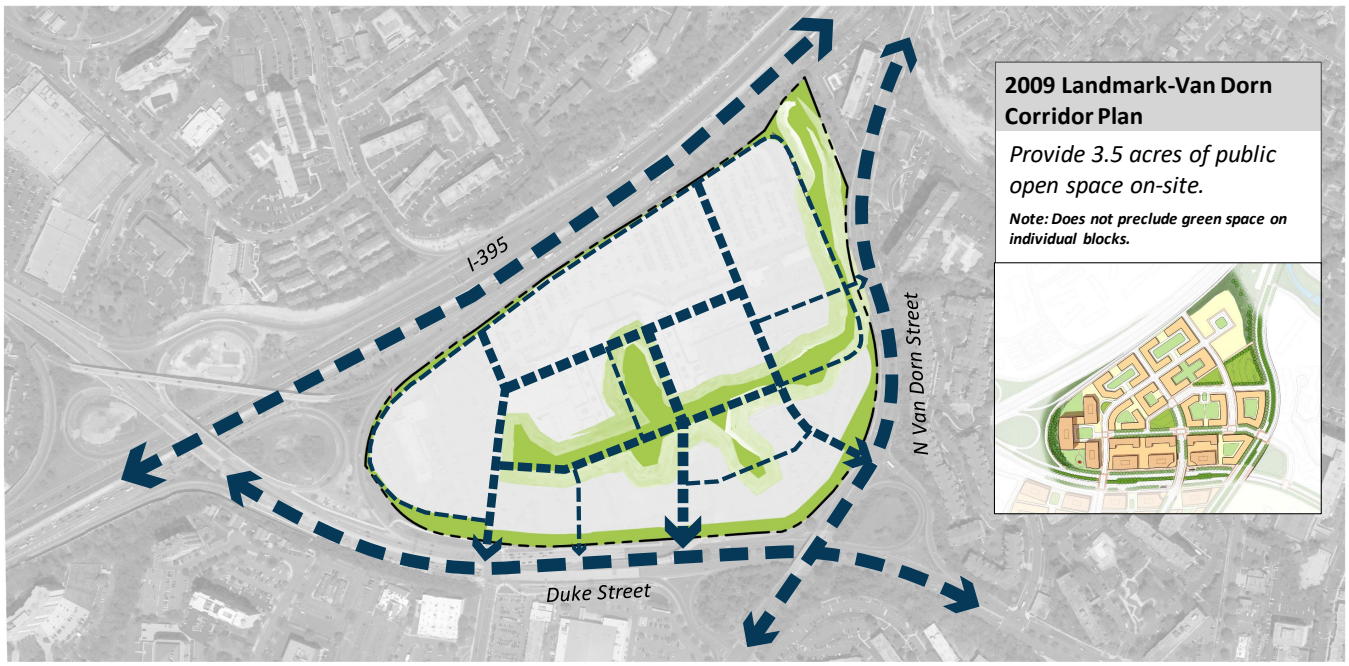

Figure 2: Concept Plan (For 2019 Proposed Development Program)

This report presents the findings of analyses performed for the following conditions:

- **Existing Conditions (2018):** Considers existing traffic volumes and existing roadway configurations.
- **Future Conditions without Development (2040):** Considers future traffic conditions for the year 2040 with regional growth, but without the proposed development.
- **Future Conditions with Development with 2009 Approved Development Program (2040):** Considers future traffic conditions for the year 2040 (build-out year) with regional growth and the development contemplated in the 2009 plan.
- **Future Conditions with Development with 2019 Proposed Development Program (2040):** Considers future traffic conditions for the year 2040 (build-out year) with regional growth and the current proposed development.

The results of the analysis and the traffic impacts associated with the proposed development is presented in the *Conclusion* section of this report.

Roadway Network

A description of the major roadways within the immediate vicinity of the site is presented below. The existing lane configuration and traffic control in the study area is shown in Figure 3.

Duke Street (Rte. 236) is an arterial roadway extending from Fairfax County (as Little River Turnpike) to Old Town Alexandria. Along the frontage of the site, Duke Street is a six-lane divided roadway with turn lanes and traffic signals at major intersections. Its junction with Van Dorn Street is a full-movement, grade-separated interchange. The posted speed limit along the roadway is 35 mph. Historical traffic count data from VDOT shows that Duke Street carried approximately 53,000 vehicles per day (vpd) between I-395 and Van Dorn Street (Rte. 401) in 2017.

Van Dorn Street (Rte. 401) is an arterial roadway extending from Kingstown to King Street near Fairlington. Running along the eastern frontage of the site, Van Dorn Street is a four-lane divided roadway with turn lanes and traffic signals at major intersections. The posted speed limit along the roadway is 35 mph. Historical traffic count data from VDOT shows that Van Dorn Street carried approximately 31,000 vpd between Edsall Road and Duke Street and 25,000 vpd between Duke Street and Seminary Road in 2017.

Existing Transit Facilities

The area surrounding the existing Landmark Mall is served by multiple DASH, WMATA (Metro), and Fairfax Connector bus routes. The mall serves as a transfer stop between several DASH and WMATA lines. An area in the rear of the mall, adjacent to the former Macy's store, serves as the transfer stop, with additional area under the parking garage for bus waiting spaces. This area is not visible from the adjacent public streets and, with the closure of the mall stores, is no longer surrounded by supporting or destination uses.

Existing Bicycle and Pedestrian Facilities

The development of the Landmark Mall was performed at a time when priority was given to private automobile travel, especially for such major retail uses. Therefore, no significant pedestrian or bicycle connections were provided to adjacent parcels. The flyover ramps and bridges that complete the ring road around the mall constrain the sidewalks on the perimeter of the site and provide barriers to non-motorized travel. Bike lanes are not present on adjacent segments of Van Dorn Street or Duke Street.

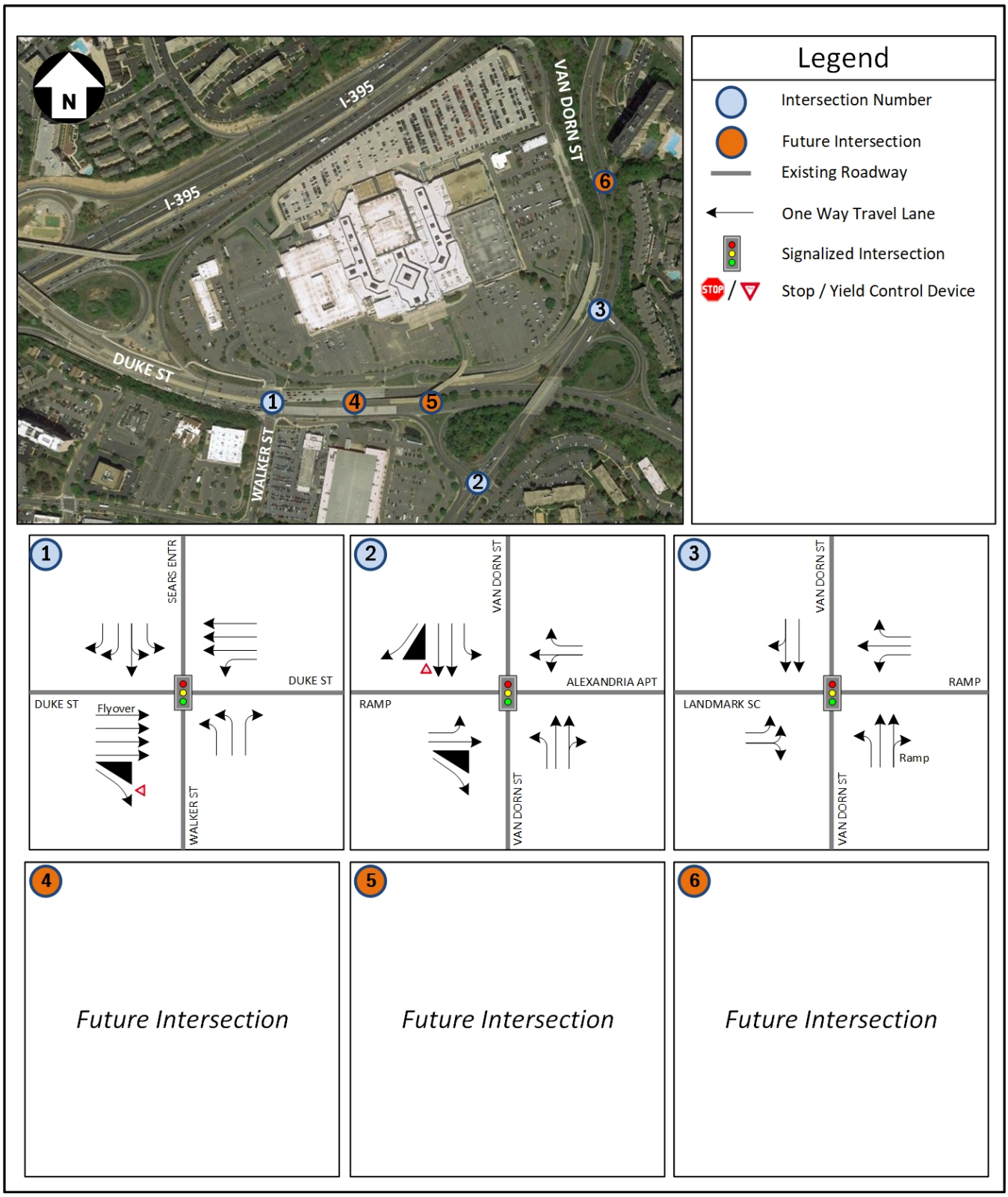

Figure 3: Existing Road Network

EXISTING CONDITIONS (2018)

Existing Traffic Volumes

In order to determine the weekday peak hour turning movement traffic volumes, traffic counts were conducted at the study intersection on Tuesday, June 16, 2018. Analysis of the traffic data found the following peak hours:

- Morning (AM) Peak Hour: 7:30 AM to 8:30 AM
- Afternoon (PM) Peak Hour: 5:00 PM to 6:00 PM

The road network was then balanced (by approach) where appropriate. If an existing driveway, commercial entrance, additional roadway was located between two study intersections, then the road network linking the two intersections was not balanced. The existing peak hour traffic volumes are shown in Figure 4. The average daily traffic (ADT) volumes show in Figure 4 are based off the k-factors from 2017 VDOT historic traffic data and the afternoon peak hour volumes. If traffic data was not available for a given approach, it was assumed to have a k-factor of 0.10.

The raw traffic count data are included in Appendix B.

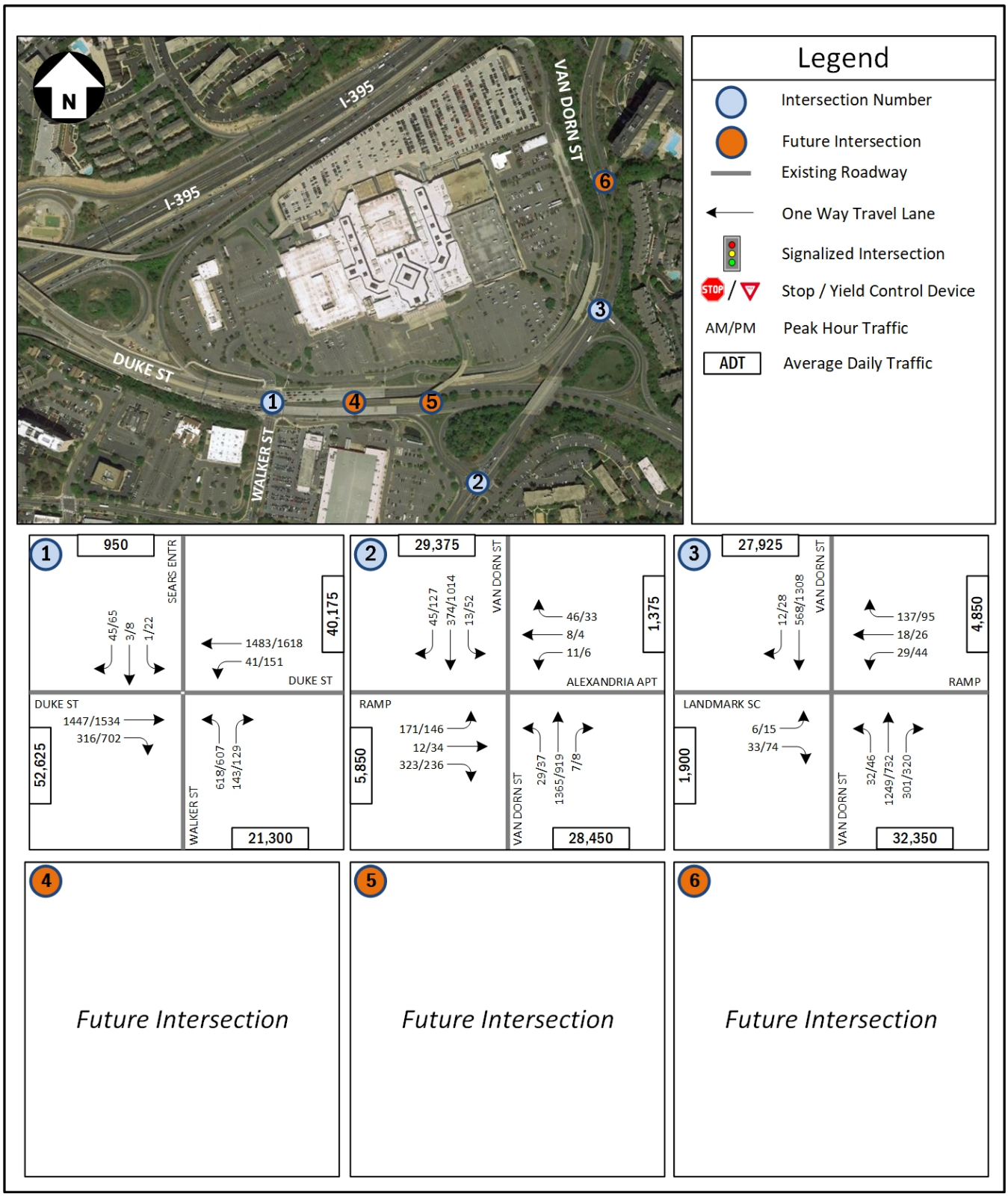

Figure 4: Existing (2018) Traffic Volumes

Existing Conditions (2018) Capacity Analysis

Intersection capacity analyses were performed for the Existing Conditions (2018) scenario at the study area intersections during the weekday morning (AM) and afternoon peak (PM) peak hours. *Synchro,* version 10, was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM) methodology.

The existing peak hour factors (by intersection) acquired from the traffic counts, with a minimum of 0.85, were used in the analysis. Heavy vehicle percentages were based on the traffic counts. Synchro files were acquired from VDOT and City of Alexandria, and the lane configurations were field-verified.

The results of the intersection capacity and queuing analyses are presented in Table 1 and are expressed in level of service (LOS) and delay (seconds per vehicle). The overall intersections, approaches, and lane groups that operated at LOS E or F are shown in red, as LOS F represents forced-flow conditions. The 95th percentile queues were determined from *Synchro* and are expressed in feet. The lane groups where the queue length exceeded the effective storage length are also shown in red. The description of different LOS and delay are included in Appendix C. The detailed analysis worksheets of 2018 Existing Conditions are contained in Appendix D.

Table 1: Existing (2018) Intersection Capacity Analysis

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
1	**Duke Street and S Walker Street /Sears Driveway**							
	Overall Intersection (Signalized)		**C**	**27.9**		**D**	**38.0**	
	Eastbound Approach		***B***	***19.5***		***C***	***30.1***	
	Eastbound Thru		B	20.0	316	C	31.0	426
	Eastbound Right	310	B	17.3	54	C	28.2	88
	Westbound Approach		***C***	***22.2***		***D***	***36.6***	
	Westbound Left	345	E	69.6	79	F	115.2	#296
	Westbound Thru		C	20.9	432	C	29.2	603
	Northbound Approach		***E***	***56.4***		***E***	***61.3***	
	Northbound Left		E	59.4	344	E	64.4	364
	Northbound Right	385	D	43.2	54	D	46.9	54
	Southbound Approach		***E***	***64.8***		***E***	***68.4***	
	Southbound Left		E	70.1	7	E	73.7	41
	Southbound Left/Thru		E	73.1	13	E	73.7	43
	Southbound Right		E	64.2	7	E	66.0	24
2	**VanDorn Street and EB Duke Street Off Ramp**							
	Overall Intersection (Signalized)		**B**	**17.4**		**B**	**14.0**	
	Eastbound Approach		***D***	***52.9***		***E***	***55.3***	
	Eastbound Left	100	E	64.9	218	E	76.5	#229
	Eastbound Thru/Right		D	46.8	100	D	43.9	119
	Westbound Approach		***D***	***44.4***		***D***	***40.6***	
	Westbound Left/Thru		D	45.2	36	D	40.9	23
	Westbound Right		D	44.1	20	D	40.5	2
	Northbound Approach		***A***	***6.0***		***A***	***3.6***	
	Northbound Left	150	A	3.7	15	A	3.9	11
	Northbound Thru/Right		A	6.1	313	A	3.6	116
	Southbound Approach		***A***	***8.7***		***A***	***7.0***	
	Southbound Left	200	B	19.3	24	E	64.3	m#51
	Southbound Thru/Left		A	9.4	99	A	4.9	9
	Southbound Right	250	A	0.1	0	A	0.1	m0

Table 1: Existing (2018) Intersection Capacity Analysis (Continued)

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
3	**Van Dorn Street and Macys Driveway/WB Ramp Overall Intersection (Signalized)**		**B**	**12.2**		**B**	**14.7**	
	Eastbound Approach		***E***	***56.4***		***D***	***50.1***	
	Eastbound Left		E	56.9	17	D	50.7	31
	Eastbound Left/Thru/Right		E	56.3	0	D	50.0	7
	Westbound Approach		***D***	***48.5***		***D***	***43.7***	
	Westbound Left	100	D	49.0	52	D	44.3	68
	Westbound Thru		D	48.9	37	D	44.4	47
	Westbound Right	100	D	48.3	61	D	43.2	24
	Northbound Approach		***A***	***6.1***		***A***	***4.6***	
	Northbound Left	620	A	4.2	14	A	9.7	m17
	Northbound Thru		A	5.7	230	A	4.7	m104
	Northbound Right	200	A	7.7	44	A	3.5	m13
	Southbound Approach		***B***	***14.6***		***B***	***17.2***	
	Southbound Thru		B	14.6	173	B	17.2	433

NOTES:

* *Effective storage length is based on the storage length plus one-half of the taper length per TOSAM guidelines.*

** *#: 95th percentile volumes exceed capacity; actual queues may be longer. Queues shown are based on the maximum after two cycles.*

*** *m: Volume for 95th percentile queue is metered by upstream signal*

**** *$: Delays exceed 300 seconds.*

Based on the capacity analysis, all of the study intersections had approaches that operate at LOS E during at least one peak hour, with overall LOS D or better at each intersection. Furthermore, all lane groups (by intersection) have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the eastbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

In general, the study intersections operate with high delays for the side-streets and mainline left turn movements. These conditions are typical of commuter corridors to reflect the prioritization of through traffic flow along the mainlines over access from individual properties and side-streets in order to accommodate the largest possible volume of through traffic in the area, and thereby, have a better overall traffic operation than if all movements were prioritized equally.

The results of the intersection capacity analyses for the existing conditions are shown in Figure 5.

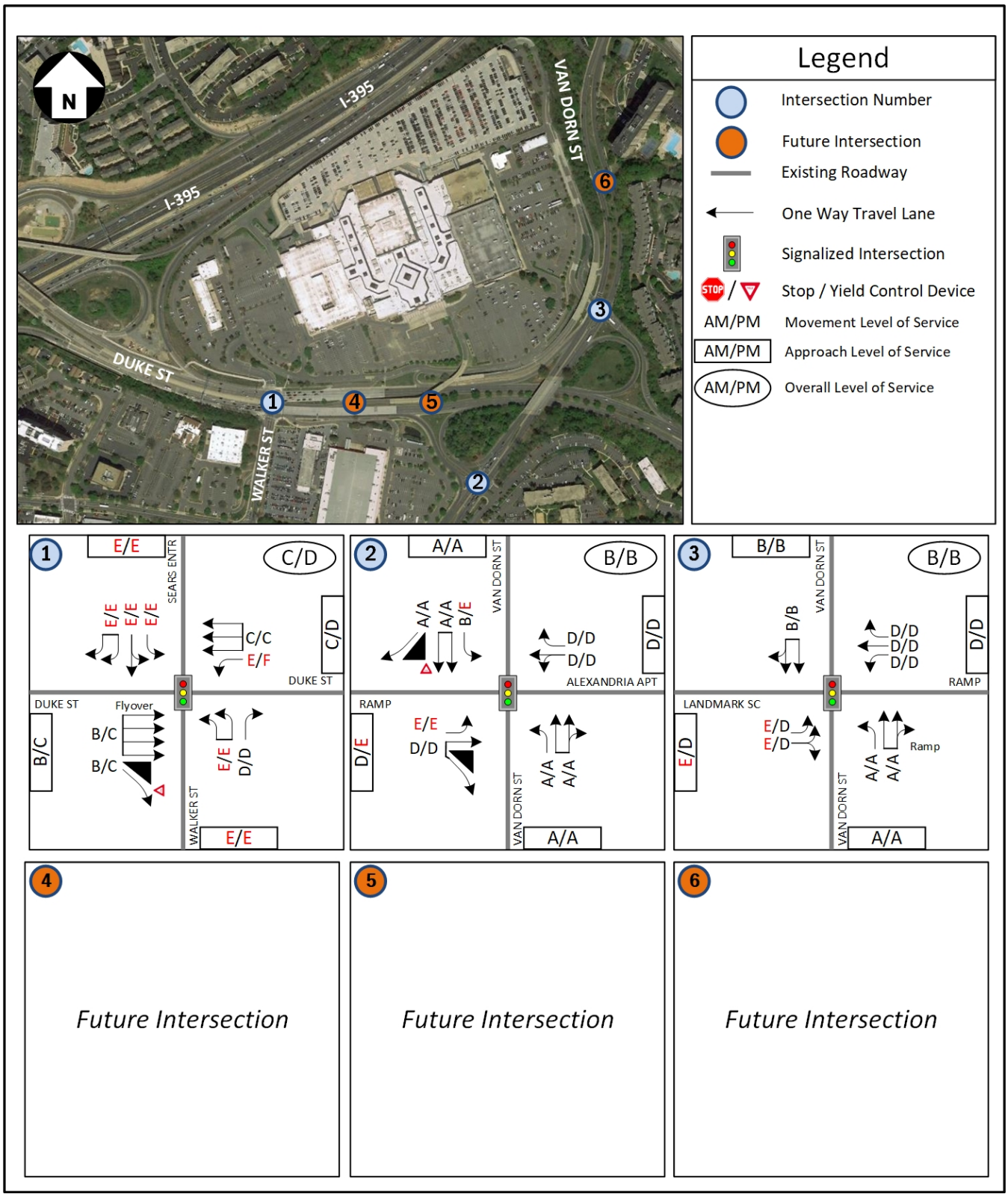

Figure 5: Existing Conditions (2018) Capacity Analysis

FUTURE CONDITIONS WITHOUT DEVELOPMENT (2040)

Future without Development Traffic Volumes

Inherent Growth

The proposed redevelopment of the Landmark Mall site is anticipated to be complete in 2040. To account for future roadway conditions, and as agreed upon with the City staff, an inherent growth rate of 0.9% compounded annually over a 22-year period, totaling 21.78% growth of the existing volumes, was applied to the major roadways and movements.

To reflect the construction of the transitways (Bus Rapid Transit) in the Duke Street and Van Dorn Street corridors, 10% of the existing trips were assumed to convert from auto to transit mode. The West End Transitway study indicated that the BRT service would attract 8,600 riders, which equates to approximately 34% of the current traffic volume on Van Dorn Street. Assuming that approximately one-third of the 8,600 riders would use the service through the study area (some patrons may only ride between King Street and Mark Center) yields a 10% mode change. Therefore, a growth of 11.78% (21.78%-10%) of the existing volumes, was applied to the major roadways and movements.

No growth has been applied to the traffic entering and exiting the existing Landmark Mall or Alexandria Apartments (EOS 21) entrance. These grown volumes were then balanced through the road network.

The inherent regional growth volumes are illustrated in Figure 6.

Background Developments and Planned Roadway Improvements

As discussed with the City staff, it was determined that the 0.9% inherent growth rate compounded annually takes into account the regional growth and any potential background developments. Therefore, no background development or roadway improvement projects were considered for this study. As such, the 2040 lane configuration and roadway geometry were assumed to be identical to the 2018 existing lane configuration and roadway geometry (illustrated in Figure 3).

The existing traffic and regional growth traffic volumes were combined to estimate the future volumes without the proposed development as illustrated in Figure 7.

Future without Development Capacity Analysis

Intersection capacity analyses were performed for the 2040 Future Conditions without Development scenario at the study area intersections during the weekday morning (AM) and afternoon peak (PM) peak hours. *Synchro,* version 10, was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM) methodology.

As agreed, upon in the scoping meeting, a minimum peak hour factor of 0.92 by intersection was utilized in the analysis for future conditions. Furthermore, the heavy vehicle percentages were based on the traffic counts.

The capacity and queuing analysis results are shown in Table 2. The detailed analysis worksheets are contained in Appendix E.

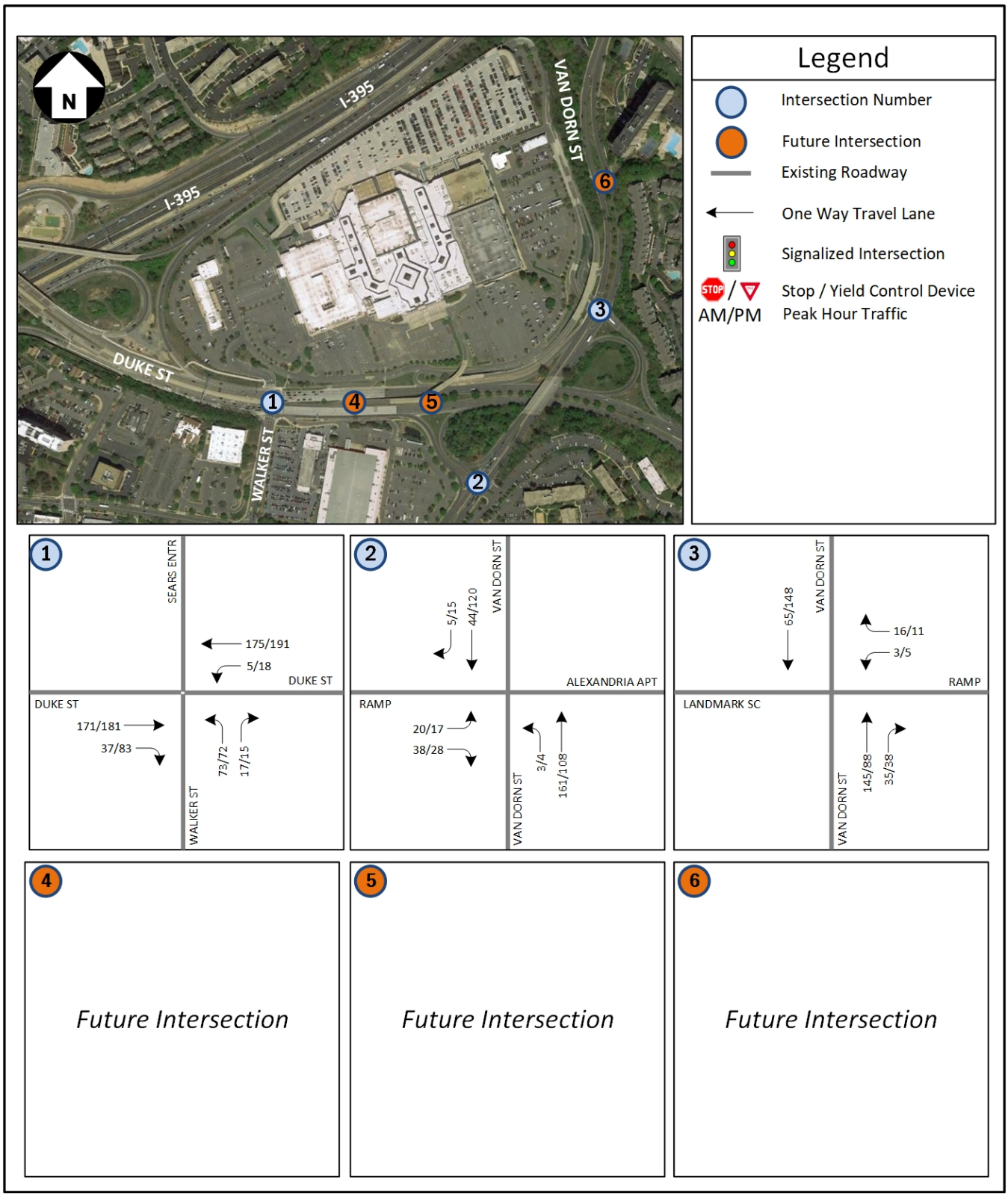

Figure 6: Background Growth Volumes (from 2018 to 2040)

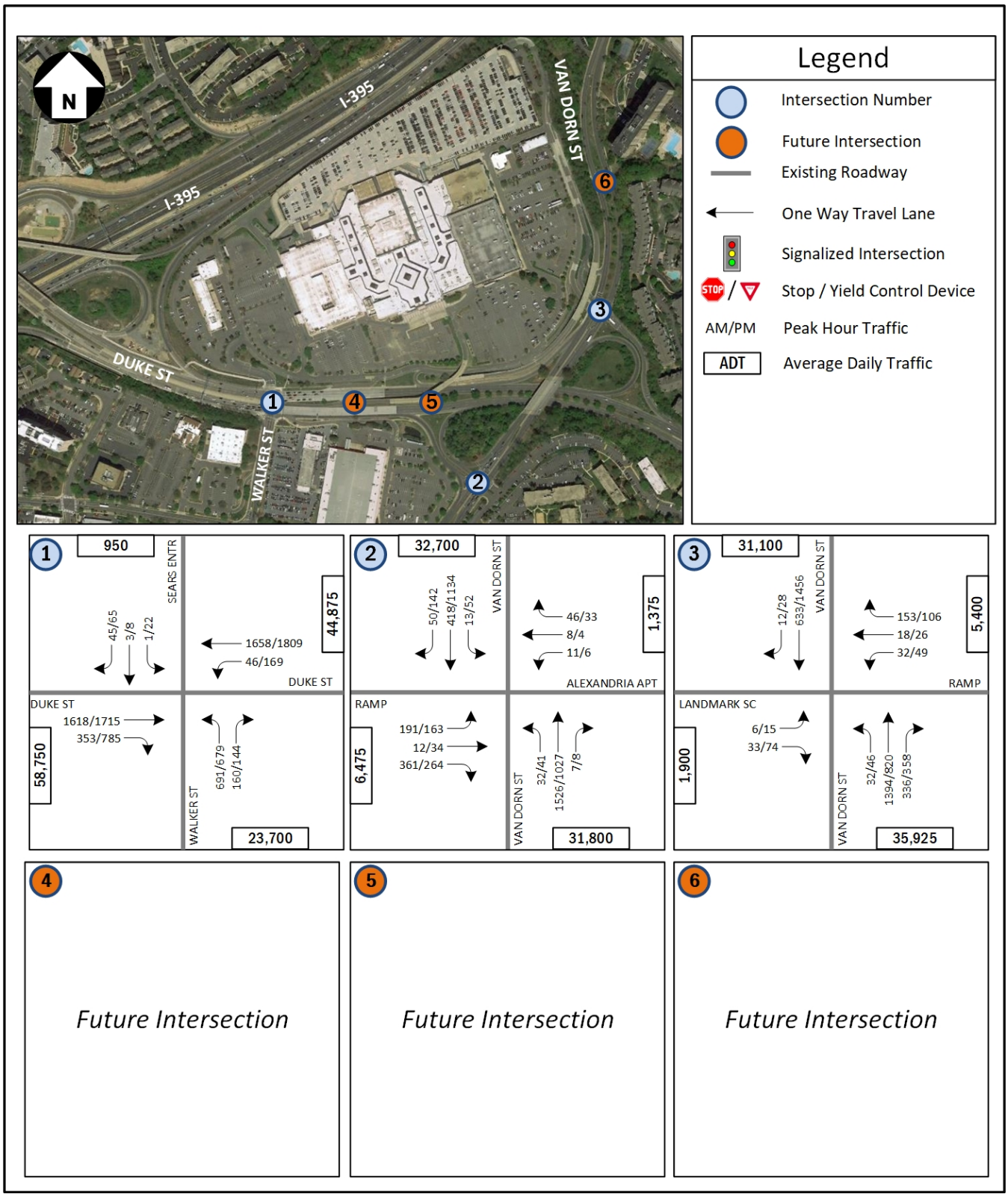

Figure 7: Future without Development (2040) Traffic Volumes

Table 2: Future without Development (2040) Intersection Capacity Analysis

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
1	**Duke Street and S Walker Street /Sears Driveway**							
	Overall Intersection (Signalized)		**C**	**30.1**		**D**	**43.6**	
	Eastbound Approach		***C***	***21.6***		***C***	***34.2***	
	Eastbound Thru		C	22.2	363	D	35.6	501
	Eastbound Right	310	B	18.8	57	C	31.1	95
	Westbound Approach		***C***	***25.0***		***D***	***46.2***	
	Westbound Left	345	E	74.2	87	F	145.0	#339
	Westbound Thru		C	23.7	505	D	37.0	#776
	Northbound Approach		***E***	***57.8***		***E***	***63.2***	
	Northbound Left		E	61.5	391	E	66.9	413
	Northbound Right	385	D	41.8	57	D	45.4	57
	Southbound Approach		***E***	***64.8***		***E***	***68.4***	
	Southbound Left		E	70.1	7	E	73.7	41
	Southbound Left/Thru		E	73.1	13	E	73.7	43
	Southbound Right		E	64.2	7	E	66.0	24
2	**VanDorn Street and EB Duke Street Off Ramp**							
	Overall Intersection (Signalized)		**B**	**18.3**		**B**	**15.8**	
	Eastbound Approach		***D***	***53.8***		***E***	***66.9***	
	Eastbound Left	100	E	68.7	245	F	96.8	#260
	Eastbound Thru/Right		D	46.1	106	D	50.7	#210
	Westbound Approach		***D***	***43.4***		***D***	***40.4***	
	Westbound Left/Thru		D	44.3	36	D	40.9	23
	Westbound Right		D	43.1	20	D	40.3	2
	Northbound Approach		***A***	***7.3***		***A***	***4.0***	
	Northbound Left	150	A	4.1	16	A	4.7	11
	Northbound Thru/Right		A	7.3	380	A	3.9	137
	Southbound Approach		***A***	***9.3***		***A***	***6.9***	
	Southbound Left	200	B	19.9	24	E	59.0	m#29
	Southbound Thru/Left		B	10.1	111	A	5.3	9
	Southbound Right	250	A	0.1	0	A	0.1	m0

Table 2: Future without Development (2040) Intersection Capacity Analysis (Continued)

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
3	**Van Dorn Street and Macys Driveway/WB Ramp**							
	Overall Intersection (Signalized)		**B**	**12.6**		**B**	**15.9**	
	Eastbound Approach		***E***	***56.4***		***D***	***50.1***	
	Eastbound Left		E	56.9	17	D	50.7	31
	Eastbound Left/Thru/Right		E	56.3	0	D	50.0	7
	Westbound Approach		***D***	***48.6***		***D***	***43.8***	
	Westbound Left	100	D	49.1	57	D	44.5	73
	Westbound Thru		D	48.9	37	D	44.4	47
	Westbound Right	100	D	48.4	64	D	43.2	35
	Northbound Approach		***A***	***6.4***		***A***	***5.0***	
	Northbound Left	620	A	4.3	14	C	21.2	m24
	Northbound Thru		A	6.1	273	A	4.8	m116
	Northbound Right	200	A	7.9	55	A	3.3	m12
	Southbound Approach		***B***	***15.6***		***B***	***19.5***	
	Southbound Thru		B	15.6	196	B	19.5	521

NOTES:

* *Effective storage length is based on the storage length plus one-half of the taper length per TOSAM guidelines.*

** *#: 95th percentile volumes exceed capacity; actual queues may be longer. Queues shown are based on the maximum after two cycles.*

*** *m: Volume for 95th percentile queue is metered by upstream signal*

**** *$: Delays exceed 300 seconds.*

Based on the capacity analysis, all of the study intersections will continue to have approaches that operate at LOS E or F during at least one peak hour under future conditions, with overall intersections operating at LOS D or better. All lane groups (by intersection) will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the eastbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

As mentioned previously, the study intersections operate with high delays for the side-streets and mainline left turn movements. These conditions are typical of commuter corridors to reflect the prioritization of through traffic flow along the mainlines over access from individual properties and side-streets in order to accommodate the largest possible volume of through traffic in the area, and thereby, have a better overall traffic operation than if all movements were prioritized equally. This condition would continue in the future, with modest increases in delay associated with the future traffic growth.

The results of the intersection capacity analyses for the future without development conditions are shown in Figure 8.

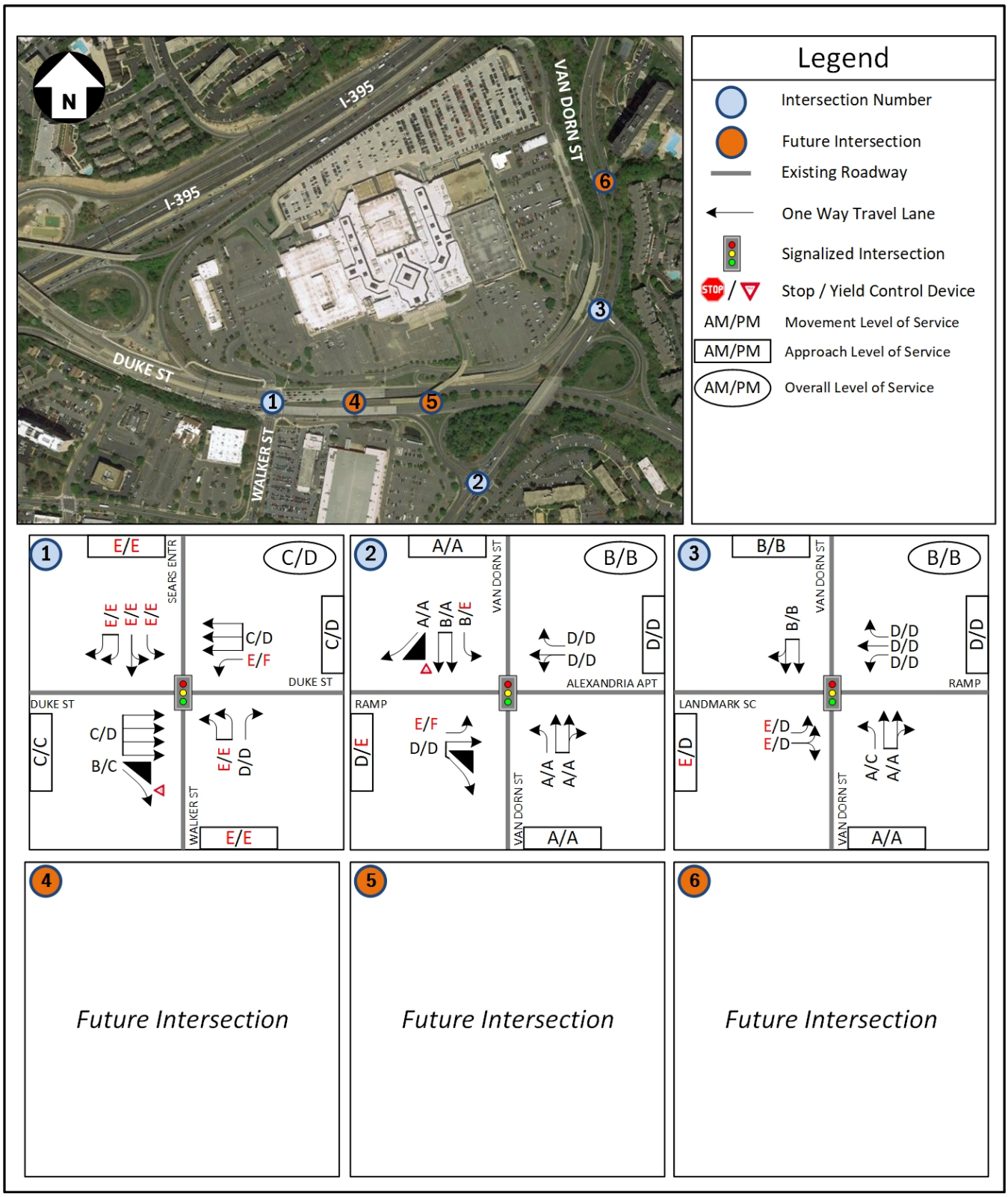

Figure 8: Future without Development (2040) Levels of Service

TRIP GENERATION

The development is anticipated to be complete by 2040. The redevelopment of the project site under the 2009 approved development program was anticipated to include a total of approximately 3,106 ksf of office, 1,000 ksf of retail, and 1,500 apartment dwelling units. The current re-planning effort anticipates a more complete mix of uses that is more integrated across the site and more balanced between residential and non-residential uses. The 2019 proposed development program includes a total of approximately 3,100 apartment dwelling units, a hotel, movie theater, 150,000 sf of health and fitness club, 344,000 sf of retail, and 860,000 sf of employment uses.

In order to determine the number to trips expected to be generated by the development under the 2009 approved and 2019 proposed programs, the Institute of Transportation Engineers' (ITE's) Trip Generation Manual, 10th Edition publication, was used to determine the trips into and out of the subject study site for the weekday morning (AM) and weekday afternoon (PM) peak hours, as well as the typical weekday trips to the site. The development's trip generation is illustrated in Table 3 and Table 4 for the two development programs. In addition, these tables illustrate the number of existing inbound and outbound trips generated by the existing development that will be removed with the redevelopment of the project site.

Table 3: Site Trip Generation for 2009 Approved Development Program

Land Use	ITE Code	Size		------ Weekday ------ AM Peak Hour In	Out	Total	PM Peak Hour In	Out	Total	Daily Total
Proposed Development Program										
Residential										
Multifamily Housing (Mid-Rise) (Apartments, Townhomes, Condo; max 10 floors)	221	1,500	DU	126	360	486	364	232	596	8,173
Total Residential w/o Reductions				126	360	486	364	232	596	8,173
Internal Trip Capture Reduction				-6	-27	-33	-73	-46	-119	-1,634
Total Residential w/ Internal Capture Reductions				*120*	*333*	*453*	*291*	*186*	*477*	*6,539*
Non-Auto Mode Share Reduction[1]		50%		-60	-167	-227	-146	-93	-239	-3,270
Subtotal (Residential Trips with Internal Capture and Non-Auto Mode Share Reduction)				*60*	*167*	*227*	*146*	*93*	*239*	*3,270*
Total External Residential Trips				**60**	**167**	**227**	**146**	**93**	**239**	**3,270**
Office										
General Office Building	710	3,106	ksf of GFA	2,534	412	2,946	476	2,502	2,978	29,728
Total Office w/o Reductions				2,534	412	2,946	476	2,502	2,978	29,728
Internal Trip Capture Reductions				-91	-57	-148	-40	-58	-98	-1,046
Total Office w/ Internal Capture Reductions				*2,443*	*355*	*2,798*	*436*	*2,444*	*2,880*	*28,682*
Non-Auto Mode Share Reduction		35%		-855	-124	-979	-153	-855	-1,008	-10,039
Subtotal (Office Trips with Internal Caputre and Non-Auto Mode Share Reduction)				*1,588*	*231*	*1,819*	*283*	*1,589*	*1,872*	*18,643*
Total External Officel Trips				**1,588**	**231**	**1,819**	**283**	**1,589**	**1,872**	**18,643**
Retail										
Shopping Center	820	1,000	ksf of GLA	404	248	652	1,433	1,553	2,986	28,775
Total Retail w/o Reductions				404	248	652	1,433	1,553	2,986	28,775
Internal Trip Capture Reductions				-77	-90	-167	-80	-89	-169	-2,028
Total Retail w/ Internal Capture Reductions				*327*	*158*	*485*	*1,353*	*1,464*	*2,817*	*26,747*
Non-Auto Mode Share Reduction [5]		35%		-114	-55	-170	-474	-512	-986	-9,361
Subtotal (Retail Trips with Internal Capture and Non-Auto Mode Share Reduction)				*213*	*103*	*315*	*879*	*952*	*1,831*	*17,386*
Passby Reduction		24%/34%/ 26%/24%	AM/PM/ SAT/Daily	-51	-25	-76	-299	-324	-623	-4,173
Subtotal (Retail Trips with Internal Capture, Non-Auto Mode Share , and Pass By Reduction)				*162*	*78*	*239*	*580*	*628*	*1,208*	*13,213*
Total External Retail Trips				**162**	**78**	**239**	**580**	**628**	**1,208**	**13,213**
Existing Trips										
Retail	Counts		kSF	133	97	230	148	187	335	3,350
Existing Trips to be Removed			kSF	133	97	230	148	187	335	3,350
OVERALL NON-AUTO MODE TRIPS				**-1,030**	**-346**	**-1,376**	**-772**	**-1,461**	**-2,232**	**-22,670**
OVERALL DEVELOPMENT TRIPS				**1,677**	**378**	**2,054**	**861**	**2,122**	**2,984**	**31,775**

Table 4: Site Trip Generation for 2019 Proposed Development Program

Land Use	ITE Code	Size		------ Weekday ------ AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily Total
Proposed Development Program										
Residential										
Multifamily Housing (Mid-Rise) (Apartments, Townhomes, Condo; max 10 floors)	221	3,138	DU	261	742	1,003	739	472	1,211	17,100
Total Residential w/o Reductions				261	742	1,003	739	472	1,211	17,100
Internal Trip Capture Reduction				-13	-34	-47	-104	-95	-199	-2,871
Total Residential w/ Internal Capture Reductions				*248*	*708*	*956*	*635*	*377*	*1,012*	*14,229*
Non-Auto Mode Share Reduction[1]		50%		-124	-354	-478	-318	-189	-506	-7,115
Subtotal (Residential Trips with Internal Capture and Non-Auto Mode Share Reduction)				*124*	*354*	*478*	*318*	*189*	*506*	*7,115*
Total External Residential Trips				**124**	**354**	**478**	**318**	**189**	**506**	**7,115**
Lodging										
Hotel	310	290	Rooms	83	57	140	97	94	191	2,847
Total Lodging w/o Reductions				83	57	140	97	94	191	2,847
Internal Trip Capture Reduction				-16	-13	-29	-11	-10	-21	-369
Total Lodging w/ Internal Capture Reductions				*67*	*44*	*111*	*86*	*84*	*170*	*2,478*
Non-Auto Mode Share Reduction[2]		5%		-3	-2	-6	-4	-4	-9	-124
Subtotal (Lodging Trips with Internal Capture and Non-Auto Mode Share Reduction)				*64*	*42*	*105*	*82*	*80*	*162*	*2,354*
Total External Lodging Trips				**64**	**42**	**105**	**82**	**80**	**162**	**2,354**
Recreational										
Movie Theater	444	690	Seats	0	0	0	34	28	62	1,214
Health / Fitness Club[3]	492	150	ksf of GFA	100	97	197	188	141	329	4,940
Total Recreational w/o Reductions				100	97	197	222	169	391	6,154
Internal Trip Capture Reductions				-19	-23	-42	-24	-19	-43	-798
Total Recreational w/ Internal Capture Reductions				*81*	*74*	*155*	*198*	*150*	*348*	*5,356*
Non-Auto Mode Share Reduction[4]		25%		-20	-19	-39	-50	-38	-87	-1,339
Subtotal (Recreational Trips with Internal Capture and Non-Auto Mode Share Reduction)				*61*	*56*	*116*	*149*	*113*	*261*	*4,017*
Total External Recreational Trips				**61**	**56**	**116**	**149**	**113**	**261**	**4,017**
Office										
General Office Building	710	116	ksf of GFA	117	19	136	21	110	131	1,225
Total Office w/o Reductions				117	19	136	21	110	131	1,225
Internal Trip Capture Reductions				-11	-4	-16	-2	-6	-9	-99
Total Office w/ Internal Capture Reductions				*106*	*15*	*120*	*19*	*104*	*122*	*1,126*
Non-Auto Mode Share Reduction		35%		-37	-5	-42	-7	-36	-43	-394
Subtotal (Office Trips with Internal Caputre and Non-Auto Mode Share Reduction)				*69*	*10*	*78*	*12*	*68*	*79*	*732*
Total External Officel Trips				**69**	**10**	**78**	**12**	**68**	**79**	**732**
Retail										
Shopping Center	820	344	ksf of GLA	201	123	324	651	705	1,356	13,928
Total Retail w/o Reductions				201	123	324	651	705	1,356	13,928
Internal Trip Capture Reductions				-38	-29	-67	-70	-77	-147	-1,806
Total Retail w/ Internal Capture Reductions				*163*	*94*	*257*	*581*	*628*	*1,209*	*12,122*
Non-Auto Mode Share Reduction[5]		35%		-57	-33	-90	-203	-220	-423	-4,243
Subtotal (Retail Trips with Internal Capture and Non-Auto Mode Share Reduction)				*106*	*61*	*167*	*378*	*408*	*786*	*7,879*
Passby Reduction		24%/34%/ 26%/24%	AM/PM/ SAT/Daily	-25	-15	-40	-128	-139	-267	-1,891
Subtotal (Retail Trips with Internal Capture, Non-Auto Mode Share , and Pass By Reduction)				*81*	*46*	*127*	*250*	*269*	*519*	*5,988*
Total External Retail Trips				**81**	**46**	**127**	**250**	**269**	**519**	**5,988**

Table 4: Site Trip Generation for 2019 Proposed Development Program (Continued)

Land Use	ITE Code	Size		------ Weekday ------ AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily Total
Employment Center										
Employment Center (Major)	610	600	ksf of GFA	388	182	570	194	411	605	6,252
Employment Center (Minor)	720	144	ksf of GFA	241	68	309	137	353	490	5,445
Total Employment Center w/o Reduction				629	250	879	331	764	1,095	11,697
Internal Trip Capture Reductions				-56	-50	-105	-36	-40	-75	-945
Total Employment Center w/ Internal Capture Reductions				573	200	774	295	724	1,020	10,752
Non-Auto Mode Share Reduction [6]		15%		-86	-30	-116	-44	-109	-153	-1,613
Subtotal (Recreational Trips with Internal Capture and Non-Auto Mode Share Reduction)				*487*	*170*	*658*	*251*	*615*	*867*	*9,139*
Total External Employment Center Trips				**487**	**170**	**658**	**251**	**615**	**867**	**9,139**
Existing Trips										
Retail	Counts		kSF	133	97	230	148	187	335	3,350
Existing Trips to be Removed			kSF	133	97	230	148	187	335	3,350
OVERALL NON-AUTO MODE TRIPS				**-328**	**-443**	**-770**	**-626**	**-595**	**-1,220**	**-14,827**
OVERALL DEVELOPMENT TRIPS				**752**	**580**	**1,333**	**912**	**1,146**	**2,059**	**25,995**

The ITE's internal capture methodology was used to account for synergy among the residential, commercial and employment uses. The ITE internal capture "triangles" showing these calculations for both the development programs are included in Appendix F.

Additionally, 50% of the residential trips, and 35% of office and retail trips were reduced due to the availability of transit options, Transportation Demand Management (TDM) measures, and future pedestrian and bicycle facilities under the 2009 previously approved development plan. Similarly, 50% of the residential trips, 5% of the lodging trips, 25% of the recreational trips, 35% of office and retail trips, and 15% of the medical trips were assumed to be made by a non-auto mode. This reduction was only applied to the external trips, meaning the trip generation calculations were reduced by the internal capture trips before applying the transit/TDM reduction in order to avoid a double reduction. Once implemented, this program will limit the number of vehicle trips through the use of mass transit, ridesharing, and other strategies. These percentages were developed based on WMATA's 2005 Development-Related Ridership Survey and consultation with City staff. It should be noted that the non-auto share reductions are less than the recommended reductions mentioned in the WMATA's 2005 Development Ridership Study.

Furthermore, a pass-by reduction of 49%, 50%, and 50% was applied to the AM peak hour trips, PM peak hour trips, and daily trips associated with the retail component, respectively.

Based on the Trip Generation Manual, the redevelopment of the site with 2009 approved development program will generate approximately 2,054 new trips during the AM peak hour, 2,984 new trips during the PM peak hour, and 31,775 new weekday daily trips. The redevelopment of the site with 2019 proposed development program will generate approximately 1,333 new trips during the AM peak hour, 2,059 new trips during the PM peak hour, and 25,995 new weekday daily trips.

It should be noted that 2019 proposed development program generates 721 fewer trips during the AM peak hour, 925 fewer trips during the PM peak hour, and 5,780 fewer weekday daily trips when compared to the 2009 approved development program.

Additionally, if the existing mall were to be fully re-occupied, it would generate 602 total AM peak hour trips, 2,762 total PM peak hour trips, and 26,786 total daily trips.

SITE ACCESS AND FACILITIES

As mentioned previously, the study area consists of three existing intersections and three future intersections. With the redevelopment of the site, the Applicant is proposing to convert the existing signalized exit only entrance to a full access signalized intersection, remove the other entrances (grade separated access and other partial entrances) along Duke Street and replace with two full access signalized intersections, one across the intersection of Duke Street and EB off-ramp to Van Dorn Street (at-grade) as fourth leg and one between the S Walker Street and the new at-grade intersection. The exiting access on Van Dorn Street will remain and an additional full-access is proposed to the north of this intersection.

These access modifications would be part of the larger conversion of the site from an auto-oriented regional mall site to a mixed-use, urban center with access and circulation balanced between modes of travel. The flyover ramps and bridges inhibiting pedestrian and bicycle access, as well as visibility, will be removed and replaced with a grid of streets.

The study intersections are as follows:

1. Duke Street and S. Walker Street (existing signalized intersection; future full access),
2. Van Dorn Street and Duke Street EB Ramps (existing signalized intersection),
3. Van Dorn Street and Duke Street WB Ramps (existing signalized intersection; future full access),
4. Duke Street and East Site Access (future signalized intersection, future full access),
5. Duke Street and Center Site Access (future signalized intersection, future full access), and
6. Van Dorn Street and North Site Access (future signalized intersection, future full access)

The proposed future lane configuration is illustrated in Figure 9. The concept plan of the development is illustrated in Figure 2.

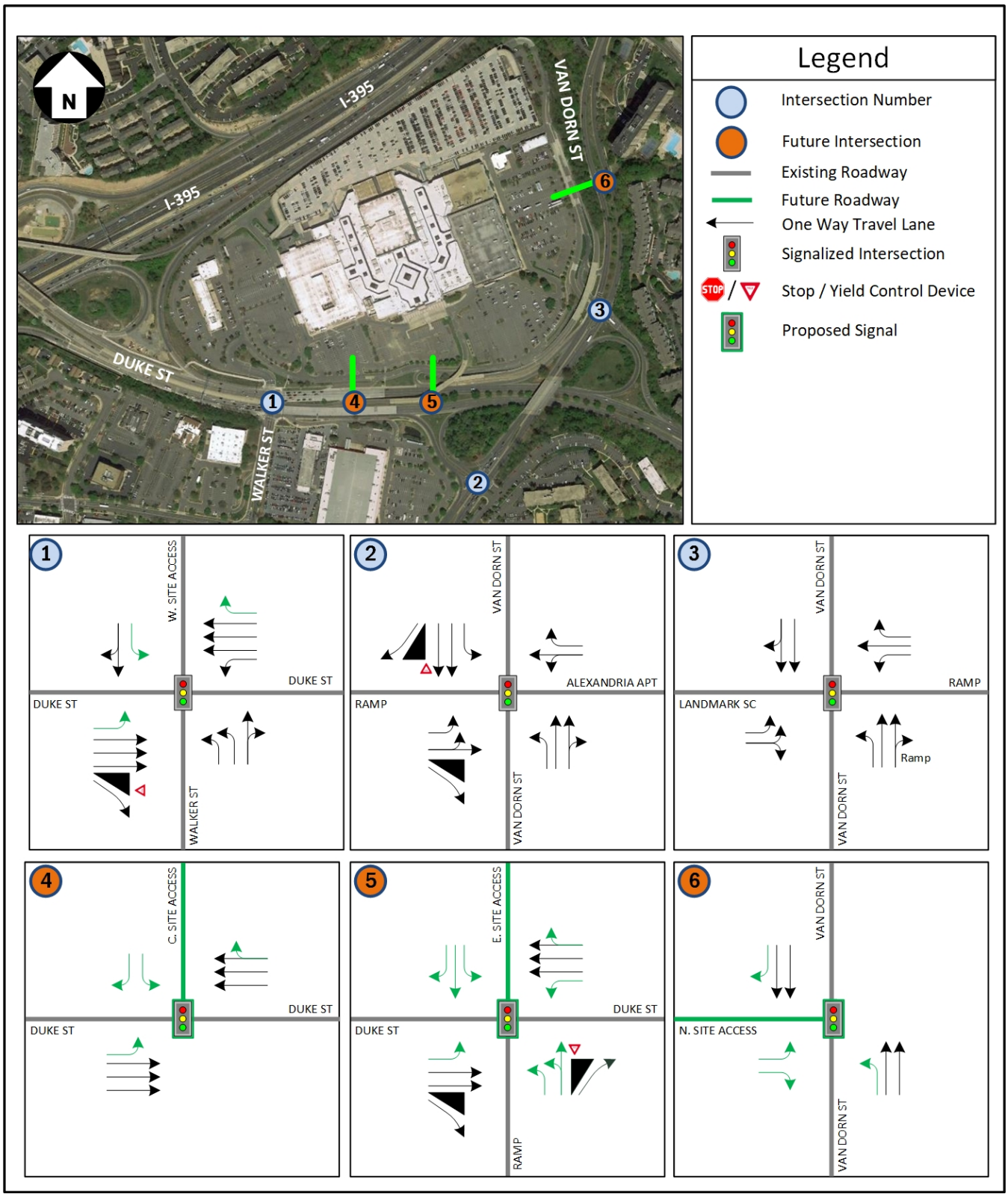

Figure 9: Future with Development (2040) Proposed Roadway Configuration

Future Transit Facilities

Per the City's adopted 2018 Transportation Master Plan, three corridors, Corridor A (between Pentagon and Fort Belvoir), Corridor B (connecting Alexandria and Fairfax County to the west), and Corridor C (running between Kingstowne and Pentagon) are identified as major transit corridors for the City. Figure 10 shows the existing and planned (Corridor B and C) transit facilities in the vicinity of the mall. Corridors B and C are planned intersect in the Landmark Mall area and provide Bus Rapid Transit (BRT) facilities with dedicated transit lanes. The re-development of the site will feature a transit hub where commuters can transfer between lines, including both BRT corridors and the local DASH and WMATA services.

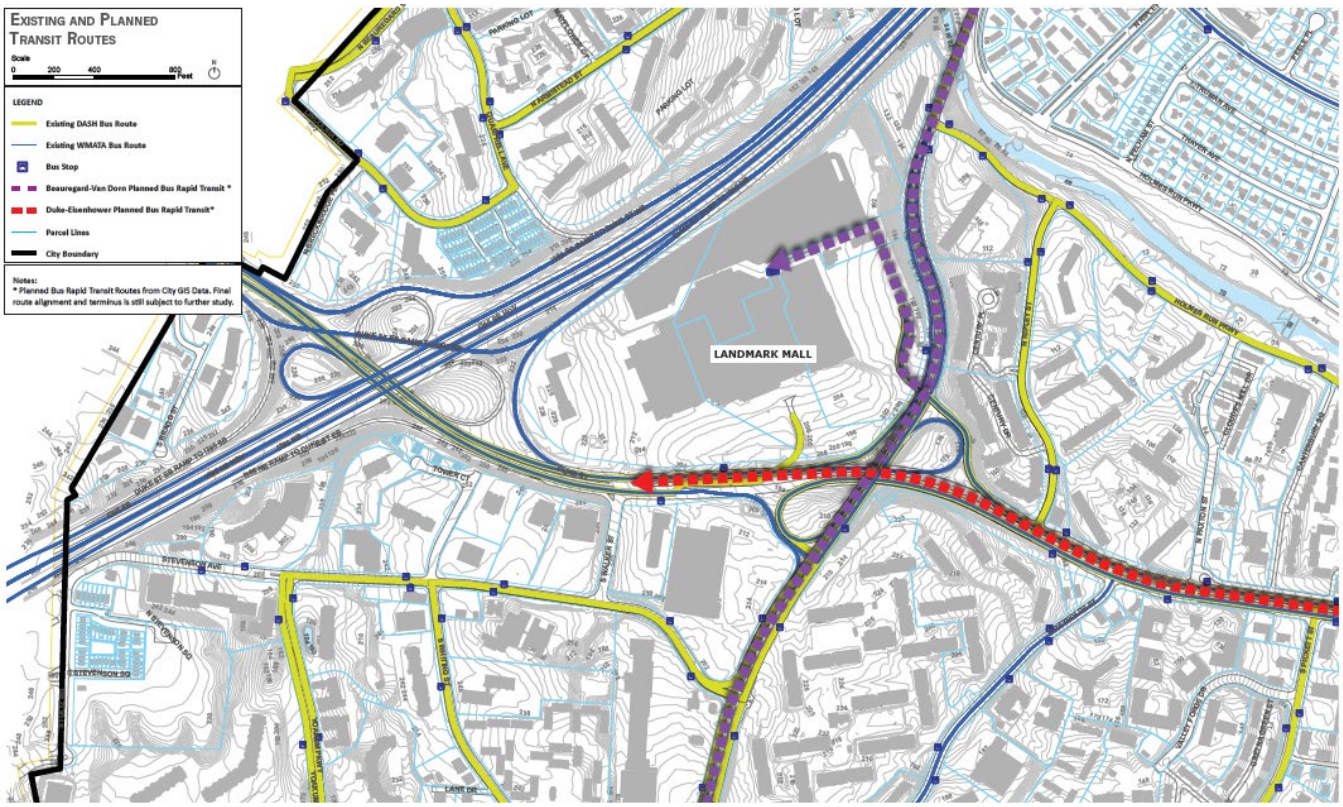

Figure 10: Transit Facilities

Future Pedestrian and Bicycle Facilities

To augment the existing sidewalks in the greater Landmark area and the proposed complete street grid on the site, the City of Alexandria Transportation Master Plan, adopted in 2016, includes construction of sidewalks along Duke Street and Van Dorn Street. The new connection are shown on Figure 11.

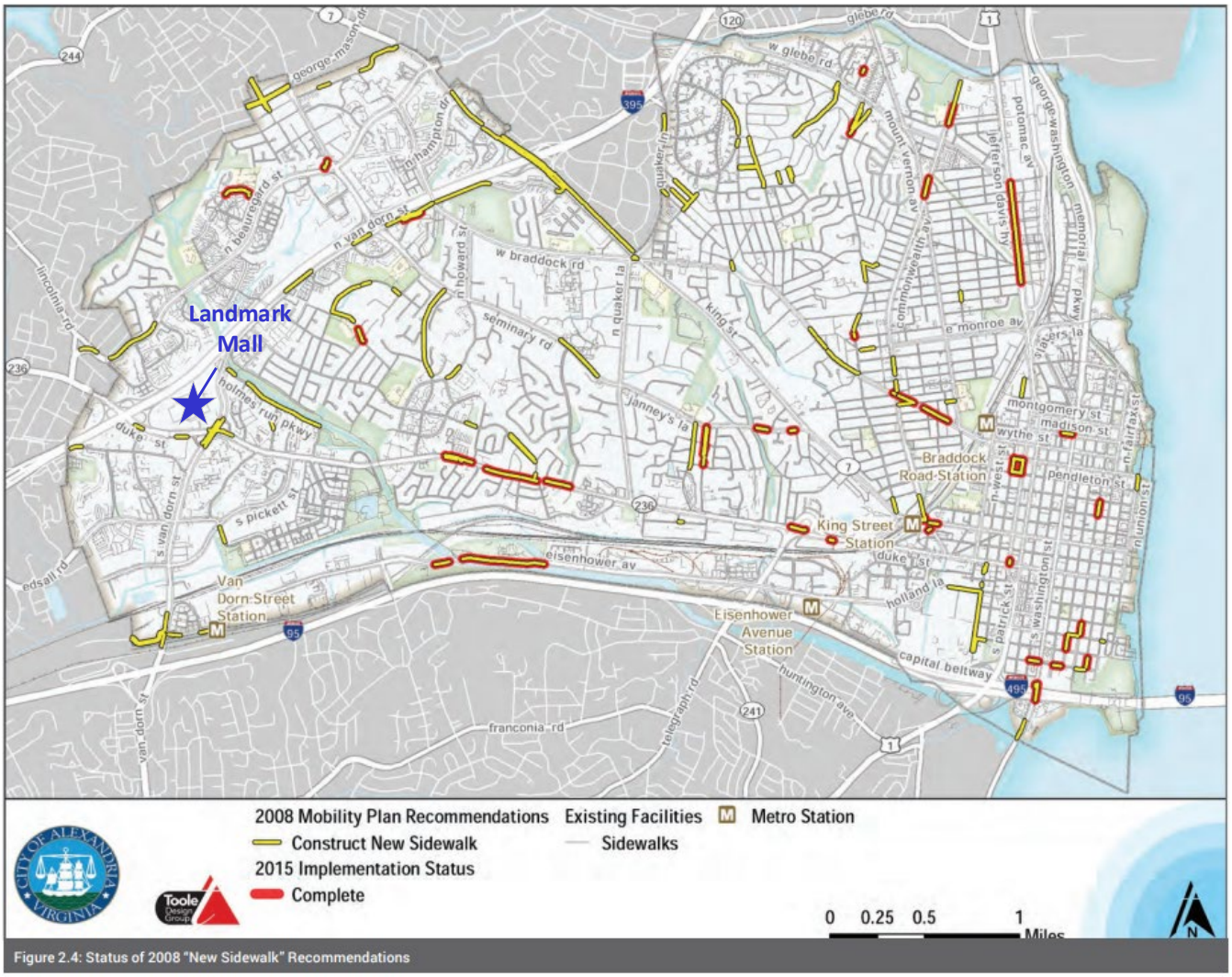

Figure 11: Existing and Planned Sidewalks

Per the City's adopted Pedestrian and Bike Master Plan, the Duke Street and Van Dorn Street corridors are identified as Enhanced Bicycle Corridors and a trail connection is planned along the Duke Street site frontage. Figure 12 below illustrates the existing and planned bicycle network in the City. DASH and WMATA buses are all equipped with bicycle racks, as would new BRT buses. The corridor enhancements, new complete street network, and transit connectivity would work together to improve access for cyclists in the area.

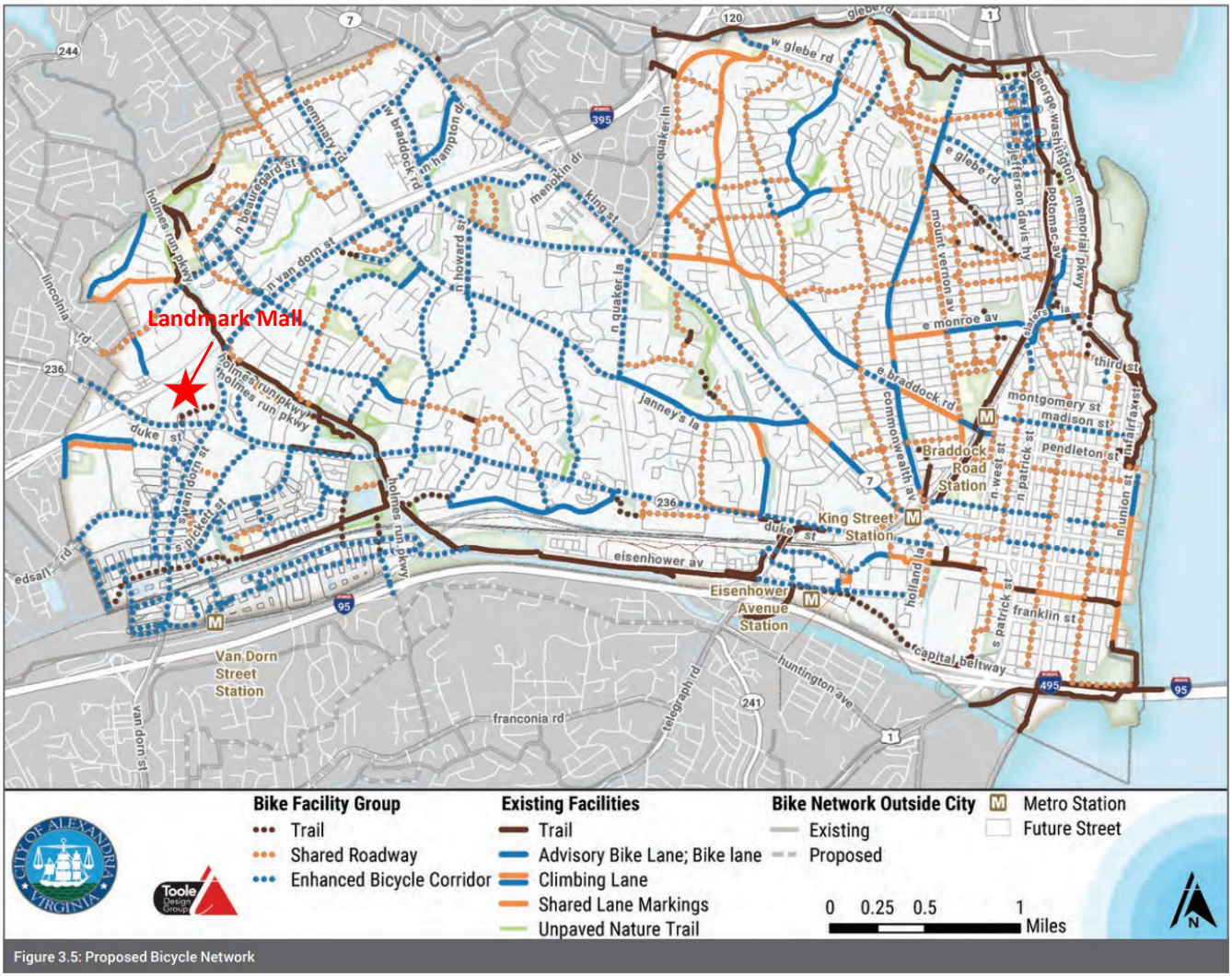

Figure 12: Existing and Proposed Bicycle Network

SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

The distribution and assignment of the site generated trips was based on the existing traffic patterns, engineering judgement, and the nature of the proposed development. The site direction of approach for the weekday peak hours is illustrated in Figure 13. The site generated trips assigned to the road network and anticipated pass-by trips are illustrated in Figure 14 and Figure 15, respectively for the 2009 approved development program. Similarly, Figure 16 and Figure 17 illustrates the site generated trips and anticipated pass-by trips associated with the 2019 proposed development program.

The traffic at the entrances is distributed depending on the possible location of land uses within in the development area. Figure 18, show the percentage of traffic entering at each of the site entrances with respect to the total development trips associated with the 2019 proposed conditions.

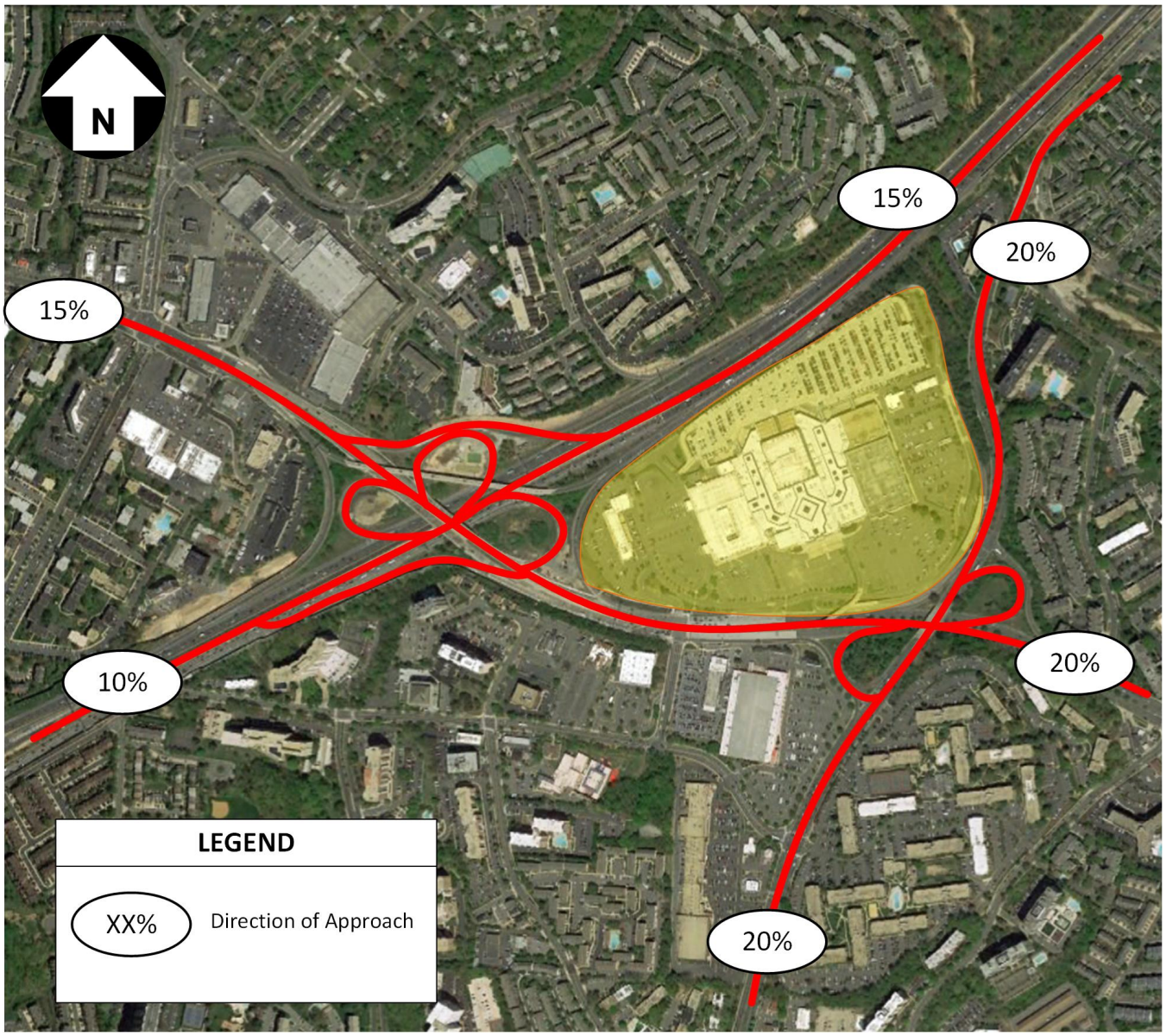

Figure 13: Direction of Approach

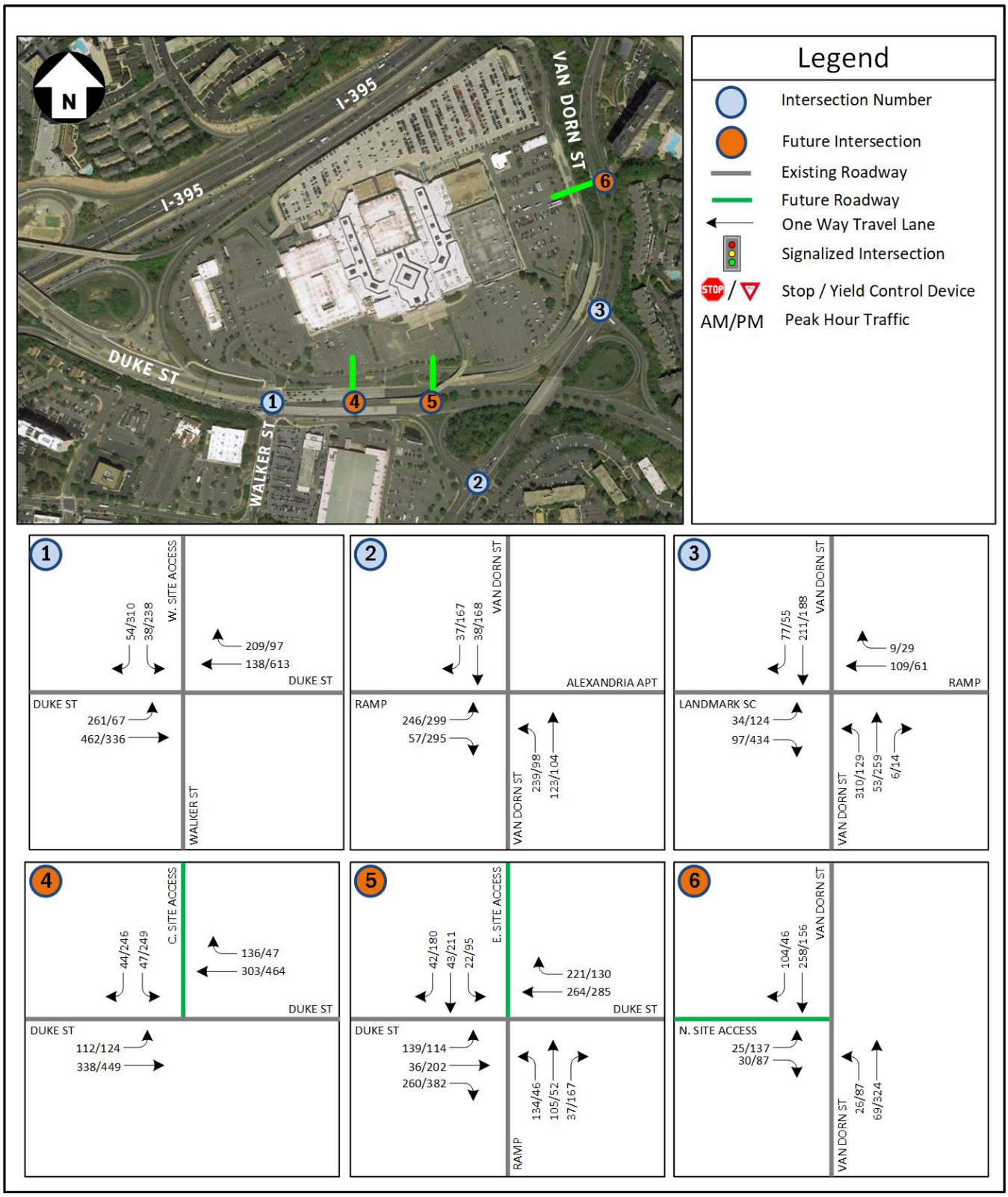

Figure 14: Site Generated Trip Assignment for 2009 Approved Plan

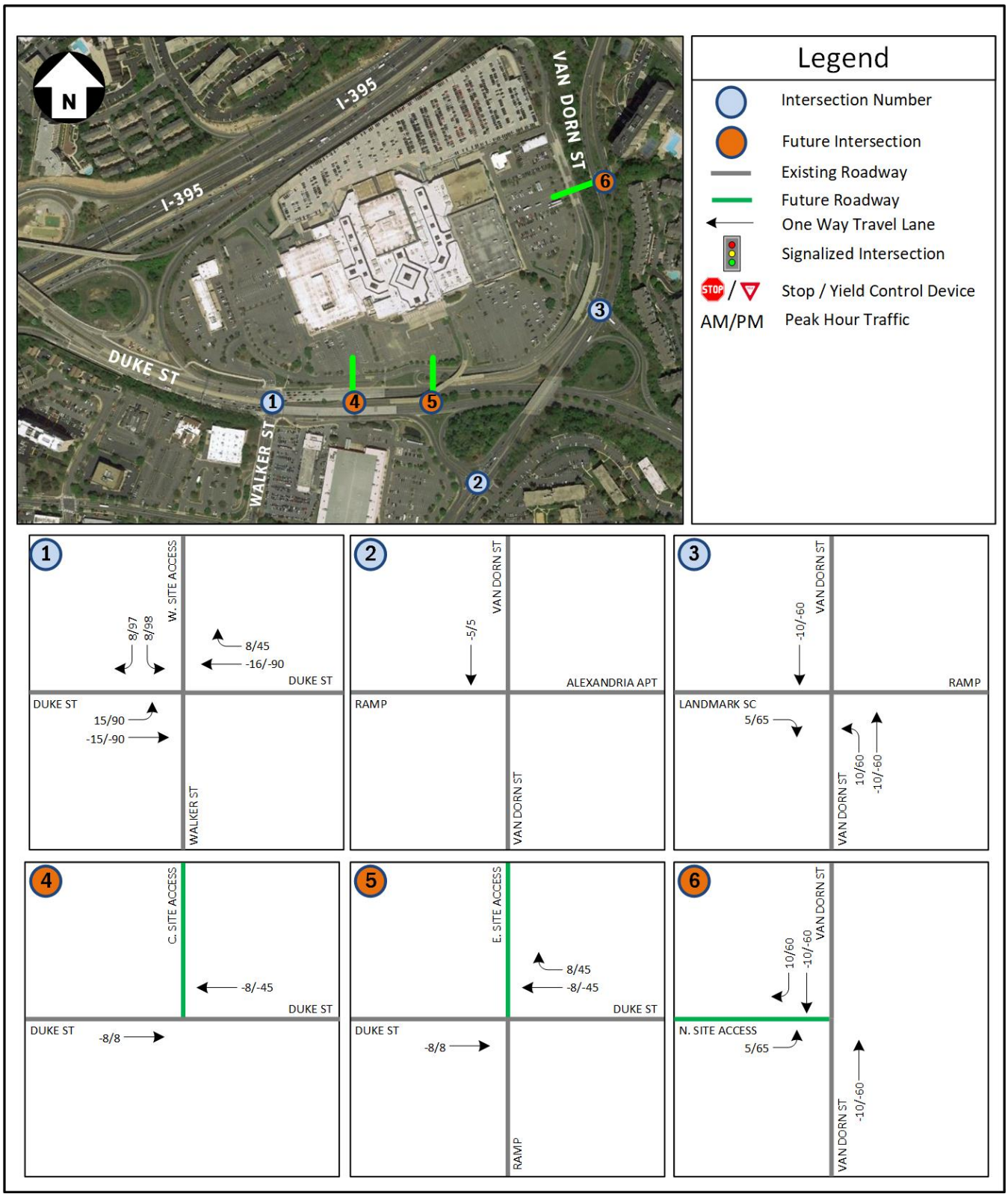

Figure 15: Site Generated Pass-by Trips for 2009 Approved Plan

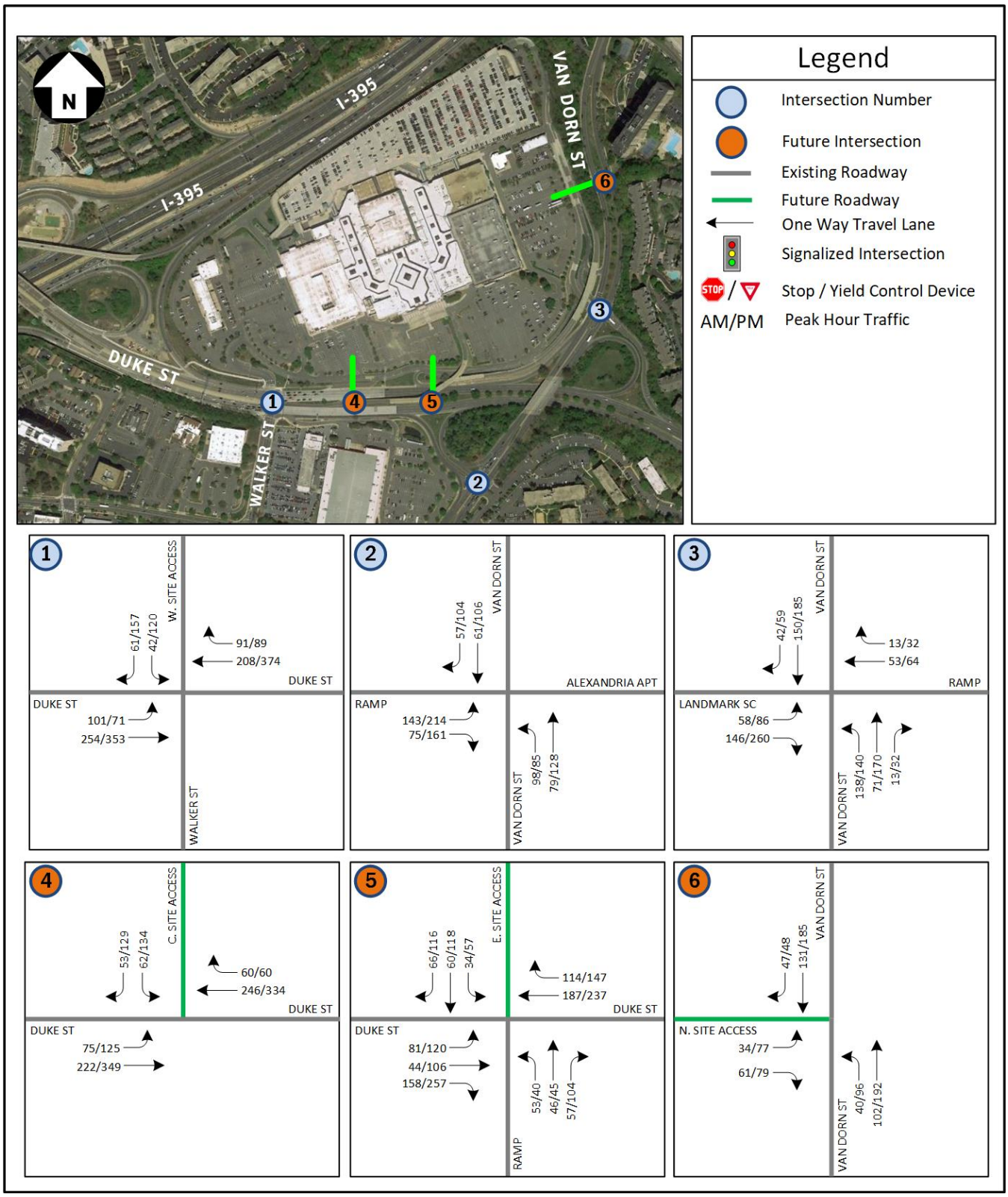

Figure 16: Site Generated Trip Assignment for 2019 Proposed Development Plan

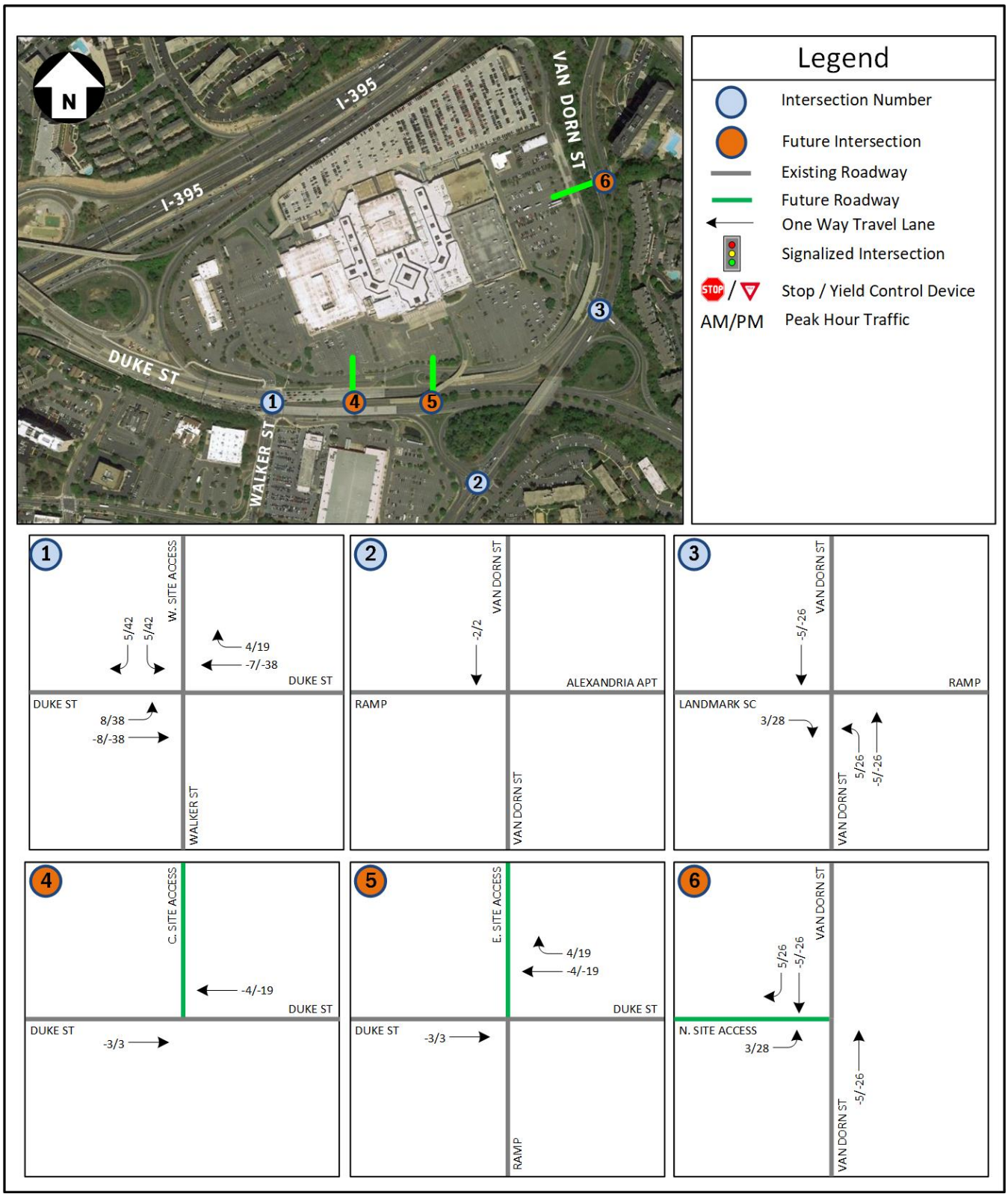

Figure 17: Site Generated Pass-by Trips for 2019 Proposed Development Plan

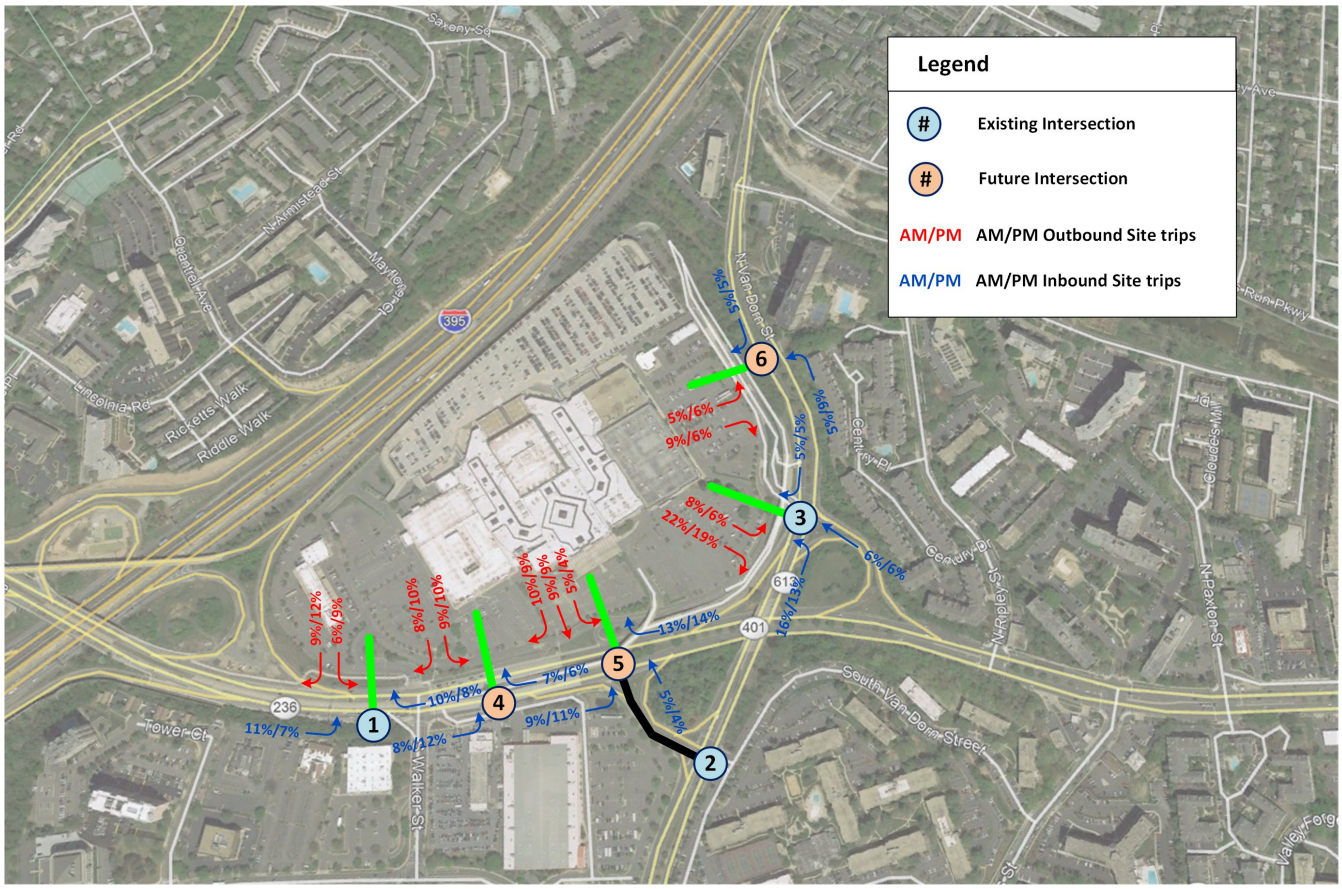

Figure 18: Distribution of Traffic at Site Entrances

FUTURE CONDITIONS WITH DEVELOPMENT (2040)

Future with Development Traffic Volumes

Removal of Existing Landmark Trips

In order to create a base for projections of future conditions, the trips associated with the existing Landmark Mall were removed. Using the 2018 traffic counts traffic peak hour volumes, the inbound and outbound vehicular trips associated with the existing Landmark Mall were removed from the road network. The removal of existing development trips is illustrated in Figure 19.

Inherent Growth

The proposed redevelopment of the project site is anticipated to be complete in 2040. To account for future roadway conditions, and as agreed upon with the City staff, an inherent growth rate of 0.9% compounded annually over a 22-year period, totaling 21.78% growth of the existing volumes, was applied to the major roadways and movements. To reflect the construction of the transitways (Bus Rapid Transit) in the Duke Street and Van Dorn Street corridors, 10% of the existing trips were assumed to convert from auto to transit mode. Therefore, a growth of 11.78% (21.78%-10%) of the existing volumes, was applied to the major roadways and movements. No growth has been applied to the traffic entering and exiting the

existing mall, and Alexandria Apartments (EOS 21) entrance. These grown volumes were then balanced through the road network. The net growth volumes are illustrated in Figure 20.

Furthermore, it was assumed that one-third of existing northbound left-turn traffic and one-half of westbound left turn traffic at the intersection of Duke Street and S. Walker Street would choose to utilize the new at-grade signalized intersection of Duke Street Off-Ramp and Van Dorn Street/East Site Access. The reroute of this traffic is illustrated in Figure 21.

Future with Development Traffic Volumes

In order to project the 2040 future with development scenario volumes, the existing 2018 peak hour volume were added to the removed existing Landmark Mall trip volumes, the net growth volumes, the rerouted traffic volumes, the site generated traffic volumes, and pass-by trips.

Figure 22 illustrates the 2040 future with development with 2009 approved development program and Figure 23 illustrates the 2040 future with development with 2019 proposed development program.

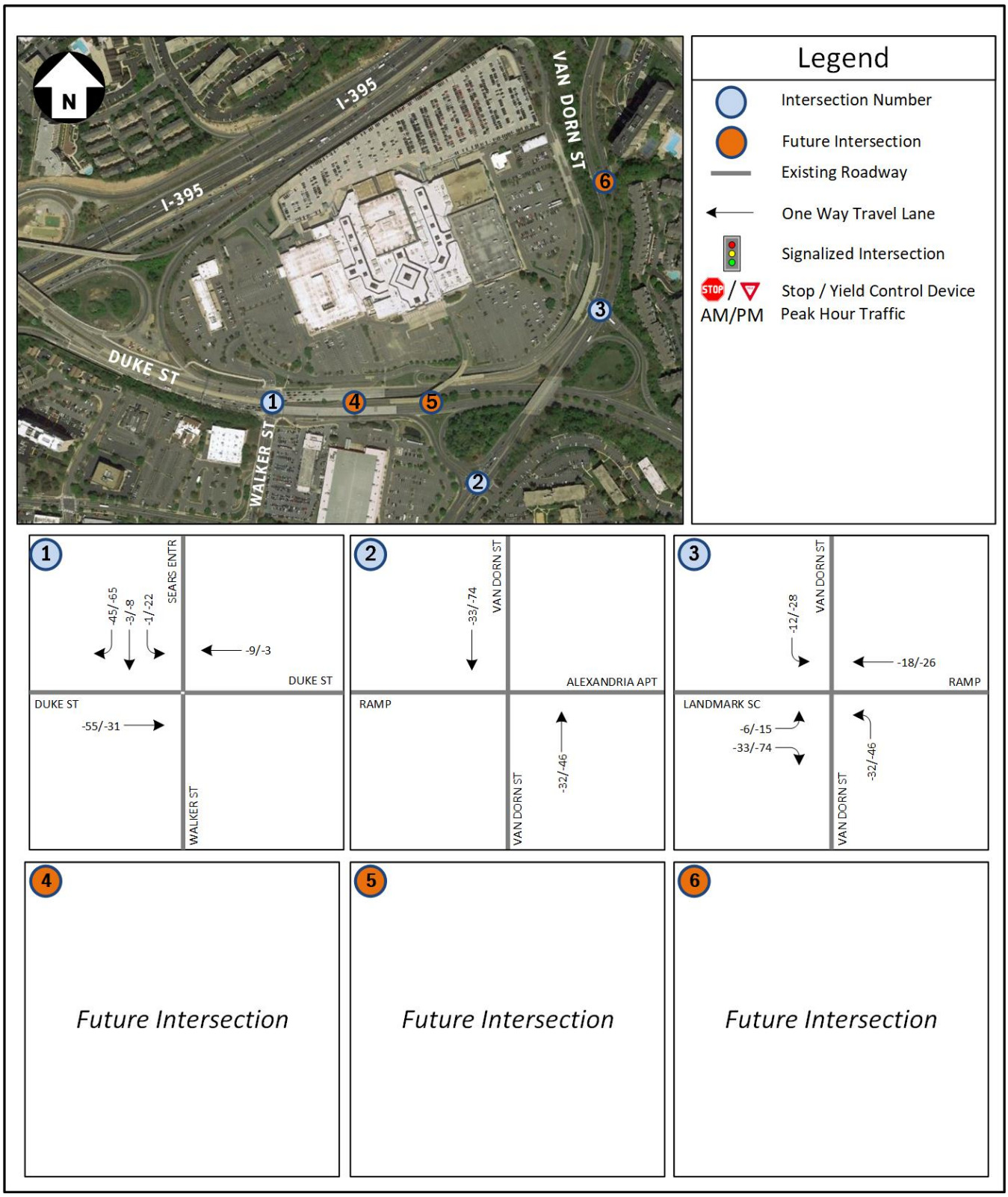

Figure 19: Removal of Existing Development Trips

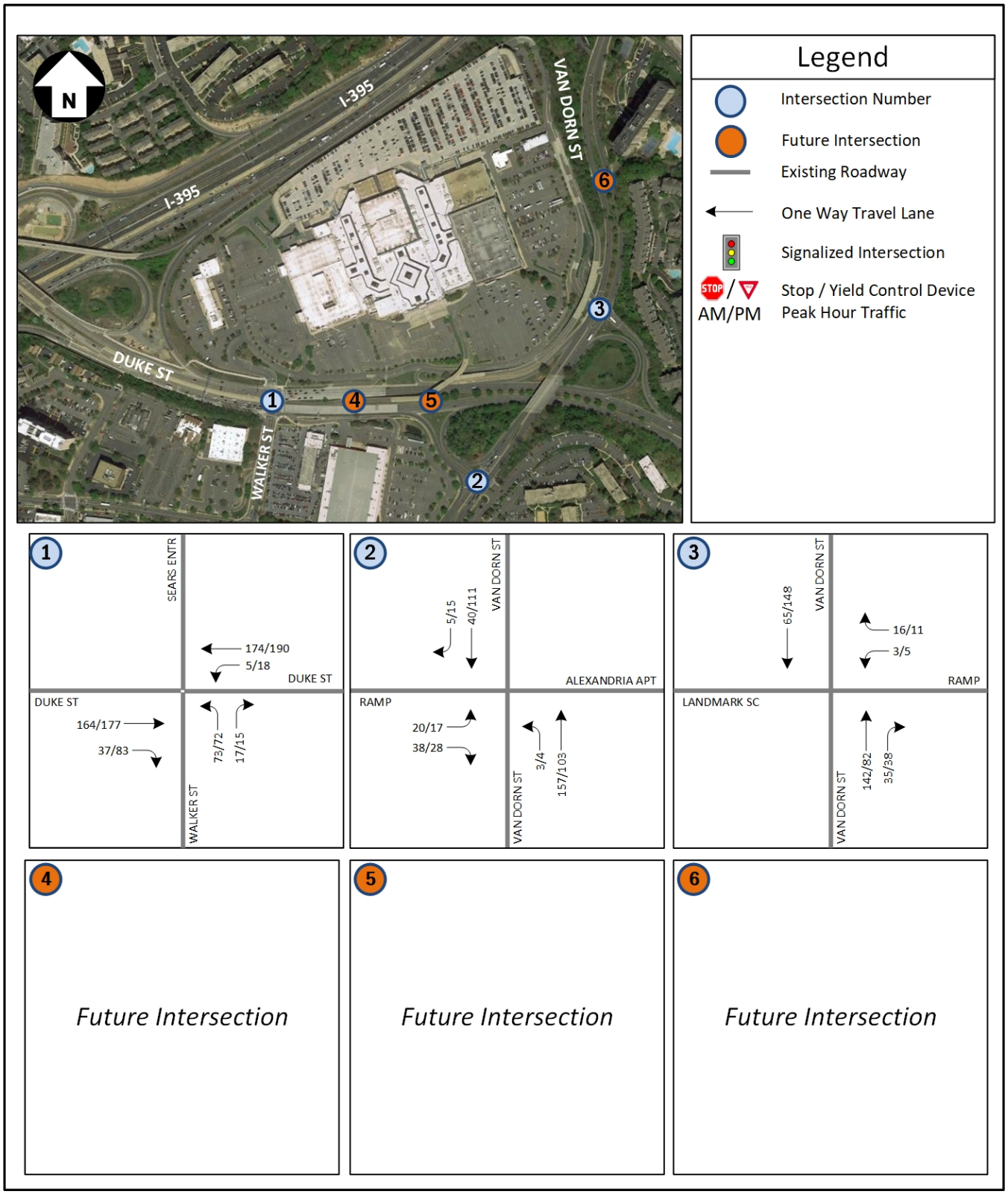

Figure 20: Growth Volumes with 10% Reduction of Existing Volumes

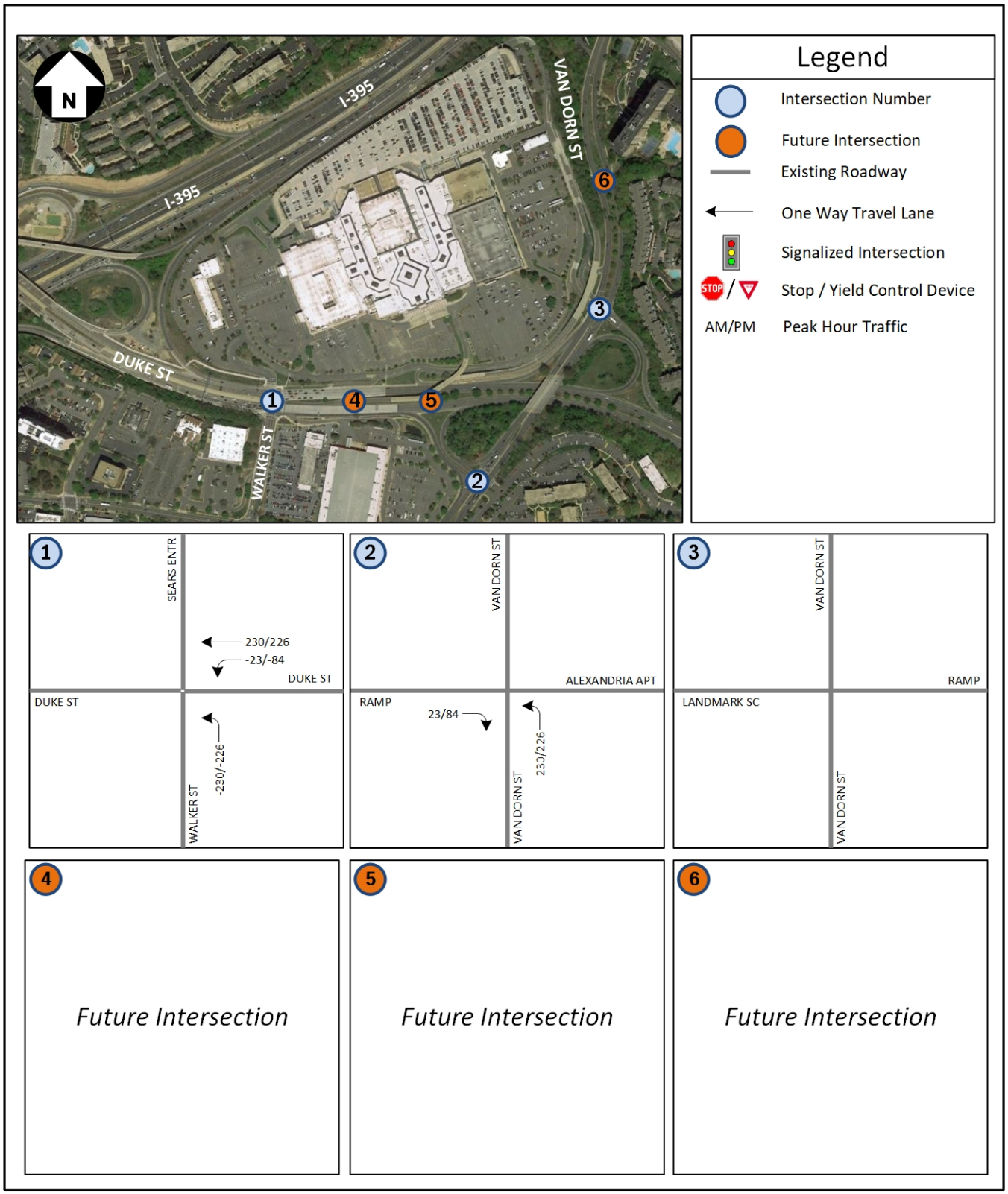

Figure 21: Reroute of Existing Traffic

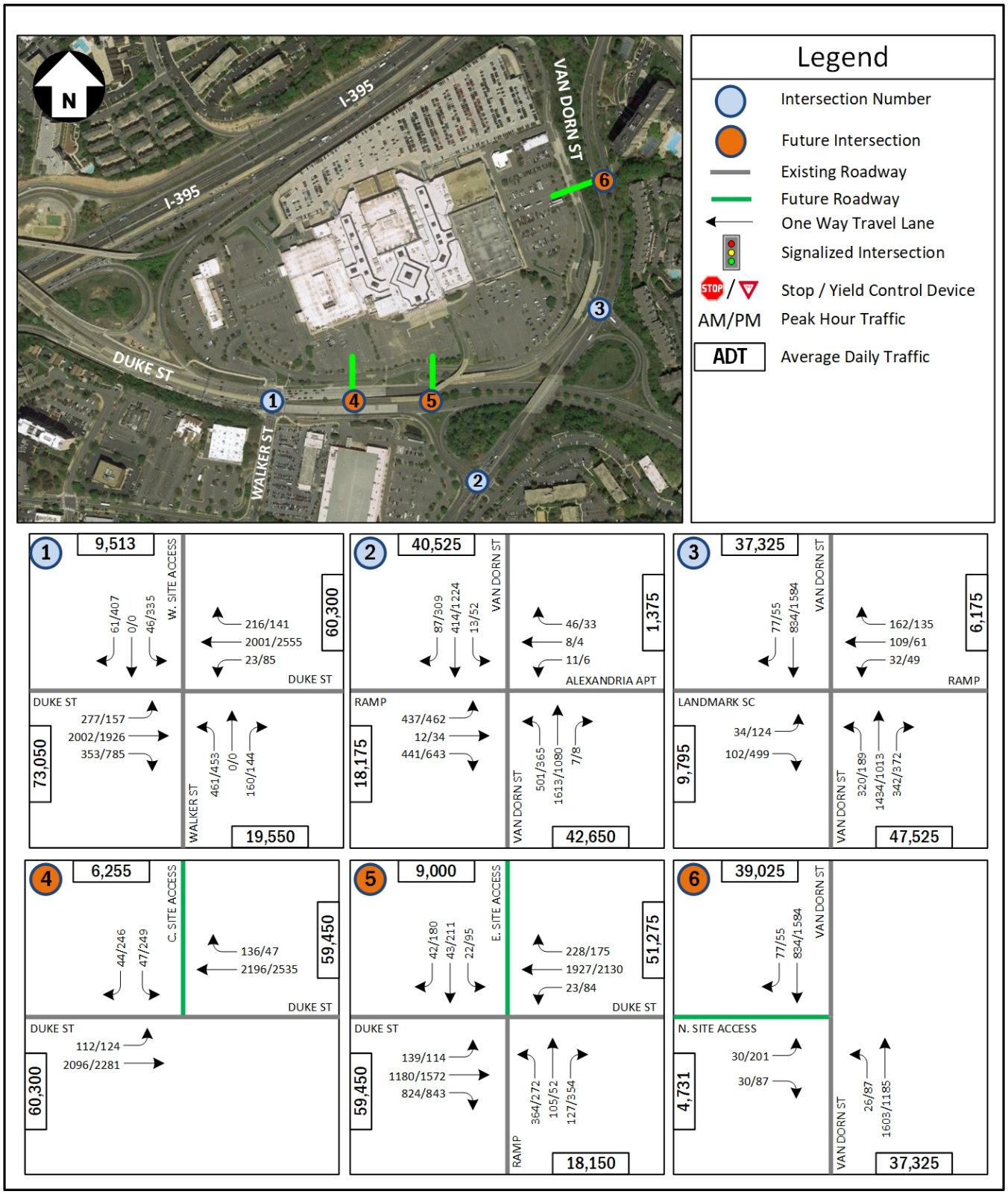

Figure 22: Future with Development (2040) Traffic Volumes with 2009 Approved Development Program

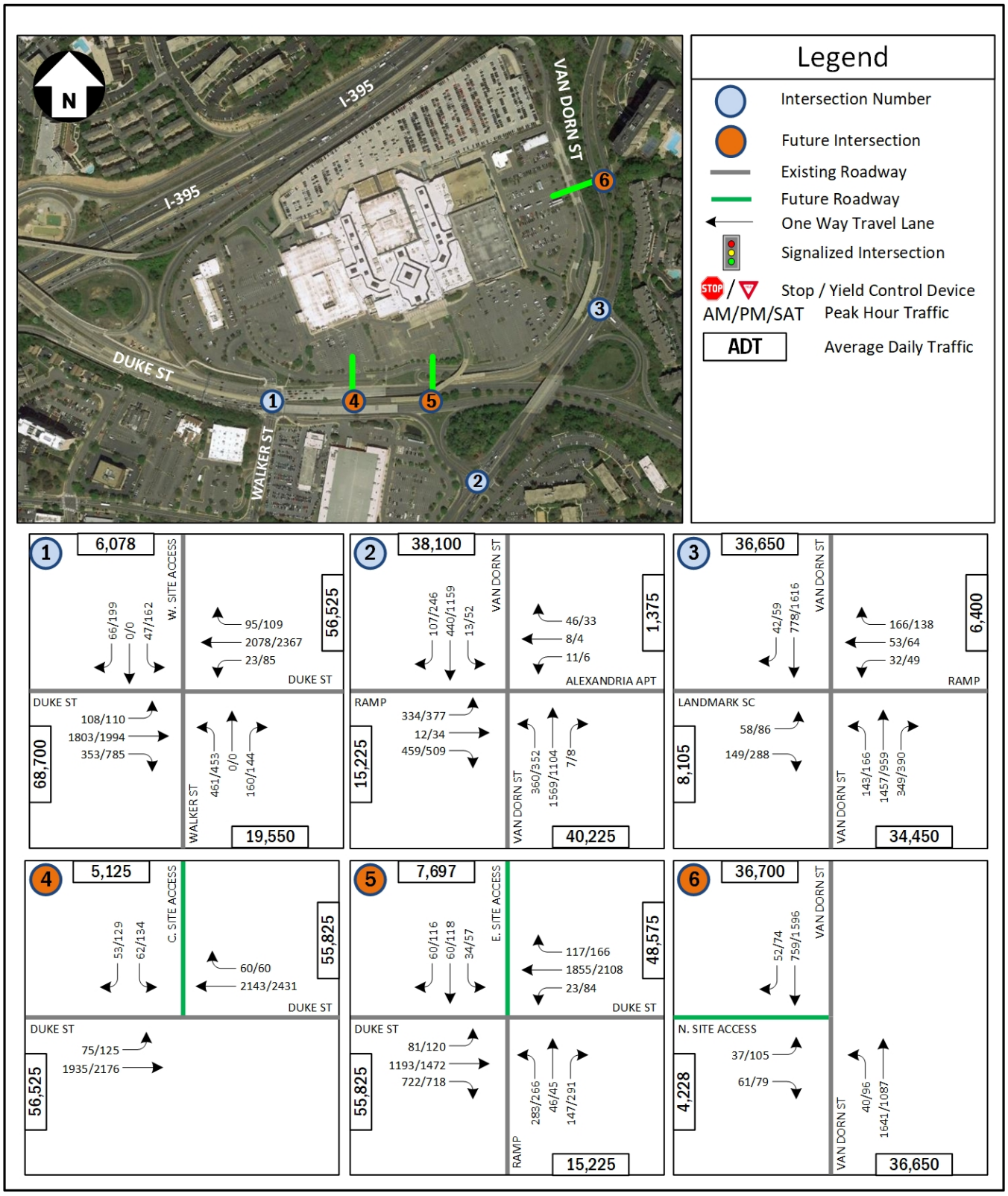

Figure 23: Future with Development (2040) Traffic Volumes with 2019 Proposed Development Program

Future with Development Capacity Analysis with 2009 Approved Development Program

Intersection capacity analyses were performed for the 2040 Future Conditions with Development with Approved Development Program at the study area intersections during the weekday morning (AM) and afternoon peak (PM) peak hours. *Synchro,* version 10, was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM) methodology.

As agreed, upon in the scoping meeting, a minimum peak hour factor of 0.92 by intersection was utilized in the analysis for future conditions. Furthermore, the heavy vehicle percentages were based on the traffic counts.

The capacity and queuing analysis results are shown in Table 5. The detailed analysis worksheets are contained in Appendix G.

Table 5: Future with Development (2040) Intersection Capacity Analysis with 2009 Approved Development Program

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
1	**Duke Street and S Walker Street /Sears Driveway**							
	Overall Intersection (Signalized)		**D**	**35.4**		**F**	**139.2**	
	Eastbound Approach		***C***	***31.1***		***D***	***36.5***	
	Eastbound Left	800	E	74.5	#441	F	105.2	#297
	Eastbound Thru		C	27.3	700	D	36.4	705
	Eastbound Right	310	B	18.1	108	C	23.0	62
	Westbound Approach		***C***	***31.8***		***F***	***119.6***	
	Westbound Left		D	50.8	m31	D	54.2	m101
	Westbound Thru		C	33.3	#823	F	128.0	#1252
	Westbound Right	250	B	16.4	m26	A	6.2	m4
	Northbound Approach		***E***	***62.4***		***F***	***102.1***	
	Northbound Left		E	62.6	268	F	112.8	#363
	Northbound Thru/Right	385	E	61.7	0	E	68.5	50
	Southbound Approach		***E***	***59.6***		***F***	***639.9***	
	Southbound Left		D	52.6	72	F	246.8	#673
	Southbound Thru/Right		E	64.8	0	F	962.7	#666
2	**VanDorn Street and EB Duke Street Off Ramp**							
	Overall Intersection (Signalized)		**C**	**20.4**		**C**	**25.4**	
	Eastbound Approach		***C***	***28.7***		***C***	***27.3***	
	Eastbound Left/Thru		E	56.0	252	E	61.9	304
	Eastbound Right		E	56.6	256	E	59.2	300
	Westbound Approach		***D***	***54.7***		***E***	***56.3***	
	Westbound Left/Thru		E	55.6	39	E	57.2	26
	Westbound Right		D	54.3	0	E	56.1	0
	Northbound Approach		***B***	***16.6***		***C***	***27.8***	
	Northbound Left	150	C	24.3	#516	E	76.0	#467
	Northbound Thru/Right		B	14.2	632	B	11.7	353
	Southbound Approach		***B***	***17.1***		***C***	***20.9***	
	Southbound Left	200	B	17.1	25	B	12.8	m17
	Southbound Thru/Left		B	17.4	158	C	25.0	m#616
	Southbound Right	250	B	15.8	24	A	6.2	m19

Table 5: Future with Development (2040) Intersection Capacity Analysis with 2009 Approved Development Program (Continued)

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
3	**Van Dorn Street and Macys Driveway/WB Ramp**							
	Overall Intersection (Signalized)		**B**	**15.7**		**D**	**36.4**	
	Eastbound Approach		***E***	***57.9***		***F***	***84.3***	
	Eastbound Left		E	59.0	61	D	48.9	155
	Eastbound Left/Thru/Right		E	57.6	64	F	92.0	#369
	Westbound Approach		***E***	***56.5***		***D***	***52.5***	
	Westbound Left	100	D	54.1	58	D	53.4	78
	Westbound Thru		E	61.9	149	D	54.4	93
	Westbound Right	100	D	53.3	65	D	51.3	61
	Northbound Approach		***A***	***9.2***		***B***	***12.3***	
	Northbound Left	620	C	20.5	139	D	44.4	m175
	Northbound Thru		A	7.2	365	B	10.7	166
	Northbound Right	200	A	6.7	51	A	0.3	0
	Southbound Approach		***B***	***10.3***		***D***	***39.0***	
	Southbound Thru/Right		B	10.3	132	D	39.0	#896
4	**Duke Street and Center Site Access**							
	Overall Intersection (Signalized)		**A**	**4.8**		**B**	**15.4**	
	Eastbound Approach		***A***	***2.8***		***A***	***5.7***	
	Eastbound Left	200	D	42.7	m165	E	57.5	m153
	Eastbound Thru		A	0.7	13	A	2.9	m164
	Westbound Approach		***A***	***4.4***		***B***	***12.7***	
	Westbound Thru/Right		A	4.4	154	B	12.7	m171
	Southbound Approach		***E***	***64.9***		***E***	***77.2***	
	Southbound Left		E	67.4	89	F	98.3	#439
	Southbound Right		E	62.2	41	E	55.8	127
5	**Duke Street and East Site Access**							
	Overall Intersection (Signalized)		**C**	**33.3**		**D**	**51.6**	
	Eastbound Approach		***B***	***15.1***		***C***	***24.0***	
	Eastbound Left	200	D	51.3	197	D	49.5	m179
	Eastbound Thru		C	20.4	341	C	34.4	#1088
	Eastbound Right		A	1.3	191	A	1.2	m22
	Westbound Approach		***D***	***41.1***		***E***	***72.3***	
	Westbound Left	250	E	60.4	52	E	68.9	149
	Westbound Thru/Right		D	40.9	#986	E	72.4	#1134
	Northbound Approach		***E***	***65.4***		***E***	***67.6***	
	Northbound Left/Thru		E	72.7	337	E	76.2	261
	Northbound Right		D	38.8	46	E	59.6	373
	Southbound Approach		***E***	***59.0***		***E***	***70.9***	
	Southbound Left		E	64.4	52	E	60.7	158
	Southbound Left/Thru		E	67.1	84	F	96.3	#377
	Southbound Right		D	47.9	17	D	46.7	129

Table 5: Future with Development (2040) Intersection Capacity Analysis with 2009 Approved Development Program (Continued)

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
6	**Van Dorn St. and North Site Access**							
	Overall Intersection (Signalized)		**A**	**3.8**		**B**	**15.5**	
	Eastbound Approach		***E***	***60.1***		***E***	***57.4***	
	Eastbound Left		E	61.7	62	E	65.8	#272
	Eastbound Right		E	58.4	34	D	38.2	84
	Northbound Approach		***A***	***1.1***		***A***	***5.6***	
	Northbound Left	250	A	0.5	m2	D	37.9	66
	Northbound Thru		A	1.1	42	A	3.2	107
	Southbound Approach		***A***	***4.7***		***B***	***15.8***	
	Southbound Thru		A	4.9	187	B	16.4	588
	Southbound Right	250	A	3.6	17	A	7.7	25

NOTES:

* *Effective storage length is based on the storage length plus one-half of the taper length per TOSAM guidelines.*

** *#: 95th percentile volumes exceed capacity; actual queues may be longer. Queues shown are based on the maximum after*

*** *m: Volume for 95th percentile queue is metered by upstream signal*

**** *$: Delays exceed 300 seconds.*

Under the 2040 future with development with 2009 approved development program scenario, all of the study intersections will continue to have approaches that operate at LOS E or F and side street delays would increase considerably when compared to Future Conditions without the development.

All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the northbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

The results of the intersection capacity analyses for the future with the approved 2009 plan conditions are shown in Figure 24.

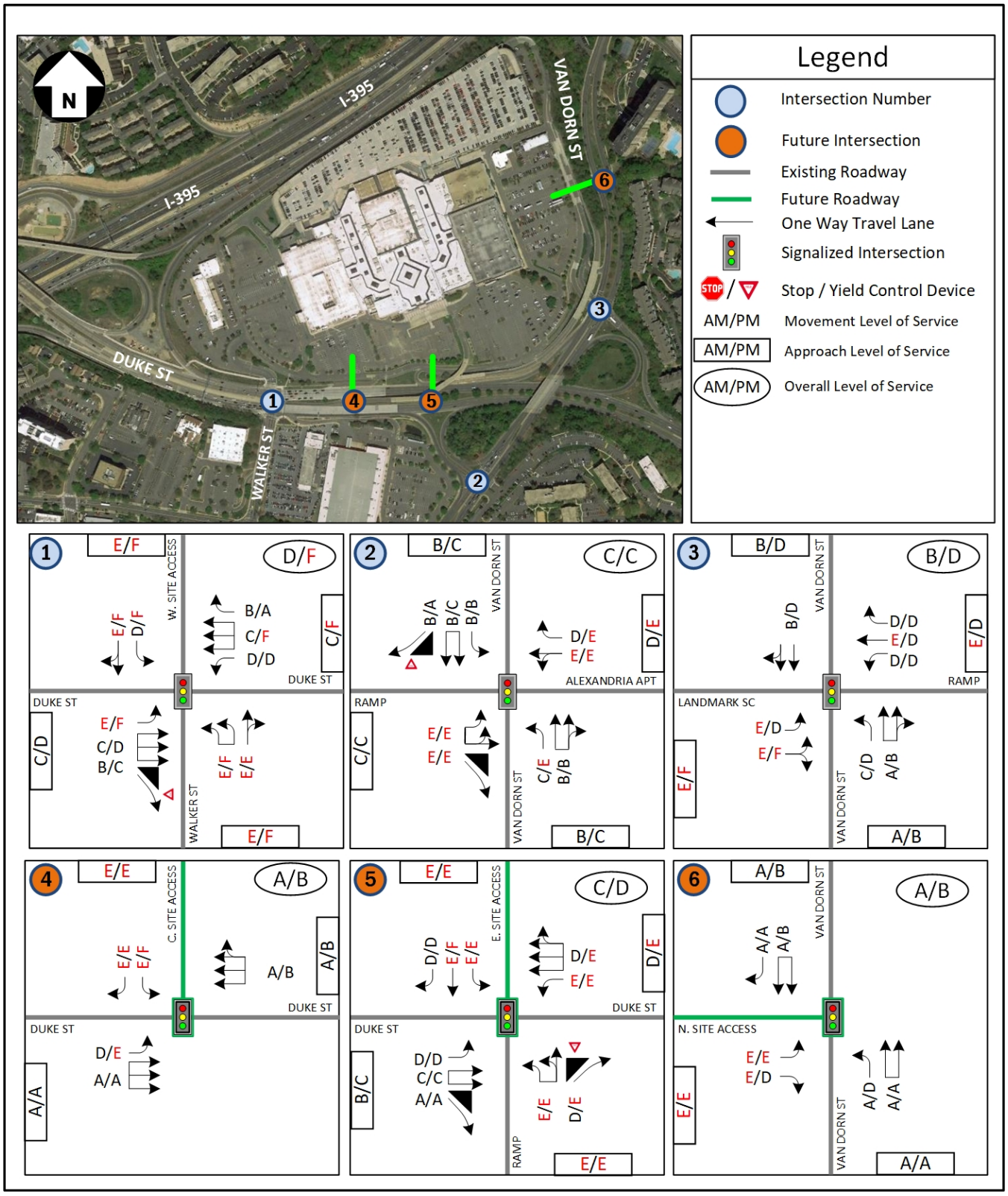

Figure 24: Future with Development (2040) Levels of Service with 2009 Approved Development Program

Future with Development Capacity Analysis with 2019 Proposed Development Program

Intersection capacity analyses were performed for the 2040 Future Conditions with Development with 2019 Proposed Development Program at the study area intersections during the weekday morning (AM) and afternoon peak (PM) peak hours. *Synchro,* version 10, was used to analyze the study intersections with results based on the Highway Capacity Manual (HCM) methodology.

As agreed, upon in the scoping meeting, a minimum peak hour factor of 0.92 by intersection was utilized in the analysis for future conditions. Furthermore, the heavy vehicle percentages were based on the traffic counts.

The capacity and queuing analysis results are shown in Table 6. The detailed analysis worksheets are contained in Appendix H.

Table 6: Future with Development (2040) Intersection Capacity Analysis with 2019 Proposed Development Program

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
1	**Duke Street and S Walker Street /Sears Driveway**							
	Overall Intersection (Signalized)		**C**	**26.0**		**E**	**57.9**	
	Eastbound Approach		***C***	***22.9***		***D***	***35.0***	
	Eastbound Left	800	E	59.7	159	E	79.7	#187
	Eastbound Thru		C	22.0	556	D	37.5	#760
	Eastbound Right	310	B	15.9	77	C	22.4	72
	Westbound Approach		***B***	***17.2***		***E***	***71.0***	
	Westbound Left		D	54.3	m32	E	61.8	m108
	Westbound Thru		B	16.6	#819	E	73.4	#1100
	Westbound Right	250	B	19.5	m1	C	27.5	m2
	Northbound Approach		***E***	***62.4***		***F***	***102.1***	
	Northbound Left		E	62.6	268	F	112.8	#363
	Northbound Thru/Right	385	E	61.7	0	E	68.5	50
	Southbound Approach		***E***	***59.8***		***E***	***74.1***	
	Southbound Left	330	D	52.6	73	E	68.3	#263
	Southbound Thru/Right	200	E	64.8	0	E	78.8	#175
2	**VanDorn Street and EB Duke Street Off Ramp**							
	Overall Intersection (Signalized)		**B**	**15.5**		**B**	**19.8**	
	Eastbound Approach		***C***	***24.8***		***C***	***26.3***	
	Eastbound Left/Thru		E	57.2	211	E	57.9	245
	Eastbound Right		E	56.5	209	E	57.5	249
	Westbound Approach		***D***	***54.7***		***E***	***56.3***	
	Westbound Left/Thru		E	55.6	39	E	57.2	26
	Westbound Right		D	54.3	0	E	56.1	0
	Northbound Approach		***B***	***10.8***		***B***	***19.8***	
	Northbound Left	150	A	9.4	200	D	49.9	#406
	Northbound Thru/Right		B	11.1	525	B	10.3	366
	Southbound Approach		***B***	***14.2***		***B***	***14.5***	
	Southbound Left	200	B	13.8	22	B	11.2	m17
	Southbound Thru/Left		B	14.5	154	B	16.6	m#628
	Southbound Right	250	B	13.2	33	A	5.4	m20

Table 6: Future with Development (2040) Intersection Capacity Analysis with 2019 Proposed Development Program (continued)

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
3	**Van Dorn Street and Macys Driveway/WB Ramp**							
	Overall Intersection (Signalized)		**B**	**14.6**		**C**	**23.5**	
	Eastbound Approach		***E***	***57.4***		***D***	***51.6***	
	Eastbound Left	220	E	59.3	89	D	53.9	114
	Eastbound Left/Thru/Right	220	E	56.8	76	D	51.0	102
	Westbound Approach		***E***	***58.0***		***D***	***52.3***	
	Westbound Left	100	E	57.7	60	D	53.1	78
	Westbound Thru		E	58.9	85	D	54.3	96
	Westbound Right	100	E	57.8	90	D	51.1	61
	Northbound Approach		***A***	***6.6***		***A***	***9.1***	
	Northbound Left	620	A	9.7	60	D	41.5	155
	Northbound Thru		A	6.4	362	A	7.1	135
	Northbound Right	200	A	6.1	51	A	0.3	0
	Southbound Approach		***A***	***9.3***		***C***	***25.9***	
	Southbound Thru/Right		A	9.3	131	C	25.9	#927
4	**Duke Street and Center Site Access**							
	Overall Intersection (Signalized)		**A**	**5.7**		**A**	**9.4**	
	Eastbound Approach		***A***	***2.4***		***A***	***4.2***	
	Eastbound Left	200	D	46.9	m128	D	55.0	m163
	Eastbound Thru		A	0.7	16	A	1.3	90
	Westbound Approach		***A***	***5.8***		***A***	***8.2***	
	Westbound Thru/Right		A	5.8	127	A	8.2	154
	Southbound Approach		***E***	***62.5***		***E***	***66.7***	
	Southbound Left	300	E	64.8	108	E	73.8	208
	Southbound Right	300	E	59.9	45	E	59.2	63
5	**Duke Street and East Site Access**							
	Overall Intersection (Signalized)		**C**	**24.3**		**D**	**36.7**	
	Eastbound Approach		***A***	***9.7***		***B***	***17.3***	
	Eastbound Left	200	D	43.8	125	D	51.9	192
	Eastbound Thru		B	12.6	271	C	22.5	#967
	Eastbound Right		A	1.0	743	A	0.9	1
	Westbound Approach		***C***	***27.4***		***D***	***45.8***	
	Westbound Left	250	E	63.5	52	E	72.7	149
	Westbound Thru/Right		C	26.9	#815	D	44.8	#1110
	Northbound Approach		***E***	***61.2***		***E***	***64.0***	
	Northbound Left/Thru		E	68.2	242	E	75.7	250
	Northbound Right		D	45.0	52	D	51.8	228
	Southbound Approach		***E***	***60.0***		***E***	***61.8***	
	Southbound Left	400	E	64.2	69	E	63.4	103
	Southbound Left/Thru	400	E	68.9	106	E	73.7	189
	Southbound Right	370	D	49.9	34	D	48.8	76

Table 6: Future with Development (2040) Intersection Capacity Analysis with 2019 Proposed Development Program (continued)

No.	Intersection (Movement)	Effective Storage Length (ft.)*	AM Peak Hour			PM Peak Hour		
			LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)	LOS (s/veh)	Delay (s/veh)	95th % Queue (ft.)
6	**Van Dorn St. and North Site Access**							
	Overall Intersection (Signalized)		**A**	**4.7**		**B**	**12.1**	
	Eastbound Approach		***E***	***59.5***		***D***	***49.8***	
	Eastbound Left		E	61.8	71	E	55.7	141
	Eastbound Right		E	58.1	45	D	42.0	79
	Northbound Approach		***A***	***1.2***		***A***	***5.1***	
	Northbound Left	250	A	0.6	m2	D	36.0	72
	Northbound Thru		A	1.2	43	A	2.4	105
	Southbound Approach		***A***	***5.4***		***B***	***12.9***	
	Southbound Thru		A	5.5	159	B	13.2	610
	Southbound Right	250	A	4.1	12	A	5.9	21

NOTES:

* *Effective storage length is based on the storage length plus one-half of the taper length per TOSAM guidelines.*

** *#: 95th percentile volumes exceed capacity; actual queues may be longer. Queues shown are based on the maximum after*

*** *m: Volume for 95th percentile queue is metered by upstream signal*

**** *$: Delays exceed 300 seconds.*

Under the 2040 future with development with 2019 approved development program scenario, all of the study intersections will continue to have approaches that operate at LOS E or F during at least one peak hour. However, this scenario provides a considerable reduction in delay when compared to future conditions with 2009 approved development program. Each intersection would operate at overall LOS D conditions, with the exception of Duke Street and Walker Street, where the delay is 2.9 seconds above the LOS D threshold.

With the development and road network modifications, the current auto-oriented site vicinity would be transformed to a grid of streets with more connections that better serves all modes. The LOS E conditions for vehicles on the minor movements reflects the equalization of priorities; by reducing the number of turn lanes, the pedestrian crossings are shortened, for example.

All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the northbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

The results of the intersection capacity analyses for the future with development conditions with 2019 proposed development program are shown in Figure 25.

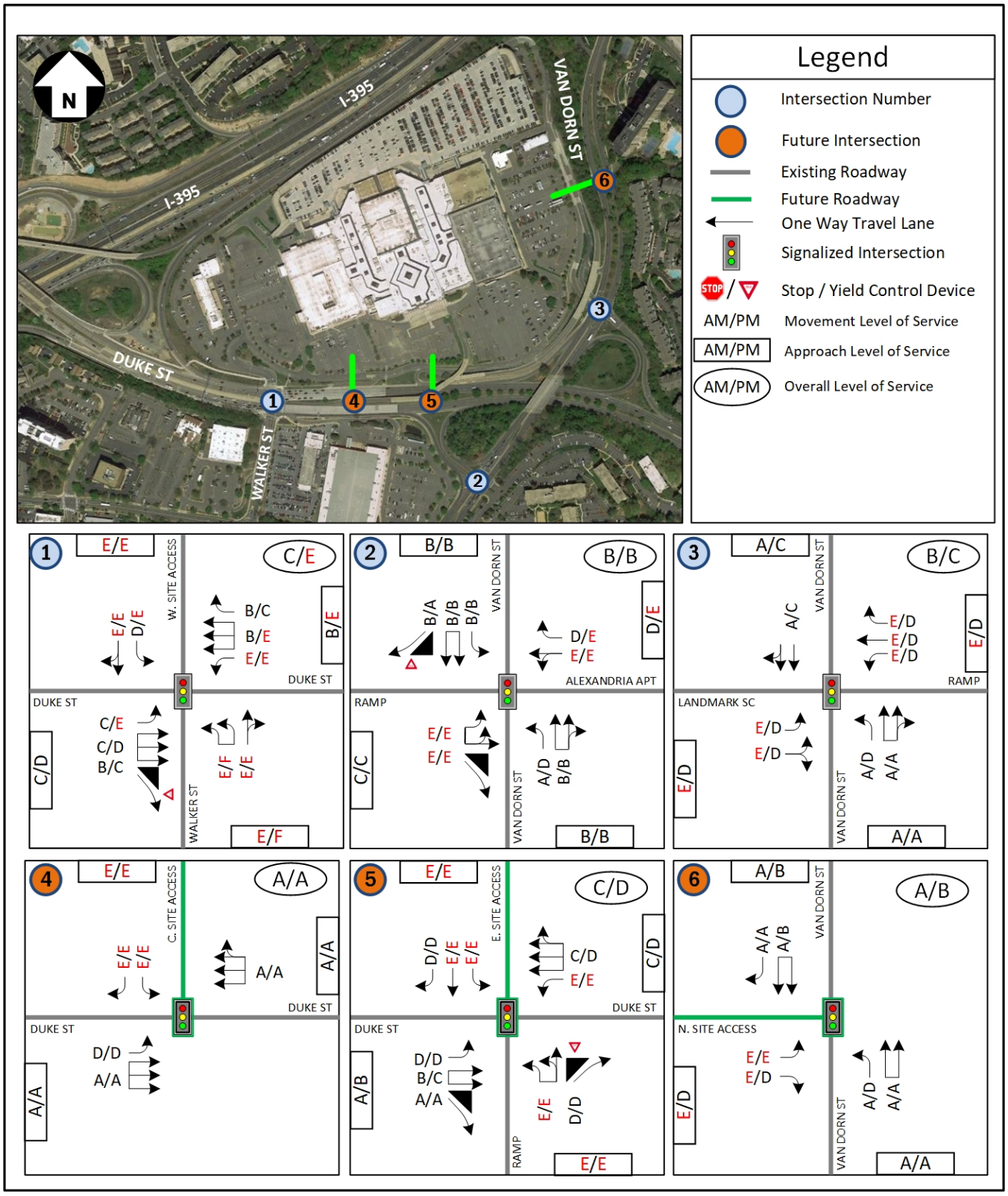

Figure 25: Future with Development (2040) Levels of Service with 2019 Proposed Development Program

CONCLUSIONS

This report presents the findings of a Transportation Impact Study (TIS) conducted for the proposed change in the densities for the 2009 previously approved Landmark Small Area plan. The project site is generally situated north of Duke Street (Rte. 236), east of I-395 Interchange, and west of Van Dorn Street (Rte. 401) in the west end of City of Alexandria, VA. The TIS evaluates the 2019 proposed program and shows that the current program will result in improved transportation operations when compared to the 2009 approved program. The redevelopment of the project site is anticipated to be complete by 2040.

The analysis presented in this report supports the following major conclusions:

Existing Conditions (2018)

- Analysis of the existing traffic count data found the following system peak hours:
  - AM Peak Hour: 7:30 AM to 8:30 AM
  - PM Peak Hour: 5:00 PM to 6:00 PM
- Based on the capacity analysis, all of the study intersections had approaches that operate at LOS E during at least one peak hour, with the overall intersections operating at LOS D or better.
- In general, the study intersections operate with high delays for the side-streets and mainline left turn movements. These conditions are typical of commuter corridors and reflect the prioritization of through traffic flow along the mainlines over access from individual properties and side-streets in order to accommodate the largest possible volume of through traffic in the area, and thereby, have a better overall traffic operation than if all movements were prioritized equally.
- All left and right turn lanes have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the eastbound left-turn movement at the intersection of the EB Duke Street Off-Ramp and Van Dorn Street.

Future Conditions without Development (2040)

- As a basis for performing the future without development analyses, it was assumed that the existing Landmark Mall would continue to remain in its current condition through 2040.
- Based on the capacity analysis, all of the study intersections will continue to operate with overall LOS D or better with LOS E or F on some movements and approaches.
- All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the eastbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

Future Conditions with Development (2040) with 2009 Approved Development Program

- The redevelopment of the site with 2009 approved development program will generate approximately 2,054 new trips during the AM peak hour, 2,984 new trips during the PM peak hour, and 31,775 new weekday daily trips.
- Under the 2040 future with development with 2009 approved development program scenario, all of the study intersections will continue to have approaches that do operate with LOS E or F during at least one peak hour and show a considerable increase in delay when compared to Future Conditions without the development.

- All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the northbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.

Future Conditions with Development (2040) with 2019 Proposed Development Program

- The redevelopment of the site with 2019 proposed development program will generate approximately 1,333 new trips during the AM peak hour, 2,059 new trips during the PM peak hour, and 25,995 new weekday daily trips. This represents significantly fewer trips than the approved 2009 plan density.
- Under the 2040 future with development with 2019 proposed development program scenario, all of the study intersections would operate with overall LOS D conditions and some LOS E movements and approaches. This scenario shows a considerable reduction in delay when compared to future conditions with 2009 approved development program and represents a balance in the prioritization of vehicular and non-motorized travel.
- All left and right turn lanes will continue to have 95th percentile queues within the available storage length for both the AM and PM peak hours except for the northbound left-turn movement at the intersection of EB Duke Street Off-Ramp and Van Dorn Street.
- The proposed removal of auto-oriented uses and highway structures and redevelopment of the Landmark Mall site with a network of complete street connections will contribute to the mobility of all modes of travel in the area and the small area plan vision for a vibrant West End community.

TECHNICAL APPENDIX

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APPENDIX A:

SCOPING DOCUMENT

City of Alexandria
Transportation Scoping Intake Form

Date: November 28, 2018 (scoping meeting)
Project Name: Landmark Small Area Plan
Property Address: 5801 Duke Street, Alexandria, VA 22304
Application # if available:
Point of contact name: Howard Hughes Corporation
Phone:
Email:

Existing uses	No. of DUs	SF	Proposed uses	No. of DUs	SF
Use 1: Sears & Vacant landmark Mall			Use 1: Residential	3,138	
Use 2:			Use 2: Lodging - Hotel	290	
Use 3:			Use 3: Recreational – Movie Theater	690	
Use 4:			Use 4: Recreational – Health/Fitness Club		150,000
			Use 5: Office – General Office Building		116,000
			Use 6: Retail – Shopping Center		344,000
			Use 7: Medical - Hospital		600,000
			Use 8: Medical – Dental Office Building		144,000

Project Description: Redevelop the existing Landmark Mall with the proposed uses (small area plan).

Assumed Peak Hours:
X AM
X PM
_____Saturday (if applicable)
_____Non-standard (based on use)

Trip Generation

			AM Peak Hour			PM Peak Hour			Other Peak Hour*			ADT
	ITE Code	DU/SF	In	Out	Total	In	Out	Total	In	Out	Total	
Existing uses (Removed)												
1: Sears			133	97	230	148	187	335				3,350
Total Existing Trips			133	97	230	148	187	335				
Proposed uses* (External)												
1: Residential	221	3,138	124	354	478	318	189	506				7,115
2: Lodging - Hotel	310	290	64	42	105	82	80	162				2,354
3: Recreational-Theatre/Fitness	444/492	690/150,000	61	56	116	149	113	261				4,017
4: Office	710	116,000	69	10	78	12	68	79				732
5: Retail	820	344,000	81	46	127	250	269	519				5,988
6. Medical – Hospital/Office	610/720	600/144,000	487	170	658	251	615	867				9,139
Total Proposed Trips			898	713	1,610	1,092	1,352	2,444				30,056
New Site Trips			765	616	1,380	944	1,165	2,109				26,706

Study Category (based on net new peak hour trips): Small Medium Large **Other (CDD/SAP)**

Horizon Years | Existing Year: 2018 | Build Out Year: 2040 | Design Year: N/A

Proposed Study Area Boundaries (Attach map)

North: I-395 N East: Van Dorn Street

South: Duke Street West: Walker Street

Study Intersections:

1. Duke St. & Walker St. / Sear Entr.
2. Van Dorn St. & EB Duke St. Ramp
3. Van Dorn St. & WB Duke St. Ramp
4. Duke St. & Center Access
5. Duke St. & At-Grade Future East Entr.
6. Van Dorn St. & Future North Site Entr.
7.
8.
9.
10.
11.
12.

Location of mid-block counts:

Background Development Projects Included in growth rate

Roadway Improvements

1. Removal of Flyover Ramp
2. New Site Entrances
3.
4.

Trip Distribution (attach a map)

North: I-395 N – 15%, Van Dorn St N – 20% East: Duke Street E – 20%

South: I-395 S – 10%, Van Dorn St N – 20% West: Duke Street W – 15%

Proposed Access Points (attach site map): A total of five (5) access points

Annual Growth Rate: 0.9% from 2018 through 2040

Mode Share Change (existing SOV to future BRT): 10% (West End Transitway study indicates BRT will attract 8600 riders, which is approximately 34% of the volume on Van Dorn Street, assuming 1/3 of those riders are in the study segments yields a 10% mode change)

VDOT Software Selection Tool Recommendation: VISSIM

Proposed Software: Synchro (Results from HCM Methodology)

Trip Reduction:

Modal split/transit: 50%/5%/25%/35%/15% (Residential/Lodging/Recreational/Office & Retail/Medical) % trips

Internal capture Based on NCHRP 684 (Table 106) % trips Pass-by trips: 24%/34%/24% (AM/PM/Daily) % trips

Justification for mode split: The Non-Auto Share reductions are less than the recommended reductions mentioned in the WMATA's 2005 Development Ridership Study. Additional 10% reduction for residential uses to reflect work-from-home infrastructure.

Attach additional sheets as needed.

** If applicable.*

Parking:
Proposed parking spaces to be provided: _____
Parking spaces required by Code: _____
Is a parking modification requested? Yes No

Required with Study?

____Signal Warrant Analysis
X Queuing Analysis
X Signal Timing/Phasing Improvements

____Parking Study
X Bike/Ped Counts
____Electronic Tabular Data for (circle applicable):
Traffic Counts / Parking / Ped/Bike Counts

Attach additional sheets as needed.
** If applicable.*

Please attach the following graphics:

Vehicular study area and intersections

Bicycle and pedestrian study area

Distribution percentages and directions

Site plan (if available)

Is a TMP required? Yes / No

Which Threshold Tier 1 Tier 2 Tier 3

Draft multimodal transportation study due to P&Z:

_____concurrent with completeness submission

_____one week prior to completeness submission

_____two weeks prior to completeness submission

_____three weeks prior to completeness submission

_____other

City staff signature 1/24/19 Date

Applicant signature Date

Please include the signed scope of work agreement and attachments as an appendix to the transportation study.

Attach additional sheets as needed.

** If applicable.*

APPENDIX B:

Existing (2018) Traffic Volumes & Count Sheets

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Walker St/Shopping Center Dwy & Duke St
City: Alexandria
Control: Signalized

Project ID: 18-11068-002
Date: 6/12/2018

Total

NS/EW Streets:	S Walker St/Shopping Center Dwy				S Walker St/Shopping Center Dwy				Duke St				Duke St				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	95	0	17	0	0	0	1	0	0	171	27	0	4	223	0	1	539
6:15 AM	104	0	15	0	0	0	1	0	0	177	37	0	2	269	0	0	605
6:30 AM	134	0	16	0	0	0	2	0	0	216	50	0	4	241	0	0	663
6:45 AM	127	0	23	0	0	1	2	0	0	264	54	0	4	317	0	0	792
7:00 AM	180	0	20	0	0	0	2	0	0	269	61	0	7	350	0	0	889
7:15 AM	157	0	33	0	1	1	5	0	0	327	45	0	7	370	0	0	946
7:30 AM	156	0	39	0	0	1	16	0	0	391	87	0	10	367	0	0	1067
7:45 AM	170	0	31	0	0	1	8	0	0	376	85	0	10	382	0	0	1063
8:00 AM	133	0	33	0	1	1	14	0	0	386	56	0	8	396	0	0	1028
8:15 AM	159	0	40	0	0	0	7	0	0	324	88	1	13	338	1	0	971
8:30 AM	129	0	21	0	2	0	6	0	0	380	81	0	19	348	0	0	986
8:45 AM	140	0	24	0	0	1	4	0	0	305	102	0	11	285	0	0	872
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1684	0	312	0	4	6	68	0	0	3586	773	1	99	3886	1	1	10421
APPROACH %'s :	84.37%	0.00%	15.63%	0.00%	5.13%	7.69%	87.18%	0.00%	0.00%	82.25%	17.73%	0.02%	2.48%	97.47%	0.03%	0.03%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	618	0	143	0	1	3	45	0	0	1477	316	1	41	1483	1	0	4129
PEAK HR FACTOR :	0.909	0.000	0.894	0.000	0.250	0.750	0.703	0.000	0.000	0.944	0.898	0.250	0.788	0.936	0.250	0.000	0.967
	0.947				0.721				0.938				0.944				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	154	0	38	0	3	3	15	0	1	324	134	0	42	382	0	1	1097
3:45 PM	144	0	38	0	5	0	6	0	0	346	133	0	40	398	0	0	1110
4:00 PM	137	0	23	0	6	4	19	0	0	318	158	1	42	373	0	1	1082
4:15 PM	139	0	29	0	3	3	14	0	0	327	150	0	33	426	0	0	1124
4:30 PM	148	0	27	0	8	4	11	0	0	400	164	0	39	362	0	0	1163
4:45 PM	150	0	32	0	6	8	13	0	0	349	142	1	43	387	1	0	1132
5:00 PM	159	0	34	0	6	4	19	0	0	371	163	1	36	416	0	1	1210
5:15 PM	140	0	35	0	3	2	17	0	0	403	177	2	35	426	2	1	1243
5:30 PM	160	0	31	0	5	2	17	0	0	389	177	0	36	399	1	1	1218
5:45 PM	148	0	29	0	8	0	12	0	0	371	185	0	40	377	0	1	1171
6:00 PM	149	0	37	0	1	3	20	0	0	366	196	0	44	428	1	0	1245
6:15 PM	158	0	38	0	8	8	23	0	0	416	202	0	41	411	0	1	1306
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1786	0	391	0	62	41	186	0	1	4380	1981	5	471	4785	5	7	14101
APPROACH %'s :	82.04%	0.00%	17.96%	0.00%	21.45%	14.19%	64.36%	0.00%	0.02%	68.79%	31.11%	0.08%	8.94%	90.83%	0.09%	0.13%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	615	0	135	0	22	13	72	0	0	1542	760	0	161	1615	2	3	4940
PEAK HR FACTOR :	0.961	0.000	0.888	0.000	0.688	0.406	0.783	0.000	0.000	0.927	0.941	0.000	0.915	0.943	0.500	0.750	0.946
	0.957				0.686				0.931				0.941				

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Walker St/Shopping Center Dwy & Duke St
City: Alexandria
Control: Signalized

Project ID: 18-11068-002
Date: 6/12/2018

Cars

NS/EW Streets:	S Walker St/Shopping Center Dwy				S Walker St/Shopping Center Dwy				Duke St				Duke St				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	94	0	17	0	0	0	0	0	0	156	27	0	4	210	0	0	508
6:15 AM	103	0	15	0	0	0	0	0	0	167	37	0	2	257	0	0	581
6:30 AM	133	0	16	0	0	0	2	0	0	208	48	0	3	233	0	0	643
6:45 AM	122	0	21	0	0	0	2	0	0	247	52	0	3	303	0	0	750
7:00 AM	174	0	19	0	0	0	1	0	0	259	61	0	7	338	0	0	859
7:15 AM	154	0	32	0	1	1	2	0	0	309	44	0	6	356	0	0	905
7:30 AM	153	0	38	0	0	1	13	0	0	376	83	0	10	352	0	0	1026
7:45 AM	164	0	30	0	0	1	8	0	0	368	83	0	9	370	0	0	1033
8:00 AM	130	0	31	0	1	1	14	0	0	371	55	0	7	388	0	0	998
8:15 AM	156	0	40	0	0	0	7	0	0	309	86	1	13	322	1	0	935
8:30 AM	127	0	21	0	2	0	6	0	0	362	79	0	19	337	0	0	953
8:45 AM	134	0	23	0	0	1	4	0	0	292	95	0	11	260	0	0	820
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1644	0	303	0	4	5	59	0	0	3424	750	1	94	3726	1	0	10011
APPROACH %'s :	84.44%	0.00%	15.56%	0.00%	5.88%	7.35%	86.76%	0.00%	0.00%	82.01%	17.96%	0.02%	2.46%	97.51%	0.03%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	603	0	139	0	1	3	42	0	0	1424	307	1	39	1432	1	0	3992
PEAK HR FACTOR :	0.92	0.000	0.869	0.000	0.250	0.750	0.750	0.000	0.000	0.947	0.892	0.250	0.750	0.923	0.250	0.000	0.966
	0.946				0.719				0.943				0.932				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	152	0	37	0	3	3	15	0	1	314	134	0	38	372	0	1	1070
3:45 PM	144	0	33	0	5	0	6	0	0	329	130	0	36	392	0	0	1075
4:00 PM	137	0	23	0	6	4	18	0	0	311	157	1	42	360	0	1	1060
4:15 PM	138	0	28	0	3	3	13	0	0	317	147	0	33	420	0	0	1102
4:30 PM	147	0	27	0	8	4	11	0	0	393	163	0	39	356	0	0	1148
4:45 PM	148	0	31	0	6	8	13	0	0	343	140	1	43	380	1	0	1114
5:00 PM	158	0	34	0	6	4	18	0	0	366	162	1	35	407	0	1	1192
5:15 PM	140	0	34	0	3	2	17	0	0	391	176	2	34	418	2	1	1220
5:30 PM	159	0	31	0	5	2	16	0	0	379	174	0	36	392	1	1	1196
5:45 PM	148	0	28	0	8	0	12	0	0	364	183	0	40	368	0	1	1152
6:00 PM	148	0	37	0	1	3	20	0	0	364	194	0	44	420	1	0	1232
6:15 PM	158	0	38	0	8	7	23	0	0	410	201	0	41	409	0	1	1296
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1777	0	381	0	62	40	182	0	1	4281	1961	5	461	4694	5	7	13857
APPROACH %'s :	82.34%	0.00%	17.66%	0.00%	21.83%	14.08%	64.08%	0.00%	0.02%	68.52%	31.39%	0.08%	8.92%	90.85%	0.10%	0.14%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	613	0	134	0	22	12	71	0	0	1517	752	0	161	1589	2	3	4876
PEAK HR FACTOR :	0.96	0.000	0.882	0.000	0.688	0.429	0.772	0.000	0.000	0.925	0.935	0.000	0.915	0.946	0.500	0.750	0.941
	0.953				0.691				0.928				0.944				

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Walker St/Shopping Center Dwy & Duke St
City: Alexandria
Control: Signalized

Project ID: 18-11068-002
Date: 6/12/2018

HT

NS/EW Streets:	S Walker St/Shopping Center Dwy				S Walker St/Shopping Center Dwy				Duke St				Duke St				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	1	0	0	0	0	0	1	0	0	15	0	0	0	13	0	1	31
6:15 AM	1	0	0	0	0	0	1	0	0	10	0	0	0	12	0	0	24
6:30 AM	1	0	0	0	0	0	0	0	0	8	2	0	1	8	0	0	20
6:45 AM	5	0	2	0	0	1	0	0	0	17	2	0	1	14	0	0	42
7:00 AM	6	0	1	0	0	0	1	0	0	10	0	0	0	12	0	0	30
7:15 AM	3	0	1	0	0	0	3	0	0	18	1	0	1	14	0	0	41
7:30 AM	3	0	1	0	0	0	3	0	0	15	4	0	0	15	0	0	41
7:45 AM	6	0	1	0	0	0	0	0	0	8	2	0	1	12	0	0	30
8:00 AM	3	0	2	0	0	0	0	0	0	15	1	0	1	8	0	0	30
8:15 AM	3	0	0	0	0	0	0	0	0	15	2	0	0	16	0	0	36
8:30 AM	2	0	0	0	0	0	0	0	0	18	2	0	0	11	0	0	33
8:45 AM	6	0	1	0	0	0	0	0	0	13	7	0	0	25	0	0	52
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	40	0	9	0	0	1	9	0	0	162	23	0	5	160	0	1	410
APPROACH %'s :	81.63%	0.00%	18.37%	0.00%	0.00%	10.00%	90.00%	0.00%	0.00%	87.57%	12.43%	0.00%	3.01%	96.39%	0.00%	0.60%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	15	0	4	0	0	0	3	0	0	53	9	0	2	51	0	0	137
PEAK HR FACTOR :	0.625	0.000	0.500	0.000	0.000	0.000	0.250	0.000	0.000	0.883	0.563	0.000	0.500	0.797	0.000	0.000	0.835
	0.679				0.250				0.816				0.828				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	2	0	1	0	0	0	0	0	0	10	0	0	4	10	0	0	27
3:45 PM	0	0	5	0	0	0	0	0	0	17	3	0	4	6	0	0	35
4:00 PM	0	0	0	0	0	0	1	0	0	7	1	0	0	13	0	0	22
4:15 PM	1	0	1	0	0	0	1	0	0	10	3	0	0	6	0	0	22
4:30 PM	1	0	0	0	0	0	0	0	0	7	1	0	0	6	0	0	15
4:45 PM	2	0	1	0	0	0	0	0	0	6	2	0	0	7	0	0	18
5:00 PM	1	0	0	0	0	0	1	0	0	5	1	0	1	9	0	0	18
5:15 PM	0	0	1	0	0	0	0	0	0	12	1	0	1	8	0	0	23
5:30 PM	1	0	0	0	0	0	1	0	0	10	3	0	0	7	0	0	22
5:45 PM	0	0	1	0	0	0	0	0	0	7	2	0	0	9	0	0	19
6:00 PM	1	0	0	0	0	0	0	0	0	2	2	0	0	8	0	0	13
6:15 PM	0	0	0	0	0	1	0	0	0	6	1	0	0	2	0	0	10
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	9	0	10	0	0	1	4	0	0	99	20	0	10	91	0	0	244
APPROACH %'s :	47.37%	0.00%	52.63%	0.00%	0.00%	20.00%	80.00%	0.00%	0.00%	83.19%	16.81%	0.00%	9.90%	90.10%	0.00%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	2	0	1	0	0	1	1	0	0	25	8	0	0	26	0	0	64
PEAK HR FACTOR :	0.50	0.000	0.250	0.000	0.000	0.250	0.250	0.000	0.000	0.625	0.667	0.000	0.000	0.722	0.000	0.000	0.727
	0.750				0.500				0.635				0.722				

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Walker St/Shopping Center Dwy & Duke St
City: Alexandria
Control: Signalized

Project ID: 18-11068-002
Date: 6/12/2018

Bikes

NS/EW Streets:	S Walker St/Shopping Center Dwy				S Walker St/Shopping Center Dwy				Duke St				Duke St				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	4	0	0	0	1	0	0	5
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	
PEAK HR :	07:30 AM - 08:30 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.375
										0.375							

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	2	0	1	0	1.5	0.5	2	0	0	2.5	0.5	0	1	3	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%									0.00%	100.00%	0.00%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Walker St/Shopping Center Dwy & Duke St
City: Alexandria

Project ID: 18-11068-002
Date: 6/12/2018

Pedestrians (Crosswalks)

NS/EW Streets:	S Walker St/Shopping Center Dwy		S Walker St/Shopping Center Dwy		Duke St		Duke St		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:00 AM	0	0	0	1	0	0	0	0	1
6:15 AM	0	0	0	0	1	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	1	2	2	0	0	5
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	1	0	0	0	3	1	0	0	5
7:30 AM	2	0	1	1	0	0	0	0	4
7:45 AM	2	0	0	0	0	2	0	0	4
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	1	1	0	0	1	1	0	0	4
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	1	0	0	0	2	1	0	0	4
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	7	1	1	3	9	7	0	0	28
APPROACH %'s :	87.50%	12.50%	25.00%	75.00%	56.25%	43.75%			
PEAK HR :	07:30 AM - 08:30 AM								TOTAL
PEAK HR VOL :	5	1	1	1	1	3	0	0	12
PEAK HR FACTOR :	0.625	0.250	0.250	0.250	0.250	0.375			0.750
	0.750		0.250		0.500				

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
3:30 PM	2	0	0	0	0	3	0	0	5
3:45 PM	0	0	0	0	1	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	1	1	0	0	1	0	0	0	3
4:30 PM	0	0	0	1	0	3	0	0	4
4:45 PM	1	1	1	0	3	0	0	0	6
5:00 PM	0	1	0	1	1	3	1	1	8
5:15 PM	2	0	0	3	0	3	0	0	8
5:30 PM	1	1	0	0	0	0	0	0	2
5:45 PM	0	1	0	0	2	2	0	0	5
6:00 PM	1	0	0	0	0	0	0	0	1
6:15 PM	0	1	1	0	1	0	1	0	4
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	8	6	2	5	9	14	2	1	47
APPROACH %'s :	57.14%	42.86%	28.57%	71.43%	39.13%	60.87%	66.67%	33.33%	
PEAK HR :	05:30 PM - 06:30 PM								TOTAL
PEAK HR VOL :	2	3	1	0	3	2	1	0	12
PEAK HR FACTOR :	0.500	0.750	0.250		0.375	0.250	0.250		0.600
	0.625		0.250		0.313		0.250		

Prepared by National Data & Surveying Services

S Walker St/Shopping Center Dwy & Duke St

Peak Hour Turning Movement Count

ID: 18-11068-002
City: Alexandria

Day: Tuesday
Date: 06/12/2018

PEAK HOURS

AM	07:30 AM - 08:30 AM
NOON	NONE
PM	05:30 PM - 06:30 PM

COUNT PERIODS

AM	06:00 AM - 09:00 AM
NOON	NONE
PM	03:30 PM - 06:30 PM

S Walker St/Shopping Center Dwy — SOUTHBOUND

AM	45	3	1	0	1	AM
NOON	0	0	0	0	0	NOON
PM	72	13	22	0	2	PM
	2	0.5	1.5	0		

EASTBOUND — Duke St

AM	NOON	PM		
2147	0	2302	⇦	
1	0	0	↶	0
0	0	0	↱	0
1477	0	1542	→	2.5
316	0	760	↴	0.5

WESTBOUND — Duke St

	PM	NOON	AM
0	2	0	1
3	1615	0	1483
1	161	0	41
0	3	0	0
⇨	1702	0	1621

CONTROL

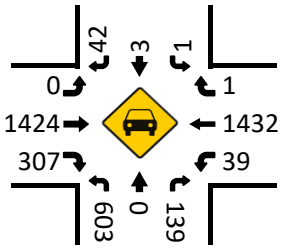
Signalized

	AM	NOON	PM
TEV	4129	0	4940
PHF	0.97		0.95

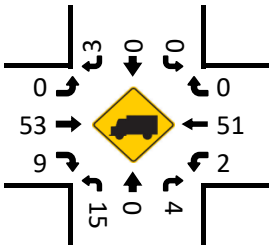
S Walker St/Shopping Center Dwy — NORTHBOUND

PM	934	0	615	0	135	PM
NOON	0	0	0	0	0	NOON
AM	360	0	618	0	143	AM
		0	2	0	1	

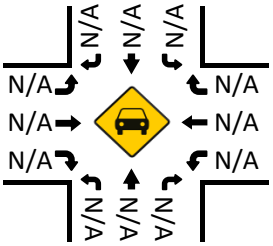
Cars (AM)



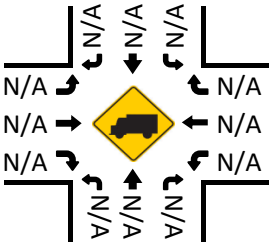
HT (AM)



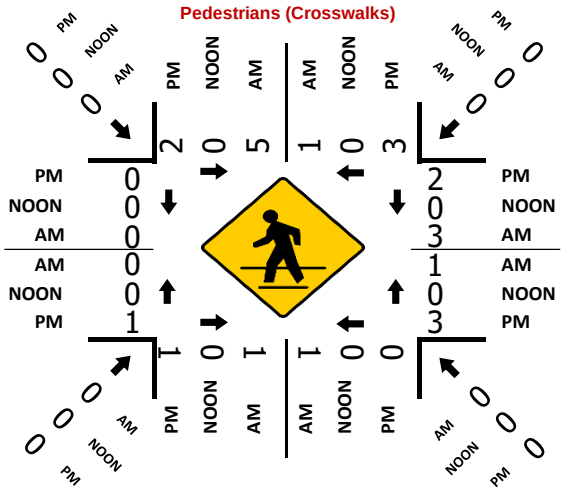
Cars (NOON)



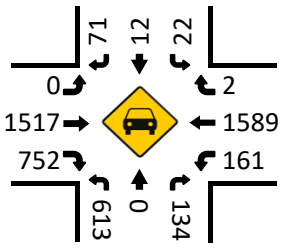
HT (NOON)



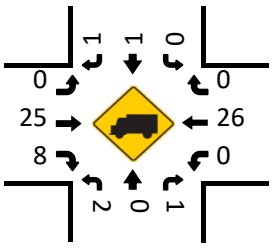
Pedestrians (Crosswalks)



Cars (PM)



HT (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: S Van Dorn St & EB Duke St Ramps/Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-005
Date: 6/12/2018

Total

NS/EW Streets:	S Van Dorn St				S Van Dorn St				EB Duke St Ramps/Dwy				EB Duke St Ramps/Dwy				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	4	166	0	0	0	50	3	0	27	1	47	0	4	0	9	0	311
6:15 AM	1	293	0	1	0	67	4	0	23	1	51	0	1	0	11	0	453
6:30 AM	6	387	1	0	1	67	5	0	17	3	61	0	2	0	13	0	563
6:45 AM	7	408	2	0	1	84	6	0	29	1	63	0	4	0	12	0	617
7:00 AM	4	432	0	0	0	72	9	0	43	1	55	0	1	5	19	0	641
7:15 AM	9	375	1	1	0	72	13	0	40	2	59	0	2	1	11	0	586
7:30 AM	6	374	0	0	2	78	13	0	39	2	89	0	0	1	12	0	616
7:45 AM	5	325	4	0	4	90	13	0	45	5	75	0	1	3	13	0	583
8:00 AM	10	303	3	0	3	123	10	1	30	1	76	0	3	2	8	0	573
8:15 AM	8	358	0	0	3	83	9	0	57	4	83	0	7	2	13	0	627
8:30 AM	10	346	0	1	5	109	12	1	34	5	78	0	8	1	10	0	620
8:45 AM	9	330	3	0	2	89	11	1	34	2	80	0	3	1	5	0	570
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	79	4097	14	3	21	984	108	3	418	28	817	0	36	16	136	0	6760
APPROACH %'s :	1.88%	97.71%	0.33%	0.07%	1.88%	88.17%	9.68%	0.27%	33.10%	2.22%	64.69%	0.00%	19.15%	8.51%	72.34%	0.00%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	26	1589	3	1	3	306	41	0	151	6	266	0	7	7	54	0	2460
PEAK HR FACTOR :	0.722	0.920	0.375	0.250	0.375	0.911	0.788	0.000	0.878	0.750	0.747	0.000	0.438	0.350	0.711	0.000	0.959
	0.928				0.941				0.813				0.680				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	17	205	4	2	12	279	36	0	23	6	50	0	3	0	9	0	646
3:45 PM	11	206	5	0	4	262	19	1	22	7	60	0	3	0	10	0	610
4:00 PM	13	201	2	2	10	247	34	0	39	9	55	0	2	2	9	0	625
4:15 PM	11	218	2	0	12	284	32	0	29	4	49	0	3	0	8	0	652
4:30 PM	13	215	3	0	15	242	32	0	39	5	60	0	4	1	4	0	633
4:45 PM	11	234	3	0	7	282	21	0	30	0	57	0	1	2	6	0	654
5:00 PM	12	238	1	0	11	264	28	0	25	10	57	0	1	0	5	0	652
5:15 PM	5	243	2	0	16	258	27	1	47	10	64	0	1	1	7	0	682
5:30 PM	10	208	1	0	11	207	31	0	41	5	53	0	1	1	12	0	581
5:45 PM	9	230	4	1	12	285	41	1	33	9	62	0	3	2	9	0	701
6:00 PM	11	219	6	0	9	216	22	0	44	11	67	0	7	1	10	0	623
6:15 PM	6	215	4	2	9	216	33	1	46	7	90	0	4	2	11	0	646
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	129	2632	37	7	128	3042	356	4	418	83	724	0	33	12	100	0	7705
APPROACH %'s :	4.60%	93.83%	1.32%	0.25%	3.63%	86.18%	10.08%	0.11%	34.12%	6.78%	59.10%	0.00%	22.76%	8.28%	68.97%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	41	930	9	0	49	1046	108	1	141	25	238	0	7	4	22	0	2621
PEAK HR FACTOR :	0.788	0.957	0.750	0.000	0.766	0.927	0.844	0.250	0.750	0.625	0.930	0.000	0.438	0.500	0.786	0.000	0.961
	0.976				0.971				0.835				0.917				

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Van Dorn St & EB Duke St Ramps/Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-005
Date: 6/12/2018

Cars

NS/EW Streets:	S Van Dorn St				S Van Dorn St				EB Duke St Ramps/Dwy				EB Duke St Ramps/Dwy				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	2	158	0	0	0	47	3	0	26	1	40	0	4	0	9	0	290
6:15 AM	0	281	0	1	0	65	3	0	23	1	45	0	1	0	11	0	431
6:30 AM	4	372	1	0	0	59	3	0	17	3	54	0	2	0	13	0	528
6:45 AM	5	391	2	0	0	81	3	0	29	1	55	0	4	0	12	0	583
7:00 AM	3	408	0	0	0	67	6	0	42	1	51	0	1	5	18	0	602
7:15 AM	6	361	0	1	0	67	11	0	39	2	52	0	2	1	11	0	553
7:30 AM	5	351	0	0	2	75	10	0	35	2	84	0	0	1	12	0	577
7:45 AM	3	309	4	0	4	85	12	0	45	5	72	0	1	3	13	0	556
8:00 AM	9	285	3	0	3	122	7	1	27	1	70	0	3	2	8	0	541
8:15 AM	6	335	0	0	3	79	5	0	57	4	74	0	6	2	13	0	584
8:30 AM	9	322	0	1	5	104	9	1	33	5	67	0	7	1	10	0	574
8:45 AM	8	267	3	0	2	83	9	1	33	2	72	0	3	1	5	0	489
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	60	3840	13	3	19	934	81	3	406	28	736	0	34	16	135	0	6308
APPROACH %'s :	1.53%	98.06%	0.33%	0.08%	1.83%	90.07%	7.81%	0.29%	34.70%	2.39%	62.91%	0.00%	18.38%	8.65%	72.97%	0.00%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	19	1511	2	1	2	290	30	0	145	6	242	0	7	7	53	0	2315
PEAK HR FACTOR :	0.79	0.926	0.250	0.250	0.250	0.895	0.682	0.000	0.863	0.750	0.720	0.000	0.438	0.350	0.736	0.000	0.961
	0.932				0.925				0.812				0.698				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	15	199	3	2	12	266	29	0	22	6	48	0	3	0	9	0	614
3:45 PM	11	201	5	0	4	253	15	1	20	7	55	0	3	0	9	0	584
4:00 PM	13	192	2	2	10	240	31	0	37	9	53	0	1	2	9	0	601
4:15 PM	11	210	2	0	11	274	29	0	25	4	43	0	2	0	8	0	619
4:30 PM	13	212	2	0	15	230	29	0	38	5	55	0	4	1	4	0	608
4:45 PM	11	224	3	0	7	273	16	0	27	0	55	0	1	2	6	0	625
5:00 PM	10	231	1	0	11	256	25	0	25	10	52	0	1	0	5	0	627
5:15 PM	5	237	2	0	16	251	23	1	44	10	60	0	1	1	7	0	658
5:30 PM	10	203	1	0	11	201	27	0	39	5	47	0	1	1	12	0	558
5:45 PM	9	225	4	1	12	279	37	1	31	9	60	0	2	2	9	0	681
6:00 PM	11	217	6	0	9	208	19	0	42	11	66	0	7	1	10	0	607
6:15 PM	6	210	4	2	9	212	29	1	44	7	87	0	4	2	11	0	628
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	125	2561	35	7	127	2943	309	4	394	83	681	0	30	12	99	0	7410
APPROACH %'s :	4.58%	93.88%	1.28%	0.26%	3.75%	86.99%	9.13%	0.12%	34.02%	7.17%	58.81%	0.00%	21.28%	8.51%	70.21%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	39	904	8	0	49	1010	93	1	134	25	222	0	7	4	22	0	2518
PEAK HR FACTOR :	0.75	0.954	0.667	0.000	0.766	0.925	0.802	0.250	0.761	0.625	0.925	0.000	0.438	0.500	0.786	0.000	0.957
	0.974				0.974				0.836				0.917				

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Van Dorn St & EB Duke St Ramps/Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-005
Date: 6/12/2018

HT

NS/EW Streets:	S Van Dorn St				S Van Dorn St				EB Duke St Ramps/Dwy				EB Duke St Ramps/Dwy				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	2	8	0	0	0	3	0	0	1	0	7	0	0	0	0	0	21
6:15 AM	1	12	0	0	0	2	1	0	0	0	6	0	0	0	0	0	22
6:30 AM	2	15	0	0	1	8	2	0	0	0	7	0	0	0	0	0	35
6:45 AM	2	17	0	0	1	3	3	0	0	0	8	0	0	0	0	0	34
7:00 AM	1	24	0	0	0	5	3	0	1	0	4	0	0	0	1	0	39
7:15 AM	3	14	1	0	0	5	2	0	1	0	7	0	0	0	0	0	33
7:30 AM	1	23	0	0	0	3	3	0	4	0	5	0	0	0	0	0	39
7:45 AM	2	16	0	0	0	5	1	0	0	0	3	0	0	0	0	0	27
8:00 AM	1	18	0	0	0	1	3	0	3	0	6	0	0	0	0	0	32
8:15 AM	2	23	0	0	0	4	4	0	0	0	9	0	1	0	0	0	43
8:30 AM	1	24	0	0	0	5	3	0	1	0	11	0	1	0	0	0	46
8:45 AM	1	63	0	0	0	6	2	0	1	0	8	0	0	0	0	0	81
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	19	257	1	0	2	50	27	0	12	0	81	0	2	0	1	0	452
APPROACH %'s :	6.86%	92.78%	0.36%	0.00%	2.53%	63.29%	34.18%	0.00%	12.90%	0.00%	87.10%	0.00%	66.67%	0.00%	33.33%	0.00%	
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	7	78	1	0	1	16	11	0	6	0	24	0	0	0	1	0	145
PEAK HR FACTOR :	0.583	0.813	0.250	0.000	0.250	0.800	0.917	0.000	0.375	0.000	0.750	0.000	0.000	0.000	0.250	0.000	0.929
	0.860				0.875				0.833				0.250				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	2	6	1	0	0	13	7	0	1	0	2	0	0	0	0	0	32
3:45 PM	0	5	0	0	0	9	4	0	2	0	5	0	0	0	1	0	26
4:00 PM	0	9	0	0	0	7	3	0	2	0	2	0	1	0	0	0	24
4:15 PM	0	8	0	0	1	10	3	0	4	0	6	0	1	0	0	0	33
4:30 PM	0	3	1	0	0	12	3	0	1	0	5	0	0	0	0	0	25
4:45 PM	0	10	0	0	0	9	5	0	3	0	2	0	0	0	0	0	29
5:00 PM	2	7	0	0	0	8	3	0	0	0	5	0	0	0	0	0	25
5:15 PM	0	6	0	0	0	7	4	0	3	0	4	0	0	0	0	0	24
5:30 PM	0	5	0	0	0	6	4	0	2	0	6	0	0	0	0	0	23
5:45 PM	0	5	0	0	0	6	4	0	2	0	2	0	1	0	0	0	20
6:00 PM	0	2	0	0	0	8	3	0	2	0	1	0	0	0	0	0	16
6:15 PM	0	5	0	0	0	4	4	0	2	0	3	0	0	0	0	0	18
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	4	71	2	0	1	99	47	0	24	0	43	0	3	0	1	0	295
APPROACH %'s :	5.19%	92.21%	2.60%	0.00%	0.68%	67.35%	31.97%	0.00%	35.82%	0.00%	64.18%	0.00%	75.00%	0.00%	25.00%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	2	26	1	0	0	36	15	0	7	0	16	0	0	0	0	0	103
PEAK HR FACTOR :	0.25	0.650	0.250	0.000	0.000	0.750	0.750	0.000	0.583	0.000	0.800	0.000	0.000	0.000	0.000	0.000	0.888
	0.725				0.850				0.821								

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Van Dorn St & EB Duke St Ramps/Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-005
Date: 6/12/2018

Bikes

NS/EW Streets:	S Van Dorn St				S Van Dorn St				EB Duke St Ramps/Dwy				EB Duke St Ramps/Dwy				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
APPROACH %'s :					0.00%	100.00%	0.00%	0.00%									
PEAK HR :	06:45 AM - 07:45 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1	2	0	0	1	2	1	0	1	0.5	0.5	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
APPROACH %'s :					0.00%	100.00%	0.00%	0.00%									
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services

Intersection Turning Movement Count

Location: S Van Dorn St & EB Duke St Ramps/Dwy **Project ID:** 18-11068-005
City: Alexandria **Date:** 6/12/2018

Pedestrians (Crosswalks)

NS/EW Streets:	S Van Dorn St		S Van Dorn St		EB Duke St Ramps/Dwy		EB Duke St Ramps/Dwy		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	1	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	3	0	0	0	0	3
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	0	0	0	0	0	0	1
8:00 AM	1	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	2	0	2
8:30 AM	0	1	0	0	1	0	0	1	3
8:45 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	1	2	0	4	1	0	2	1	11
APPROACH %'s :	33.33%	66.67%	0.00%	100.00%	100.00%	0.00%	66.67%	33.33%	
PEAK HR :	**06:45 AM - 07:45 AM**								TOTAL
PEAK HR VOL :	0	0	0	3	0	0	0	0	3
PEAK HR FACTOR :				0.250					0.250
			0.250						

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
3:30 PM	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	1	0	1
4:00 PM	0	0	0	0	0	3	0	1	4
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	2	0	0	0	0	0	2
4:45 PM	0	0	1	0	0	0	1	0	2
5:00 PM	0	0	0	0	0	0	2	0	2
5:15 PM	0	0	0	1	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	1	1	0	0	0	0	0	2
6:00 PM	0	0	0	1	0	1	0	0	2
6:15 PM	0	0	1	1	1	0	0	2	5
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	1	5	3	1	4	4	3	21
APPROACH %'s :	0.00%	100.00%	62.50%	37.50%	20.00%	80.00%	57.14%	42.86%	
PEAK HR :	**04:30 PM - 05:30 PM**								TOTAL
PEAK HR VOL :	0	0	3	1	0	0	3	0	7
PEAK HR FACTOR :			0.375	0.250			0.375		0.875
			0.500				0.375		

Prepared by National Data & Surveying Services

S Van Dorn St & EB Duke St Ramps/Dwy

Peak Hour Turning Movement Count

ID: 18-11068-005
City: Alexandria

Day: Tuesday
Date: 06/12/2018

PEAK HOURS	COUNT PERIODS
06:45 AM - 07:45 AM	06:00 AM - 09:00 AM
NONE	NONE
04:30 PM - 05:30 PM	03:30 PM - 06:30 PM

S Van Dorn St — SOUTHBOUND

AM	41	306	3	0	1794	AM
NOON	0	0	0	0	0	NOON
PM	108	1046	49	1	1094	PM
	1	2	1	0		

EB Duke St Ramps/Dwy — EASTBOUND

AM	NOON	PM		
74	0	153		
0	0	0	0	
151	0	141	1	
6	0	25	0.5	
266	0	238	0.5	
AM	NOON	PM		

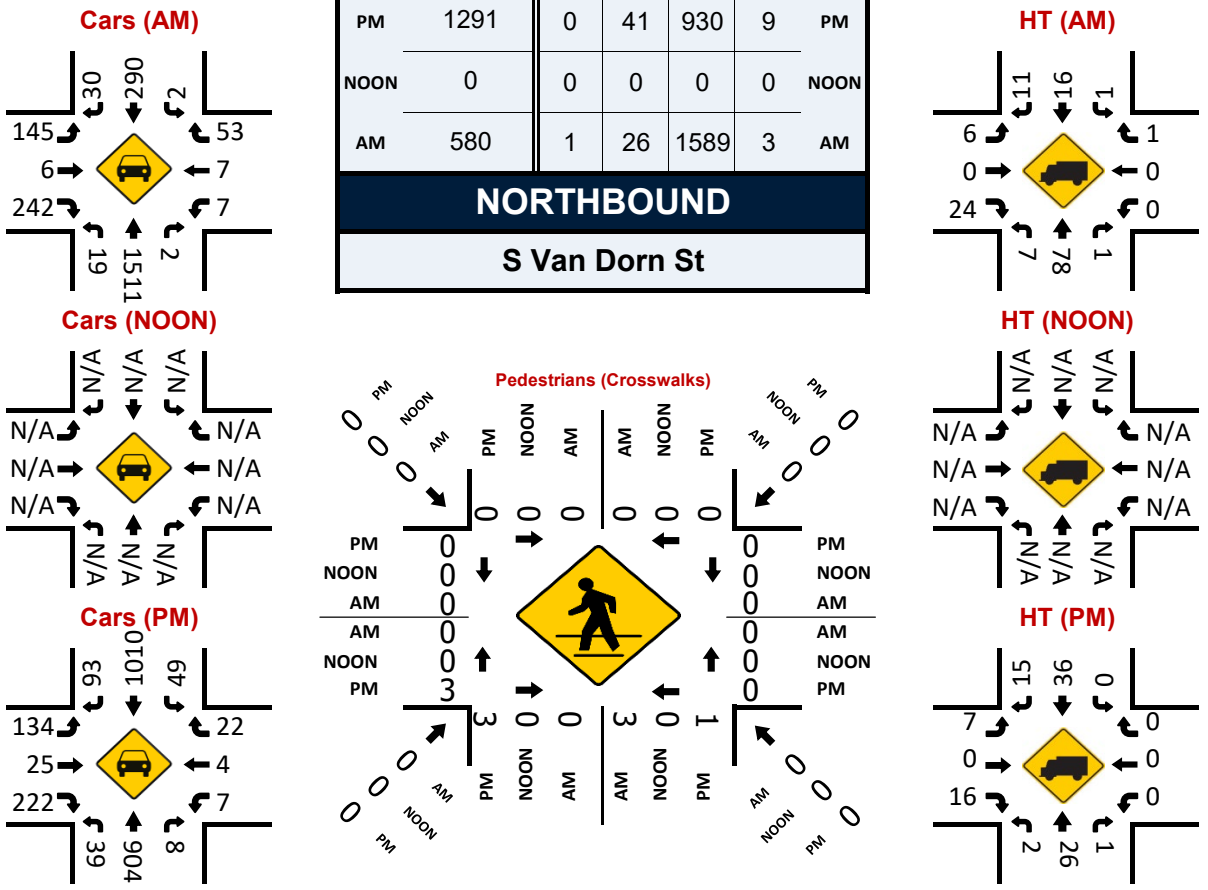
EB Duke St Ramps/Dwy — WESTBOUND

PM	NOON	AM		
0	22	0	54	
1	4	0	7	
0	7	0	7	
0	0	0	0	
	83	0	12	
PM	NOON	AM		

CONTROL			
Signalized			
TEV	2460	0	2621
	AM	NOON	PM
PHF	0.96		0.96

S Van Dorn St — NORTHBOUND

PM	1291	0	41	930	9	PM
NOON	0	0	0	0	0	NOON
AM	580	1	26	1589	3	AM
		0	1	2	0	



National Data & Surveying Services

Intersection Turning Movement Count

Location: N Van Dorn St & Duke St Ramps/Shopping Mall Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-006
Date: 6/12/2018

Total

NS/EW Streets:	N Van Dorn St				N Van Dorn St					Duke St Ramps/Shopping Mall Dwy				Duke St Ramps/Shopping Mall Dwy				
AM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND				
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	12	143	48	1	0	75	3	0	38	0	0	11	0	5	1	15	0	352
6:15 AM	9	236	76	0	0	93	1	0	38	0	0	7	0	11	5	17	0	493
6:30 AM	13	355	59	0	0	109	3	0	45	0	0	6	0	5	6	20	0	621
6:45 AM	9	372	67	0	0	105	1	0	39	0	0	10	0	11	5	32	0	651
7:00 AM	6	375	81	0	0	123	1	0	59	2	0	5	0	9	3	28	0	692
7:15 AM	12	353	70	0	0	132	2	0	66	0	0	13	0	8	4	27	0	687
7:30 AM	9	327	85	0	0	126	3	0	50	3	0	8	0	7	3	33	0	654
7:45 AM	7	311	74	2	0	146	3	0	59	2	0	8	0	7	5	37	0	661
8:00 AM	10	270	63	0	0	176	2	0	57	1	0	8	0	8	3	30	0	628
8:15 AM	6	341	79	1	0	120	4	0	42	0	0	9	0	7	7	37	0	653
8:30 AM	5	297	88	0	0	142	5	0	42	1	0	11	0	11	4	21	0	627
8:45 AM	10	271	79	0	1	120	3	0	35	1	0	13	0	7	5	21	0	566
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	108	3651	869	4	1	1467	31	0	570	10	0	109	0	96	51	318	0	7285
APPROACH %'s :	2.33%	78.82%	18.76%	0.09%	0.05%	70.90%	1.50%	0.00%	27.55%	8.40%	0.00%	91.60%	0.00%	20.65%	10.97%	68.39%	0.00%	
PEAK HR :	07:00 AM - 08:00 AM																	TOTAL
PEAK HR VOL :	34	1366	310	2	0	527	9	0	234	7	0	34	0	31	15	125	0	2694
PEAK HR FACTOR :	0.708	0.911	0.912	0.250	0.000	0.902	0.750	0.000	0.886	0.583	0.000	0.654	0.000	0.861	0.750	0.845	0.000	0.973
	0.926				0.925					0.788				0.872				

PM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND				
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	5	137	83	0	0	336	9	0	62	5	0	17	0	14	9	16	0	693
3:45 PM	9	157	81	2	0	320	15	0	58	2	0	18	1	7	6	15	0	691
4:00 PM	7	156	86	0	0	348	8	0	79	7	0	22	0	8	7	13	0	741
4:15 PM	12	154	82	0	0	357	7	0	63	3	0	24	0	10	10	19	0	741
4:30 PM	9	183	63	3	0	305	5	0	57	8	0	20	0	10	10	14	0	687
4:45 PM	11	162	84	0	0	342	3	0	64	5	0	20	0	9	4	17	0	721
5:00 PM	9	197	84	1	0	345	8	0	65	1	0	19	0	12	8	19	0	768
5:15 PM	12	199	83	1	0	351	6	0	69	3	0	17	1	10	6	21	0	779
5:30 PM	10	163	78	1	0	273	7	0	59	6	0	24	1	11	5	33	0	671
5:45 PM	10	173	75	2	0	339	7	0	40	3	0	14	0	11	7	22	0	703
6:00 PM	11	162	97	0	0	281	9	0	60	6	0	20	0	7	5	21	0	679
6:15 PM	10	191	87	1	0	284	15	0	56	4	0	20	0	11	11	14	0	704
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	115	2034	983	11	0	3881	99	0	732	53	0	235	3	120	88	224	0	8578
APPROACH %'s :	3.66%	64.72%	31.28%	0.35%	0.00%	82.36%	2.10%	0.00%	15.53%	18.21%	0.00%	80.76%	1.03%	27.78%	20.37%	51.85%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																	TOTAL
PEAK HR VOL :	41	741	314	5	0	1343	22	0	255	17	0	76	1	41	28	71	0	2955
PEAK HR FACTOR :	0.854	0.931	0.935	0.417	0.000	0.957	0.688	0.000	0.924	0.531	0.000	0.950	0.250	0.854	0.700	0.845	0.000	0.948
	0.933				0.951					0.839				0.897				

National Data & Surveying Services

Intersection Turning Movement Count

Location: N Van Dorn St & Duke St Ramps/Shopping Mall Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-006
Date: 6/12/2018

Cars

NS/EW Streets:	N Van Dorn St				N Van Dorn St					Duke St Ramps/Shopping Mall Dwy				Duke St Ramps/Shopping Mall Dwy				
AM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND				
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	11	139	45	0	0	74	3	0	31	0	0	5	0	3	1	14	0	326
6:15 AM	7	233	69	0	0	92	1	0	37	0	0	3	0	10	1	17	0	470
6:30 AM	11	348	52	0	0	105	2	0	43	0	0	2	0	3	4	19	0	589
6:45 AM	8	362	60	0	0	101	1	0	37	0	0	5	0	10	1	32	0	617
7:00 AM	5	361	73	0	0	119	1	0	57	2	0	1	0	7	1	24	0	651
7:15 AM	9	344	65	0	0	130	1	0	62	0	0	6	0	6	2	27	0	652
7:30 AM	6	314	76	0	0	122	3	0	48	3	0	5	0	5	2	32	0	616
7:45 AM	4	301	69	2	0	143	2	0	57	1	0	3	0	6	2	34	0	624
8:00 AM	7	255	61	0	0	174	2	0	54	0	0	4	0	7	1	29	0	594
8:15 AM	4	326	73	1	0	115	3	0	38	0	0	2	0	7	2	36	0	607
8:30 AM	3	282	80	0	0	140	5	0	39	0	0	3	0	10	1	21	0	584
8:45 AM	6	235	57	0	0	115	2	0	33	1	0	9	0	6	3	19	0	486
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	81	3500	780	3	0	1430	26	0	536	7	0	48	0	80	21	304	0	6816
APPROACH %'s :	1.86%	80.20%	17.87%	0.07%	0.00%	71.79%	1.31%	0.00%	26.91%	12.73%	0.00%	87.27%	0.00%	19.75%	5.19%	75.06%	0.00%	
PEAK HR :	07:00 AM - 08:00 AM																	TOTAL
PEAK HR VOL :	24	1320	283	2	0	514	7	0	224	6	0	15	0	24	7	117	0	2543
PEAK HR FACTOR :	0.67	0.914	0.931	0.250	0.000	0.899	0.583	0.000	0.903	0.500	0.000	0.625	0.000	0.857	0.875	0.860	0.000	0.975
	0.928				0.922					0.656				0.881				

PM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND				
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	2	136	81	0	0	318	9	0	59	4	0	12	0	14	5	14	0	654
3:45 PM	4	155	77	2	0	312	14	0	56	2	0	11	1	7	4	15	0	660
4:00 PM	4	154	80	0	0	343	7	0	76	7	0	14	0	8	2	13	0	708
4:15 PM	8	152	79	0	0	347	6	0	61	2	0	18	0	10	7	19	0	709
4:30 PM	4	182	61	3	0	297	4	0	54	6	0	11	0	10	6	14	0	652
4:45 PM	4	161	80	0	0	332	3	0	60	5	0	11	0	9	0	17	0	682
5:00 PM	6	196	81	1	0	339	7	0	62	0	0	11	0	12	3	19	0	737
5:15 PM	7	197	82	1	0	345	5	0	68	3	0	12	1	9	2	21	0	753
5:30 PM	5	163	75	1	0	271	5	0	57	5	0	14	1	11	3	33	0	644
5:45 PM	6	172	74	2	0	335	6	0	38	3	0	6	0	11	2	22	0	677
6:00 PM	7	162	97	0	0	277	8	0	58	5	0	11	0	7	2	21	0	655
6:15 PM	5	190	86	1	0	283	14	0	55	4	0	11	0	11	6	14	0	680
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	62	2020	953	11	0	3799	88	0	704	46	0	142	3	119	42	222	0	8211
APPROACH %'s :	2.04%	66.32%	31.29%	0.36%	0.00%	82.75%	1.92%	0.00%	15.33%	24.08%	0.00%	74.35%	1.57%	31.07%	10.97%	57.96%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																	TOTAL
PEAK HR VOL :	21	736	304	5	0	1313	19	0	244	14	0	45	1	40	11	71	0	2824
PEAK HR FACTOR :	0.75	0.934	0.927	0.417	0.000	0.951	0.679	0.000	0.897	0.583	0.000	0.938	0.250	0.833	0.458	0.845	0.000	0.938
	0.929				0.943					0.882				0.897				

National Data & Surveying Services

Intersection Turning Movement Count

Location: N Van Dorn St & Duke St Ramps/Shopping Mall Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-006
Date: 6/12/2018

HT

NS/EW Streets:	N Van Dorn St				N Van Dorn St					Duke St Ramps/Shopping Mall Dwy				Duke St Ramps/Shopping Mall Dwy					
AM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND					
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	WT2	TOTAL
6:00 AM	1	4	3	1	0	1	0	0	7	0	0	6	0	2	0	1	0	0	26
6:15 AM	2	3	7	0	0	1	0	0	1	0	0	4	0	1	4	0	0	0	23
6:30 AM	2	7	7	0	0	4	1	0	2	0	0	4	0	2	2	1	0	0	32
6:45 AM	1	10	7	0	0	4	0	0	2	0	0	5	0	1	4	0	0	0	34
7:00 AM	1	14	8	0	0	4	0	0	2	0	0	4	0	2	2	4	0	0	41
7:15 AM	3	9	5	0	0	2	1	0	4	0	0	7	0	2	2	0	0	0	35
7:30 AM	3	13	9	0	0	4	0	0	2	0	0	3	0	2	1	1	0	0	38
7:45 AM	3	10	5	0	0	3	1	0	2	1	0	5	0	1	3	3	0	0	37
8:00 AM	3	15	2	0	0	2	0	0	3	1	0	4	0	1	2	1	0	0	34
8:15 AM	2	15	6	0	0	5	1	0	4	0	0	7	0	0	5	1	0	0	46
8:30 AM	2	15	8	0	0	2	0	0	3	1	0	8	0	1	3	0	0	0	43
8:45 AM	4	36	22	0	1	5	1	0	2	0	0	4	0	1	2	2	0	0	80
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	WT2	TOTAL
TOTAL VOLUMES :	27	151	89	1	1	37	5	0	34	3	0	61	0	16	30	14	0	0	469
APPROACH %'s :	10.07%	56.34%	33.21%	0.37%	1.30%	48.05%	6.49%	0.00%	44.16%	4.69%	0.00%	95.31%	0.00%	26.67%	50.00%	23.33%	0.00%	0.00%	
PEAK HR :	07:00 AM - 08:00 AM																		TOTAL
PEAK HR VOL :	10	46	27	0	0	13	2	0	10	1	0	19	0	7	8	8	0	0	151
PEAK HR FACTOR :	0.833	0.821	0.750	0.000	0.000	0.813	0.500	0.000	0.625	0.250	0.000	0.679	0.000	0.875	0.667	0.500	0.000	0.000	0.921
	0.830				0.893					0.714				0.719					

PM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND					
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	WT2	TOTAL
3:30 PM	3	1	2	0	0	18	0	0	3	1	0	5	0	0	4	2	0	0	39
3:45 PM	5	2	4	0	0	8	1	0	2	0	0	7	0	0	2	0	0	0	31
4:00 PM	3	2	6	0	0	5	1	0	3	0	0	8	0	0	5	0	0	0	33
4:15 PM	4	2	3	0	0	10	1	0	2	1	0	6	0	0	3	0	0	0	32
4:30 PM	5	1	2	0	0	8	1	0	3	2	0	9	0	0	4	0	0	0	35
4:45 PM	7	1	4	0	0	10	0	0	4	0	0	9	0	0	4	0	0	0	39
5:00 PM	3	1	3	0	0	6	1	0	3	1	0	8	0	0	5	0	0	0	31
5:15 PM	5	2	1	0	0	6	1	0	1	0	0	5	0	1	4	0	0	0	26
5:30 PM	5	0	3	0	0	2	2	0	2	1	0	10	0	0	2	0	0	0	27
5:45 PM	4	1	1	0	0	4	1	0	2	0	0	8	0	0	5	0	0	0	26
6:00 PM	4	0	0	0	0	4	1	0	2	1	0	9	0	0	3	0	0	0	24
6:15 PM	5	1	1	0	0	1	1	0	1	0	0	9	0	0	5	0	0	0	24
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	WT2	TOTAL
TOTAL VOLUMES :	53	14	30	0	0	82	11	0	28	7	0	93	0	1	46	2	0	0	367
APPROACH %'s :	54.64%	14.43%	30.93%	0.00%	0.00%	67.77%	9.09%	0.00%	23.14%	7.00%	0.00%	93.00%	0.00%	2.04%	93.88%	4.08%	0.00%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																		TOTAL
PEAK HR VOL :	20	5	10	0	0	30	3	0	11	3	0	31	0	1	17	0	0	0	131
PEAK HR FACTOR :	0.71	0.625	0.625	0.000	0.000	0.750	0.750	0.000	0.688	0.375	0.000	0.861	0.000	0.250	0.850	0.000	0.000	0.000	0.840
	0.729				0.786					0.773				0.900					

National Data & Surveying Services

Intersection Turning Movement Count

Location: N Van Dorn St & Duke St Ramps/Shopping Mall Dwy
City: Alexandria
Control: Signalized

Project ID: 18-11068-006
Date: 6/12/2018

Bikes

NS/EW Streets:	N Van Dorn St				N Van Dorn St					Duke St Ramps/Shopping Mall Dwy				Duke St Ramps/Shopping Mall Dwy				
AM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND				
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
APPROACH %'s :					0.00%	100.00%	0.00%	0.00%	0.00%									
PEAK HR :	**07:00 AM - 08:00 AM**																	TOTAL
PEAK HR VOL :	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250
							0.250											

PM	NORTHBOUND				SOUTHBOUND					EASTBOUND				WESTBOUND				
	1	1.5	0.5	0	0	2	0	0	0	1.5	0	1.5	0	1	1	1	0	
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
3:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	SR2	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
APPROACH %'s :					0.00%	100.00%	0.00%	0.00%	0.00%									
PEAK HR :	**04:30 PM - 05:30 PM**																	TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services

Intersection Turning Movement Count

Location: N Van Dorn St & Duke St Ramps/Shopping Mall Dwy
City: Alexandria
Project ID: 18-11068-006
Date: 6/12/2018

Pedestrians (Crosswalks)

NS/EW Streets:	N Van Dorn St		N Van Dorn St		Duke St Ramps/Shopping Mall Dwy		Duke St Ramps/Shopping Mall Dwy				
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		WEST LEG 2		
	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	1	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	1	0	0	1	0	0	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	1	1	0	0	0	0	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	1	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	2	1	1	2	0	0	6
APPROACH %'s :					66.67%	33.33%	33.33%	66.67%			
PEAK HR :	07:00 AM - 08:00 AM										TOTAL
PEAK HR VOL :	0	0	0	0	1	1	0	0	0	0	2
PEAK HR FACTOR :					0.250	0.250					0.250
					0.250						

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		WEST LEG 2		
	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	TOTAL
3:30 PM	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	2	0	1	0	3
4:00 PM	0	0	0	0	0	2	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	1	0	0	0	0	2	0	0	3
4:45 PM	0	0	0	0	0	0	1	0	1	0	2
5:00 PM	0	0	0	0	0	0	2	1	1	0	4
5:15 PM	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	1	0	1	0	0	2
5:45 PM	0	0	1	0	1	0	0	0	0	0	2
6:00 PM	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	1	0	0	1	0	0	2
	EB	WB	EB	WB	NB	SB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	2	0	2	3	5	5	3	0	20
APPROACH %'s :			100.00%	0.00%	40.00%	60.00%	50.00%	50.00%	100.00%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM										TOTAL
PEAK HR VOL :	0	0	1	0	0	0	3	3	2	0	9
PEAK HR FACTOR :			0.250				0.375	0.375	0.500		0.563
			0.250				0.500		0.500		

Prepared by National Data & Surveying Services

N Van Dorn St & Duke St Ramps/Shopping Mall Dwy

Peak Hour Turning Movement Count

ID: 18-11068-006
City: Alexandria

Day: Tuesday
Date: 06/12/2018

PEAK HOURS

AM	07:00 AM - 08:00 AM
NOON	NONE
PM	04:30 PM - 05:30 PM

COUNT PERIODS

AM	06:00 AM - 09:00 AM
NOON	NONE
PM	03:30 PM - 06:30 PM

N Van Dorn St — SOUTHBOUND

AM	9	527	0	0	1498	AM
NOON	0	0	0	0	0	NOON
PM	22	1343	0	0	829	PM
	0	2	0	0		

Duke St Ramps/Shopping Mall Dwy — EASTBOUND

AM	NOON	PM	
58	0	92	
0	0	1	0
7	0	17	1.5
0	0	0	0
34	0	76	1.5

Duke St Ramps/Shopping Mall Dwy — WESTBOUND

PM	NOON	AM	
71	0	125	1
28	0	15	1
41	0	31	1
0	0	0	0
314	0	310	

CONTROL

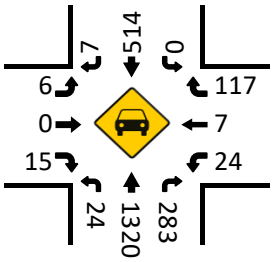
Signalized

	AM	NOON	PM
TEV	2460	0	2700
PHF	0.97		0.95

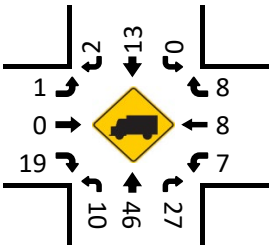
N Van Dorn St — NORTHBOUND

PM	1465	5	41	741	314	PM
NOON	0	0	0	0	0	NOON
AM	594	2	34	1366	310	AM
		0	1	1.5	0.5	

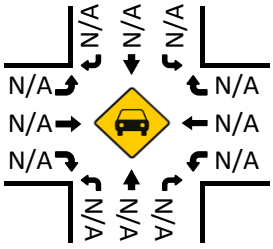
Cars (AM)



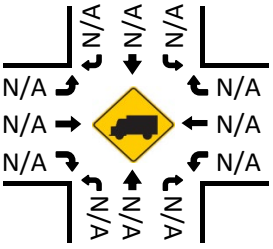
HT (AM)



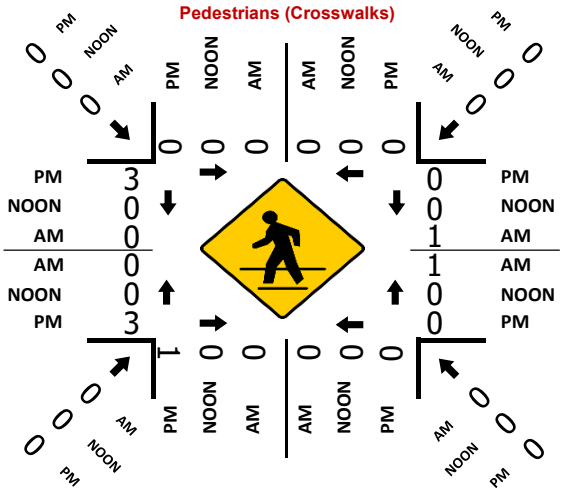
Cars (NOON)



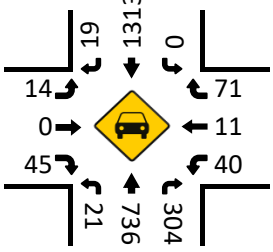
HT (NOON)



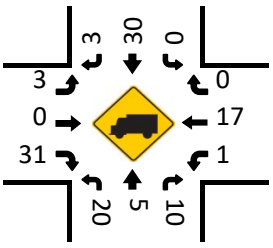
Pedestrians (Crosswalks)



Cars (PM)



HT (PM)



APPENDIX C:

Level of Service Definitions

APPENDIX C: LEVEL OF SERVICE DEFINITIONS

All capacity analyses are based on the procedures specified by the Transportation Research Board, Special Report 209: *Highway Capacity Manual (HCM)*, 2000. Levels of service (LOS) range from A to F. A brief description of each level of service for signalized and unsignalized intersections is provided below.

Signalized Intersections: Level of service is based upon the traffic volume present in each lane on the roadway, the capacity of each lane at the intersection and the delay associated with each directional movement. The levels of service for signalized intersections are defined below:

- Level of Service A describes operations with very low average delay per vehicle, i.e., less than 10.0 seconds. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop. Short signal cycle lengths may also contribute to low delay.
- Level of Service B describes operations with average delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
- Level of Service C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level although many still pass through the intersection without stopping. This is generally considered the lower end of the range of the acceptable level of service in rural areas.
- Level of Service D describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high traffic volumes as compared to the roadway capacity. Many vehicles are required to stop and the number of vehicles that do not have to stop declines. Individual signal cycle failures, where all waiting vehicles do not clear the intersection during a single green time, are noticeable. This is generally considered the lower end of the range of the acceptable level of service in urban areas.
- Level of Service E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high traffic volumes. Individual cycle failures are frequent occurrences. LOS E has been set as the limit of acceptable conditions.
- Level of Service F describes operations with average delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when traffic arrives at a flow rate that exceeds the capacity of the intersection. It may also occur at high volumes with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such delays.

Unsignalized Intersections: At an unsignalized intersection, the major street through traffic and right-turns are assumed to operate unimpeded and therefore receive no level of service rating. The level of service for the minor street and the major street left-turn traffic is dependent on the volume and capacity of the available lanes, and, the number and frequency of acceptable gaps in the major street traffic to make a conflicting turn. The level of service grade is provided for each conflicting movement at an unsignalized intersection and is based on the total average delay experienced by each vehicle. The delay includes the time it takes a vehicle to move from the back of a queue through the intersection.

The unsignalized intersection level of service analysis does not account for variations in driver behavior or the effects of nearby traffic signals. Therefore, the results from this analysis usually indicate worse levels of service than may be experienced in the field. The unsignalized intersection level of service descriptions are provided below:

- Level of Service A. Describes operations where there is very little to no conflicting traffic for a minor side street movement, i.e., an average total delay of less than 10.0 seconds per vehicle.
- Level of Service B. Describes operations with average total delay in the range of 10.1 to 15.0 seconds per vehicle.
- Level of Service C. Describes operations with average total delay in the range of 15.1 to 25.0 second per vehicle.
- Level of Service D. Describes operations with average total delay in the range of 25.1 to 35.0 seconds per vehicle.
- Level of Service E. Describes operations with average total delay in the range of 35.1 to 50.0 seconds per vehicle.
- Level of Service F. Describes operations with average total delay of 50 seconds per vehicle. LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through or enter a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queuing on the minor approaches. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal driver behavior.

APPENDIX D:

Intersection Capacity Analysis - Existing Conditions (2018)

Queues
1: Walker Street/Sears Entr. & Duke Street

01/18/2019

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1492	326	42	1529	637	147	1	3	46
v/c Ratio	0.41	0.31	0.46	0.51	0.83	0.32	0.01	0.03	0.20
Control Delay	18.1	2.9	80.2	18.8	61.6	8.0	64.0	64.3	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	2.9	80.2	18.8	61.6	8.0	64.0	64.3	5.2
Queue Length 50th (ft)	210	0	38	283	285	0	1	3	0
Queue Length 95th (ft)	316	54	79	432	344	54	7	13	7
Internal Link Dist (ft)	1533			1138				338	
Turn Bay Length (ft)		310	345			385			
Base Capacity (vph)	3671	1051	103	3011	882	512	94	99	285
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.31	0.41	0.51	0.72	0.29	0.01	0.03	0.16

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1447	316	41	1483	0	618	0	143	1	3	45
Future Volume (vph)	0	1447	316	41	1483	0	618	0	143	1	3	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Lane Util. Factor		0.86	1.00	1.00	0.91		0.97		1.00	0.95	0.95	0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		6285	1568	1719	5036		3433		1568	1715	1805	2656
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		6285	1568	1719	5036		3433		1568	1715	1805	2656
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1492	326	42	1529	0	637	0	147	1	3	46
RTOR Reduction (vph)	0	0	150	0	0	0	0	0	114	0	0	44
Lane Group Flow (vph)	0	1492	176	42	1529	0	637	0	33	1	3	2
Heavy Vehicles (%)	0%	4%	3%	5%	3%	0%	2%	0%	3%	0%	0%	7%
Turn Type		NA	Perm	Prot	NA		Prot		Perm	Split	NA	custom
Protected Phases		2		1	6		8			4	4	5
Permitted Phases			2						8			4
Actuated Green, G (s)		75.4	75.4	6.3	77.4		31.3		31.3	1.4	1.4	6.0
Effective Green, g (s)		75.4	75.4	6.3	77.4		31.3		31.3	1.4	1.4	6.0
Actuated g/C Ratio		0.54	0.54	0.04	0.55		0.22		0.22	0.01	0.01	0.04
Clearance Time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Vehicle Extension (s)		3.0	3.0	2.0	2.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		3384	844	77	2784		767		350	17	18	233
v/s Ratio Prot		0.24		c0.02	c0.30		c0.19			0.00	c0.00	0.00
v/s Ratio Perm			0.11						0.02			0.00
v/c Ratio		0.44	0.21	0.55	0.55		0.83		0.09	0.06	0.17	0.01
Uniform Delay, d1		19.5	16.8	65.4	20.1		51.8		43.1	68.6	68.7	64.2
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		0.4	0.6	4.2	0.8		7.6		0.1	1.5	4.3	0.0
Delay (s)		20.0	17.3	69.6	20.9		59.4		43.2	70.1	73.1	64.2
Level of Service		B	B	E	C		E		D	E	E	E
Approach Delay (s)		19.5			22.2			56.4			64.8	
Approach LOS		B			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	178	349	19	48	30	1429	14	390	47
v/c Ratio	0.77	0.66	0.12	0.13	0.04	0.53	0.24	0.17	0.04
Control Delay	71.5	11.7	43.9	5.4	4.5	7.3	24.4	10.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.5	11.7	43.9	5.4	4.5	7.3	24.4	10.1	0.0
Queue Length 50th (ft)	143	9	14	0	5	219	5	65	0
Queue Length 95th (ft)	218	100	36	20	15	313	24	99	0
Internal Link Dist (ft)		309	138			713		891	
Turn Bay Length (ft)	100				150		200		250
Base Capacity (vph)	290	582	195	436	690	2714	58	2248	1269
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.60	0.10	0.11	0.04	0.53	0.24	0.17	0.04

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	12	323	11	8	46	29	1365	7	13	374	45
Future Volume (vph)	171	12	323	11	8	46	29	1365	7	13	374	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	6.0	6.0			6.0	6.0	0.0	1.0		1.0	1.0	-1.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.99			1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86			1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1661	1438			1871	1723	1499	3535		1796	3487	1269
Flt Permitted	0.75	1.00			0.46	1.00	0.49	1.00		0.05	1.00	1.00
Satd. Flow (perm)	1303	1438			878	1723	774	3535		90	3487	1269
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	178	12	336	11	8	48	30	1422	7	14	390	47
RTOR Reduction (vph)	0	276	0	0	0	39	0	0	0	0	0	0
Lane Group Flow (vph)	178	73	0	0	19	9	30	1429	0	14	390	47
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	4%	0%	7%	9%	0%	0%	21%	6%	0%	0%	3%	24%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	Free
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2		2	1 3			1		Free
Actuated Green, G (s)	23.2	23.2			23.2	23.2	89.8	94.8		78.8	78.8	130.0
Effective Green, g (s)	23.2	23.2			23.2	23.2	99.8	99.8		83.8	83.8	130.0
Actuated g/C Ratio	0.18	0.18			0.18	0.18	0.77	0.77		0.64	0.64	1.00
Clearance Time (s)	6.0	6.0			6.0	6.0	5.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0			0.2	0.2	
Lane Grp Cap (vph)	232	256			156	307	683	2713		58	2247	1269
v/s Ratio Prot		0.05					0.01	c0.40			0.11	
v/s Ratio Perm	c0.14				0.02	0.00	0.03			0.16		0.04
v/c Ratio	0.77	0.29			0.12	0.03	0.04	0.53		0.24	0.17	0.04
Uniform Delay, d1	50.8	46.2			44.8	44.1	3.7	5.9		9.7	9.2	0.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	14.1	0.6			0.4	0.0	0.0	0.2		9.6	0.2	0.1
Delay (s)	64.9	46.8			45.2	44.1	3.7	6.1		19.3	9.4	0.1
Level of Service	E	D			D	D	A	A		B	A	A
Approach Delay (s)		52.9			44.4			6.0			8.7	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	5	35	30	18	140	33	1274	307	580
v/c Ratio	0.07	0.20	0.18	0.15	0.48	0.06	0.45	0.25	0.29
Control Delay	55.6	2.5	51.5	51.7	13.9	4.1	6.1	2.1	14.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.6	2.5	51.5	51.7	13.9	4.1	6.1	2.1	14.9
Queue Length 50th (ft)	4	0	21	13	0	6	190	15	133
Queue Length 95th (ft)	17	0	52	37	61	14	230	44	173
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	239	284	283	204	393	600	2805	1215	1984
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.12	0.11	0.09	0.36	0.06	0.45	0.25	0.29

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	0	33	29	18	137	32	1249	301	0	568	0
Future Volume (vph)	6	0	33	29	18	137	32	1249	301	0	568	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	0.0	1.5	6.5		1.5	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1276	969		1583	1141	1553	1367	3641	1583		3451	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.37	1.00	1.00		1.00	
Satd. Flow (perm)	1276	969		1583	1141	1553	536	3641	1583		3451	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	6	0	34	30	18	140	33	1274	307	0	580	0
RTOR Reduction (vph)	0	34	0	0	0	125	0	0	80	0	0	0
Lane Group Flow (vph)	5	1	0	30	18	15	33	1274	227	0	580	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	33%	0%	58%	14%	61%	4%	34%	4%	7%	0%	2%	17%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm		NA	
Protected Phases	4	4		3	3		1	2 1			2	
Permitted Phases						3	2 1		2 1			
Actuated Green, G (s)	4.2	4.2		13.0	13.0	13.0	80.3	85.3	85.3		61.8	
Effective Green, g (s)	4.2	4.2		13.0	13.0	13.0	90.3	90.3	80.3		66.8	
Actuated g/C Ratio	0.04	0.04		0.11	0.11	0.11	0.75	0.75	0.67		0.56	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.0				6.5	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0				2.5	
Lane Grp Cap (vph)	44	33		171	123	168	566	2739	1059		1921	
v/s Ratio Prot	c0.00	0.00		c0.02	0.02		0.01	c0.35			0.17	
v/s Ratio Perm						0.01	0.03		0.14			
v/c Ratio	0.11	0.04		0.18	0.15	0.09	0.06	0.47	0.21		0.30	
Uniform Delay, d1	56.1	55.9		48.6	48.5	48.2	4.2	5.7	7.7		14.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.8	0.3		0.4	0.4	0.2	0.0	0.0	0.0		0.4	
Delay (s)	56.9	56.3		49.0	48.9	48.3	4.2	5.7	7.7		14.6	
Level of Service	E	E		D	D	D	A	A	A		B	
Approach Delay (s)		56.4			48.5			6.1			14.6	
Approach LOS		E			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Walker Street/Sears Entr. & Duke Street

01/18/2019

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1581	724	156	1668	626	133	15	16	67
v/c Ratio	0.65	0.65	0.93	0.74	0.84	0.30	0.17	0.18	0.20
Control Delay	30.9	4.9	118.4	29.0	66.9	8.5	72.4	72.6	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.9	4.9	118.4	29.0	66.9	8.5	72.4	72.6	12.2
Queue Length 50th (ft)	351	0	154	484	303	0	14	15	0
Queue Length 95th (ft)	426	88	#296	603	364	54	41	43	24
Internal Link Dist (ft)	1533			1138				338	
Turn Bay Length (ft)		310	345			385			
Base Capacity (vph)	2445	1117	169	2249	846	490	145	149	492
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.65	0.92	0.74	0.74	0.27	0.10	0.11	0.14

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1534	702	151	1618	0	607	0	129	22	8	65
Future Volume (vph)	0	1534	702	151	1618	0	607	0	129	22	8	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Lane Util. Factor		0.86	1.00	1.00	0.91		0.97		1.00	0.95	0.95	0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	0.98	1.00
Satd. Flow (prot)		4878	1509	1770	3900		3433		1583	1715	1761	2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00	0.95	0.98	1.00
Satd. Flow (perm)		4878	1509	1770	3900		3433		1583	1715	1761	2787
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1581	724	156	1668	0	626	0	133	23	8	67
RTOR Reduction (vph)	0	0	373	0	0	0	0	0	104	0	0	63
Lane Group Flow (vph)	0	1581	351	156	1668	0	626	0	29	15	16	4
Heavy Vehicles (%)	0%	34%	7%	2%	33%	0%	2%	0%	2%	0%	0%	2%
Turn Type		NA	Perm	Prot	NA		Prot		Perm	Split	NA	custom
Protected Phases		2		1	6		8			4	4	5
Permitted Phases			2						8			4
Actuated Green, G (s)		72.7	72.7	14.3	82.7		32.6		32.6	4.8	4.8	9.4
Effective Green, g (s)		72.7	72.7	14.3	82.7		32.6		32.6	4.8	4.8	9.4
Actuated g/C Ratio		0.48	0.48	0.10	0.55		0.22		0.22	0.03	0.03	0.06
Clearance Time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Vehicle Extension (s)		3.0	3.0	2.0	2.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2364	731	168	2150		746		344	54	56	291
v/s Ratio Prot		0.32		c0.09	c0.43		c0.18			0.01	c0.01	0.00
v/s Ratio Perm			0.23						0.02			0.00
v/c Ratio		0.67	0.48	0.93	0.78		0.84		0.08	0.28	0.29	0.01
Uniform Delay, d1		29.5	26.0	67.3	26.4		56.2		46.8	70.9	70.9	66.0
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		1.5	2.3	47.9	2.8		8.2		0.1	2.8	2.8	0.0
Delay (s)		31.0	28.2	115.2	29.2		64.4		46.9	73.7	73.7	66.0
Level of Service		C	C	F	C		E		D	E	E	E
Approach Delay (s)		30.1			36.6			61.3			68.4	
Approach LOS		C			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	38.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	157	291	10	35	40	997	56	1090	137
v/c Ratio	0.86	0.71	0.07	0.11	0.08	0.41	0.82	0.60	0.10
Control Delay	84.9	18.7	42.0	0.7	2.6	4.1	74.5	5.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.9	18.7	42.0	0.7	2.6	4.1	74.5	5.0	0.1
Queue Length 50th (ft)	109	23	6	0	5	91	15	7	0
Queue Length 95th (ft)	#229	119	23	2	11	116	m#51	9	m0
Internal Link Dist (ft)		309	138			713		891	
Turn Bay Length (ft)	100				150		200		250
Base Capacity (vph)	185	414	151	318	503	2418	68	1830	1368
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.70	0.07	0.11	0.08	0.41	0.82	0.60	0.10

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	34	236	6	4	33	37	919	8	52	1014	127
Future Volume (vph)	146	34	236	6	4	33	37	919	8	52	1014	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	6.0	6.0			6.0	6.0	0.0	1.0		1.0	1.0	-1.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.99			1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.87			1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1614	1359			1955	1723	1778	3049		1796	2828	1368
Flt Permitted	0.75	1.00			0.52	1.00	0.20	1.00		0.06	1.00	1.00
Satd. Flow (perm)	1276	1359			1038	1723	372	3049		106	2828	1368
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	157	37	254	6	4	35	40	988	9	56	1090	137
RTOR Reduction (vph)	0	218	0	0	0	30	0	1	0	0	0	0
Lane Group Flow (vph)	157	73	0	0	10	5	40	996	0	56	1090	137
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	7%	0%	17%	1%	0%	0%	2%	23%	0%	0%	27%	15%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	Free
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2		2	1 3			1		Free
Actuated Green, G (s)	15.8	15.8			15.8	15.8	77.2	82.2		66.2	66.2	110.0
Effective Green, g (s)	15.8	15.8			15.8	15.8	87.2	87.2		71.2	71.2	110.0
Actuated g/C Ratio	0.14	0.14			0.14	0.14	0.79	0.79		0.65	0.65	1.00
Clearance Time (s)	6.0	6.0			6.0	6.0	5.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0			0.2	0.2	
Lane Grp Cap (vph)	183	195			149	247	499	2417		68	1830	1368
v/s Ratio Prot		0.05					0.01	c0.33			0.39	
v/s Ratio Perm	c0.12				0.01	0.00	0.05			c0.53		0.10
v/c Ratio	0.86	0.38			0.07	0.02	0.08	0.41		0.82	0.60	0.10
Uniform Delay, d1	46.0	42.6			40.7	40.5	3.9	3.5		14.7	11.1	0.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		0.58	0.34	1.00
Incremental Delay, d2	30.5	1.2			0.2	0.0	0.1	0.1		55.8	1.1	0.1
Delay (s)	76.5	43.9			40.9	40.5	3.9	3.6		64.3	4.9	0.1
Level of Service	E	D			D	D	A	A		E	A	A
Approach Delay (s)		55.3			40.6			3.6			7.0	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	14	81	47	28	101	49	779	340	1391
v/c Ratio	0.15	0.41	0.22	0.21	0.32	0.19	0.29	0.28	0.67
Control Delay	51.8	6.9	47.0	48.2	5.8	6.4	5.0	0.8	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.8	6.9	47.0	48.2	5.8	6.4	5.0	0.8	17.5
Queue Length 50th (ft)	10	0	31	18	0	8	80	0	342
Queue Length 95th (ft)	31	7	68	47	24	m17	m104	m13	433
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	114	211	297	190	387	254	2714	1213	2088
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.38	0.16	0.15	0.26	0.19	0.29	0.28	0.67

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	74	44	26	95	46	732	320	0	1308	0
Future Volume (vph)	15	0	74	44	26	95	46	732	320	0	1308	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	0.0	1.5	6.5		1.5	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1476	1078		1770	1134	1615	1299	3749	1645		3485	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.11	1.00	1.00		1.00	
Satd. Flow (perm)	1476	1078		1770	1134	1615	145	3749	1645		3485	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	16	0	79	47	28	101	49	779	340	0	1391	0
RTOR Reduction (vph)	0	77	0	0	0	89	0	0	128	0	0	0
Lane Group Flow (vph)	14	4	0	47	28	12	49	779	212	0	1391	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	15%	0%	42%	2%	62%	0%	41%	1%	3%	0%	1%	18%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm		NA	
Protected Phases	4	4		3	3		1	2 1			2	
Permitted Phases						3	2 1		2 1			
Actuated Green, G (s)	5.8	5.8		13.0	13.0	13.0	68.7	73.7	73.7		59.9	
Effective Green, g (s)	5.8	5.8		13.0	13.0	13.0	78.7	78.7	68.7		64.9	
Actuated g/C Ratio	0.05	0.05		0.12	0.12	0.12	0.72	0.72	0.62		0.59	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.0				6.5	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0				2.5	
Lane Grp Cap (vph)	77	56		209	134	190	248	2682	1027		2056	
v/s Ratio Prot	c0.01	0.00		c0.03	0.02		0.02	c0.21			c0.40	
v/s Ratio Perm						0.01	0.12		0.13			
v/c Ratio	0.18	0.08		0.22	0.21	0.06	0.20	0.29	0.21		0.68	
Uniform Delay, d1	49.8	49.6		43.9	43.9	43.1	9.5	5.6	8.9		15.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.02	0.84	0.39		1.00	
Incremental Delay, d2	0.8	0.4		0.4	0.6	0.1	0.1	0.0	0.0		1.8	
Delay (s)	50.7	50.0		44.3	44.4	43.2	9.7	4.7	3.5		17.2	
Level of Service	D	D		D	D	D	A	A	A		B	
Approach Delay (s)		50.1			43.7			4.6			17.2	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX E:

Intersection Capacity Analysis - Future without Development Condition (2040)

Queues
1: Walker Street/Sears Entr. & Duke Street

03/15/2019

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1668	364	47	1709	712	165	1	3	46
v/c Ratio	0.47	0.35	0.51	0.58	0.87	0.33	0.01	0.03	0.20
Control Delay	19.9	2.9	82.9	21.0	63.7	7.6	64.0	64.3	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	2.9	82.9	21.0	63.7	7.6	64.0	64.3	5.2
Queue Length 50th (ft)	258	0	42	352	319	0	1	3	0
Queue Length 95th (ft)	363	57	87	505	391	57	7	13	7
Internal Link Dist (ft)	1533			1138				338	
Turn Bay Length (ft)		310	345			385			
Base Capacity (vph)	3577	1049	103	2941	882	525	94	99	285
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.35	0.46	0.58	0.81	0.31	0.01	0.03	0.16

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1618	353	46	1658	0	691	0	160	1	3	45
Future Volume (vph)	0	1618	353	46	1658	0	691	0	160	1	3	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Lane Util. Factor		0.86	1.00	1.00	0.91		0.97		1.00	0.95	0.95	0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (prot)		6285	1568	1719	5036		3433		1568	1715	1805	2656
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00	0.95	1.00	1.00
Satd. Flow (perm)		6285	1568	1719	5036		3433		1568	1715	1805	2656
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1668	364	47	1709	0	712	0	165	1	3	46
RTOR Reduction (vph)	0	0	173	0	0	0	0	0	126	0	0	44
Lane Group Flow (vph)	0	1668	191	47	1709	0	712	0	39	1	3	2
Heavy Vehicles (%)	0%	4%	3%	5%	3%	0%	2%	0%	3%	0%	0%	7%
Turn Type		NA	Perm	Prot	NA		Prot		Perm	Split	NA	custom
Protected Phases		2		1	6		8			4	4	5
Permitted Phases			2						8			4
Actuated Green, G (s)		73.3	73.3	6.4	75.4		33.3		33.3	1.4	1.4	6.0
Effective Green, g (s)		73.3	73.3	6.4	75.4		33.3		33.3	1.4	1.4	6.0
Actuated g/C Ratio		0.52	0.52	0.05	0.54		0.24		0.24	0.01	0.01	0.04
Clearance Time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Vehicle Extension (s)		3.0	3.0	2.0	2.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		3290	820	78	2712		816		372	17	18	233
v/s Ratio Prot		0.27		c0.03	c0.34		c0.21			0.00	c0.00	0.00
v/s Ratio Perm			0.12						0.03			0.00
v/c Ratio		0.51	0.23	0.60	0.63		0.87		0.11	0.06	0.17	0.01
Uniform Delay, d1		21.6	18.1	65.6	22.6		51.3		41.7	68.6	68.7	64.2
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.7	8.7	1.1		10.2		0.1	1.5	4.3	0.0
Delay (s)		22.2	18.8	74.2	23.7		61.5		41.8	70.1	73.1	64.2
Level of Service		C	B	E	C		E		D	E	E	E
Approach Delay (s)		21.6			25.0			57.8			64.8	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	199	389	19	48	33	1597	14	435	52
v/c Ratio	0.81	0.68	0.13	0.13	0.05	0.60	0.25	0.20	0.04
Control Delay	74.8	11.4	43.6	5.3	4.7	8.6	25.2	10.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	74.8	11.4	43.6	5.3	4.7	8.6	25.2	10.7	0.1
Queue Length 50th (ft)	160	9	13	0	6	288	5	78	0
Queue Length 95th (ft)	245	106	36	20	16	380	24	111	0
Internal Link Dist (ft)		309	138			713		891	
Turn Bay Length (ft)	100				150		200		250
Base Capacity (vph)	290	612	175	436	654	2678	57	2213	1269
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.64	0.11	0.11	0.05	0.60	0.25	0.20	0.04

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	191	12	361	11	8	46	32	1526	7	13	418	50
Future Volume (vph)	191	12	361	11	8	46	32	1526	7	13	418	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	6.0	6.0			6.0	6.0	0.0	1.0		1.0	1.0	-1.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.99			1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86			1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1661	1437			1872	1723	1499	3535		1796	3487	1269
Flt Permitted	0.75	1.00			0.41	1.00	0.46	1.00		0.05	1.00	1.00
Satd. Flow (perm)	1303	1437			788	1723	731	3535		92	3487	1269
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	199	12	376	11	8	48	33	1590	7	14	435	52
RTOR Reduction (vph)	0	305	0	0	0	39	0	0	0	0	0	0
Lane Group Flow (vph)	199	84	0	0	19	9	33	1597	0	14	435	52
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	4%	0%	7%	9%	0%	0%	21%	6%	0%	0%	3%	24%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	Free
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2		2	1 3			1		Free
Actuated Green, G (s)	24.5	24.5			24.5	24.5	88.5	93.5		77.5	77.5	130.0
Effective Green, g (s)	24.5	24.5			24.5	24.5	98.5	98.5		82.5	82.5	130.0
Actuated g/C Ratio	0.19	0.19			0.19	0.19	0.76	0.76		0.63	0.63	1.00
Clearance Time (s)	6.0	6.0			6.0	6.0	5.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0			0.2	0.2	
Lane Grp Cap (vph)	245	270			148	324	648	2678		58	2212	1269
v/s Ratio Prot		0.06					0.01	c0.45			0.12	
v/s Ratio Perm	c0.15				0.02	0.01	0.03			0.15		0.04
v/c Ratio	0.81	0.31			0.13	0.03	0.05	0.60		0.24	0.20	0.04
Uniform Delay, d1	50.5	45.5			43.9	43.0	4.0	7.0		10.2	9.9	0.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	18.2	0.7			0.4	0.0	0.0	0.4		9.6	0.2	0.1
Delay (s)	68.7	46.1			44.3	43.1	4.1	7.3		19.9	10.1	0.1
Level of Service	E	D			D	D	A	A		B	B	A
Approach Delay (s)		53.8			43.4			7.3			9.3	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	5	35	33	18	156	33	1422	343	646
v/c Ratio	0.07	0.20	0.19	0.15	0.51	0.06	0.51	0.28	0.33
Control Delay	55.6	2.5	51.8	51.7	13.9	4.1	6.6	2.6	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.6	2.5	51.8	51.7	13.9	4.1	6.6	2.6	15.6
Queue Length 50th (ft)	4	0	24	13	0	6	226	24	152
Queue Length 95th (ft)	17	0	57	37	64	14	273	55	196
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	239	284	283	204	406	571	2805	1206	1953
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.12	0.12	0.09	0.38	0.06	0.51	0.28	0.33

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	0	33	32	18	153	32	1394	336	0	633	0
Future Volume (vph)	6	0	33	32	18	153	32	1394	336	0	633	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	0.0	1.5	6.5		1.5	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1276	969		1583	1141	1553	1367	3641	1583		3451	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.34	1.00	1.00		1.00	
Satd. Flow (perm)	1276	969		1583	1141	1553	486	3641	1583		3451	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	6	0	34	33	18	156	33	1422	343	0	646	0
RTOR Reduction (vph)	0	34	0	0	0	139	0	0	80	0	0	0
Lane Group Flow (vph)	5	1	0	33	18	17	33	1422	263	0	646	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	33%	0%	58%	14%	61%	4%	34%	4%	7%	0%	2%	17%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm		NA	
Protected Phases	4	4		3	3		1	2 1			2	
Permitted Phases						3	2 1		2 1			
Actuated Green, G (s)	4.2	4.2		13.0	13.0	13.0	80.3	85.3	85.3		60.8	
Effective Green, g (s)	4.2	4.2		13.0	13.0	13.0	90.3	90.3	80.3		65.8	
Actuated g/C Ratio	0.04	0.04		0.11	0.11	0.11	0.75	0.75	0.67		0.55	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.0				6.5	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0				2.5	
Lane Grp Cap (vph)	44	33		171	123	168	545	2739	1059		1892	
v/s Ratio Prot	c0.00	0.00		c0.02	0.02		0.01	c0.39			0.19	
v/s Ratio Perm						0.01	0.03		0.17			
v/c Ratio	0.11	0.04		0.19	0.15	0.10	0.06	0.52	0.25		0.34	
Uniform Delay, d1	56.1	55.9		48.7	48.5	48.2	4.3	6.0	7.9		15.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.8	0.3		0.4	0.4	0.2	0.0	0.1	0.0		0.5	
Delay (s)	56.9	56.3		49.1	48.9	48.4	4.3	6.1	7.9		15.6	
Level of Service	E	E		D	D	D	A	A	A		B	
Approach Delay (s)		56.4			48.6			6.4			15.6	
Approach LOS		E			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Walker Street/Sears Entr. & Duke Street

03/15/2019

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1768	809	174	1865	700	148	15	16	67
v/c Ratio	0.74	0.70	1.03	0.85	0.88	0.31	0.17	0.18	0.20
Control Delay	35.0	5.6	141.4	34.6	69.2	8.1	72.4	72.6	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	5.6	141.4	34.6	69.2	8.1	72.4	72.6	12.2
Queue Length 50th (ft)	434	0	~181	624	338	0	14	15	0
Queue Length 95th (ft)	501	95	#339	#776	413	57	41	43	24
Internal Link Dist (ft)	1533			1138				338	
Turn Bay Length (ft)		310	345			385			
Base Capacity (vph)	2376	1150	169	2196	846	501	145	149	492
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.70	1.03	0.85	0.83	0.30	0.10	0.11	0.14

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1715	785	169	1809	0	679	0	144	22	8	65
Future Volume (vph)	0	1715	785	169	1809	0	679	0	144	22	8	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Lane Util. Factor		0.86	1.00	1.00	0.91		0.97		1.00	0.95	0.95	0.88
Frt		1.00	0.85	1.00	1.00		1.00		0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00		0.95		1.00	0.95	0.98	1.00
Satd. Flow (prot)		4878	1509	1770	3900		3433		1583	1715	1761	2787
Flt Permitted		1.00	1.00	0.95	1.00		0.95		1.00	0.95	0.98	1.00
Satd. Flow (perm)		4878	1509	1770	3900		3433		1583	1715	1761	2787
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1768	809	174	1865	0	700	0	148	23	8	67
RTOR Reduction (vph)	0	0	429	0	0	0	0	0	114	0	0	63
Lane Group Flow (vph)	0	1768	380	174	1865	0	700	0	34	15	16	4
Heavy Vehicles (%)	0%	34%	7%	2%	33%	0%	2%	0%	2%	0%	0%	2%
Turn Type		NA	Perm	Prot	NA		Prot		Perm	Split	NA	custom
Protected Phases		2		1	6		8			4	4	5
Permitted Phases			2						8			4
Actuated Green, G (s)		70.5	70.5	14.4	80.6		34.7		34.7	4.8	4.8	9.4
Effective Green, g (s)		70.5	70.5	14.4	80.6		34.7		34.7	4.8	4.8	9.4
Actuated g/C Ratio		0.47	0.47	0.10	0.54		0.23		0.23	0.03	0.03	0.06
Clearance Time (s)		5.7	5.7	6.6	5.7		7.0		7.0	6.3	6.3	6.3
Vehicle Extension (s)		3.0	3.0	2.0	2.0		3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		2292	709	169	2095		794		366	54	56	291
v/s Ratio Prot		0.36		c0.10	c0.48		c0.20			0.01	c0.01	0.00
v/s Ratio Perm			0.25						0.02			0.00
v/c Ratio		0.77	0.54	1.03	0.89		0.88		0.09	0.28	0.29	0.01
Uniform Delay, d1		33.0	28.2	67.8	30.8		55.7		45.3	70.9	70.9	66.0
Progression Factor		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2		2.6	2.9	77.2	6.2		11.3		0.1	2.8	2.8	0.0
Delay (s)		35.6	31.1	145.0	37.0		66.9		45.4	73.7	73.7	66.0
Level of Service		D	C	F	D		E		D	E	E	E
Approach Delay (s)		34.2			46.2			63.2			68.4	
Approach LOS		C			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	43.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	175	321	10	35	44	1113	56	1219	153
v/c Ratio	0.95	0.81	0.08	0.11	0.10	0.46	0.82	0.67	0.11
Control Delay	101.3	31.2	42.6	0.7	2.7	4.5	69.6	5.5	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	101.3	31.2	42.6	0.7	2.7	4.5	69.6	5.5	0.1
Queue Length 50th (ft)	124	60	6	0	5	108	11	7	0
Queue Length 95th (ft)	#260	#210	23	2	11	137	m#29	9	m0
Internal Link Dist (ft)		309	138			713		891	
Turn Bay Length (ft)	100				150		200		250
Base Capacity (vph)	185	394	126	318	458	2411	68	1825	1368
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.95	0.81	0.08	0.11	0.10	0.46	0.82	0.67	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	34	264	6	4	33	41	1027	8	52	1134	142
Future Volume (vph)	163	34	264	6	4	33	41	1027	8	52	1134	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	6.0	6.0			6.0	6.0	0.0	1.0		1.0	1.0	-1.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	0.99			1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.87			1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1614	1354			1955	1723	1778	3049		1796	2828	1368
Flt Permitted	0.75	1.00			0.43	1.00	0.16	1.00		0.06	1.00	1.00
Satd. Flow (perm)	1276	1354			872	1723	306	3049		106	2828	1368
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	175	37	284	6	4	35	44	1104	9	56	1219	153
RTOR Reduction (vph)	0	197	0	0	0	30	0	0	0	0	0	0
Lane Group Flow (vph)	175	124	0	0	10	5	44	1113	0	56	1219	153
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	7%	0%	17%	1%	0%	0%	2%	23%	0%	0%	27%	15%
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	Free
Protected Phases		2			2		3	1 3			1	
Permitted Phases	2			2		2	1 3			1		Free
Actuated Green, G (s)	16.0	16.0			16.0	16.0	77.0	82.0		66.0	66.0	110.0
Effective Green, g (s)	16.0	16.0			16.0	16.0	87.0	87.0		71.0	71.0	110.0
Actuated g/C Ratio	0.15	0.15			0.15	0.15	0.79	0.79		0.65	0.65	1.00
Clearance Time (s)	6.0	6.0			6.0	6.0	5.0			6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0			0.2	0.2	
Lane Grp Cap (vph)	185	196			126	250	456	2411		68	1825	1368
v/s Ratio Prot		0.09					0.01	c0.36			0.43	
v/s Ratio Perm	c0.14				0.01	0.00	0.06			c0.53		0.11
v/c Ratio	0.95	0.63			0.08	0.02	0.10	0.46		0.82	0.67	0.11
Uniform Delay, d1	46.6	44.2			40.6	40.3	4.6	3.8		14.8	12.2	0.0
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		0.49	0.33	1.00
Incremental Delay, d2	50.2	6.5			0.3	0.0	0.1	0.1		51.7	1.4	0.1
Delay (s)	96.8	50.7			40.9	40.3	4.7	3.9		59.0	5.3	0.1
Level of Service	F	D			D	D	A	A		E	A	A
Approach Delay (s)		66.9			40.4			4.0			6.9	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	14	81	52	28	113	49	872	381	1549
v/c Ratio	0.15	0.41	0.25	0.21	0.36	0.22	0.32	0.31	0.74
Control Delay	51.8	6.9	47.5	48.2	7.7	10.2	5.2	0.8	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.8	6.9	47.5	48.2	7.7	10.2	5.2	0.8	19.6
Queue Length 50th (ft)	10	0	34	18	0	8	92	0	413
Queue Length 95th (ft)	31	7	73	47	35	m24	m116	m12	521
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	114	211	297	190	387	226	2719	1240	2083
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.38	0.18	0.15	0.29	0.22	0.32	0.31	0.74

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	74	49	26	106	46	820	358	0	1456	0
Future Volume (vph)	15	0	74	49	26	106	46	820	358	0	1456	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.5	5.5		5.5	5.5	5.5	0.0	1.5	6.5		1.5	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1476	1078		1770	1134	1615	1299	3749	1645		3485	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.07	1.00	1.00		1.00	
Satd. Flow (perm)	1476	1078		1770	1134	1615	100	3749	1645		3485	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	16	0	79	52	28	113	49	872	381	0	1549	0
RTOR Reduction (vph)	0	77	0	0	0	100	0	0	143	0	0	0
Lane Group Flow (vph)	14	4	0	52	28	13	49	872	238	0	1549	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	15%	0%	42%	2%	62%	0%	41%	1%	3%	0%	1%	18%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm		NA	
Protected Phases	4	4		3	3		1	2 1			2	
Permitted Phases						3	2 1		2 1			
Actuated Green, G (s)	5.8	5.8		13.0	13.0	13.0	68.7	73.7	73.7		59.7	
Effective Green, g (s)	5.8	5.8		13.0	13.0	13.0	78.7	78.7	68.7		64.7	
Actuated g/C Ratio	0.05	0.05		0.12	0.12	0.12	0.72	0.72	0.62		0.59	
Clearance Time (s)	5.5	5.5		5.5	5.5	5.5	5.0				6.5	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0				2.5	
Lane Grp Cap (vph)	77	56		209	134	190	224	2682	1027		2049	
v/s Ratio Prot	c0.01	0.00		c0.03	0.02		0.03	c0.23			c0.44	
v/s Ratio Perm						0.01	0.13		0.14			
v/c Ratio	0.18	0.08		0.25	0.21	0.07	0.22	0.33	0.23		0.76	
Uniform Delay, d1	49.8	49.6		44.1	43.9	43.1	12.2	5.8	9.1		16.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.73	0.83	0.36		1.00	
Incremental Delay, d2	0.8	0.4		0.5	0.6	0.1	0.2	0.0	0.0		2.7	
Delay (s)	50.7	50.0		44.5	44.4	43.2	21.2	4.8	3.3		19.5	
Level of Service	D	D		D	D	D	C	A	A		B	
Approach Delay (s)		50.1			43.8			5.0			19.5	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX F:

ITE Internal Capture Triangles for 2009 Approved and 2019 Proposed Development Programs

2009 Approved Development Program

Analyst Gorove/Slade Associates

Date 11/28/18

Project No.: 2737-001

Name of Dvlpt: Landmark SAP

Time Period: AM

TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Land Use A

ITE LU Code Residential

Size

	Total	Internal	External
Enter	126	6	120
Exit	360	27	333
Total	486	33	453
%	100%	**7%**	93%

Exit to External: 333

Enter from External: 120

	Demand	Balanced
Exit to External	2% 7	7
Enter from External	0% 0	0
Enter from External	16% 58	20
Enter from External	5% 6	6
Enter from External	3% 76	76
Enter from External	1% 4	4
Enter from External	5% 20	20
Enter from External	9% 22	22

Land Use B

ITE LU Code Employment

Size

	Total	Internal	External
Enter	2,534	91	2,443
Exit	412	57	355
Total	2,946	148	2,798
%	100%	**5%**	95%

Exit to External: 355

Enter from External: 2,443

	Demand	Balanced
Exit to External	7% 177	84
Enter from External	23% 95	57

Land Use C

ITE LU Code Commercial

Size

	Total	Internal	External
Enter	404	77	327
Exit	248	90	158
Total	652	167	485
%	100%	**26%**	74%

Enter from External: 327

Exit to External: 158

	Demand	Balanced
Exit to External	34% 84	84
Enter from External	14% 57	57

Net External Trips for Multi-Use Development

	Land Use A	*Land Use B*	*Land Use C*	*Total*
Enter	*120*	*2,443*	*327*	*2,890*
Exit	*333*	*355*	*158*	*846*
Total	*453*	*2,798*	*485*	*3,736*
Single-Use Trip Gen Est.	*486*	*2,946*	*652*	*4,084*

INTERNAL CAPTURE

348 ***Vehicles***

9 ***%***

2009 Approved Development Program

Analyst: Gorove/Slade Associates

Date: 11/28/18

Project No.: 2737-001

Name of Dvlpt: Landmark SAP

Time Period: PM

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Land Use A

ITE LU Code Residential

Size

	Total	Internal	External
Enter	364	73	291
Exit	232	46	186
Total	596	119	477
%	100%	20%	80%

Exit to External: 186

Enter from External: 291

4% 9 *Demand*

4% 15 *Demand*

16% 37 *Demand*

16% 58 *Demand*

9 *Balanced*

15 *Balanced*

37 *Balanced*

58 *Balanced*

57% 271 *Demand*

2% 50 *Demand*

13% 186 *Demand*

9% 140 *Demand*

Land Use B

ITE LU Code Employment

Size

	Total	Internal	External
Enter	476	40	436
Exit	2,502	58	2,444
Total	2,978	98	2,880
%	100%	3%	97%

Exit to External: 2,444

Enter from External: 436

Demand 17% 81

Balanced 31

Demand 2% 31

6% 150 *Demand*

43 *Balanced*

3% 43 *Demand*

Land Use C

ITE LU Code Commercial

Size

	Total	Internal	External
Enter	1,433	80	1,353
Exit	1,553	89	1,464
Total	2,986	169	2,817
%	100%	6%	94%

Enter from External: 1,353

Exit to External: 1,464

Net External Trips for Multi-Use Development

	Land Use A	*Land Use B*	*Land Use C*	*Total*
Enter	*291*	*436*	*1,353*	*2,080*
Exit	*186*	*2,444*	*1,464*	*4,094*
Total	*477*	*2,880*	*2,817*	*6,174*
Single-Use Trip Gen Est.	*596*	*2,978*	*2,986*	*6,560*

INTERNAL CAPTURE

386 ***Vehicles***

6 ***%***

2009 Approved Development Program

Analyst: Gorove/Slade Associates
Date: 11/28/18

Project No.: 2737-001
Name of Dvlpt: Landmark SAP
Time Period: Daily

TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Land Use A

ITE LU Code: Residential
Size

	Total	Internal	External
Enter	4,087	817	3,270
Exit	4,087	817	3,270
Total	8,173	1,634	6,539
%	100%	20%	80%

Exit to External: 3,270
Enter from External: 3,270

4% 163 Demand
4% 163 Demand
16% 654 Demand
16% 654 Demand

163 Balanced
163 Balanced
654 Balanced
654 Balanced

57% 8472 Demand
2% 297 Demand
13% 1870 Demand
9% 1295 Demand

Land Use B

ITE LU Code: Employment
Size

	Total	Internal	External
Enter	14,864	451	14,413
Exit	14,864	595	14,269
Total	29,728	1,046	28,682
%	100%	4%	96%

Exit to External: 14,269
Enter from External: 14,413

Demand: 17% 2527
Balanced: 288
Demand: 2% 288

Demand: 6% 892
Balanced: 432
Demand: 3% 432

Land Use C

ITE LU Code: Commercial
Size

	Total	Internal	External
Enter	14,388	1,086	13,302
Exit	14,388	942	13,446
Total	28,775	2,028	26,747
%	100%	7%	93%

Enter from External: 13,302
Exit to External: 13,446

Net External Trips for Multi-Use Development

	Land Use A	Land Use B	Land Use C	Total
Enter	3,270	14,413	13,302	30,984
Exit	3,270	14,269	13,446	30,984
Total	6,539	28,682	26,747	61,968
Single-Use Trip Gen Est.	8,173	29,728	28,775	66,676

INTERNAL CAPTURE
4,708 Vehicles
7 %

2019 Proposed Development Program

Analyst Gorove/Slade Associates

Date 11/28/18

TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Project No.: 2737-001

Name of Dvlpt: Landmark SAP

Time Period: AM

Land Use A

ITE LU Code Residential

Size

	Total	Internal	External
Enter	261	13	248
Exit	742	34	708
Total	1,003	47	956
%	100%	**5%**	95%

Exit to External: 708

Enter from External: 248

Demand	Balanced
2% 15	15
0% 0	0
16% 119	19
5% 13	13
3% 22	22
1% 3	3
5% 19	19
9% 25	25

Land Use B

ITE LU Code Employment

Size

	Total	Internal	External
Enter	746	67	679
Exit	269	54	215
Total	1,015	121	894
%	100%	**12%**	88%

Exit to External: 215

Enter from External: 679

Demand	Balanced
7% 52	52
23% 62	54

Land Use C

ITE LU Code Commercial

Size

	Total	Internal	External
Enter	384	73	311
Exit	277	65	212
Total	661	138	523
%	100%	**21%**	79%

Enter from External: 311

Exit to External: 212

Demand	Balanced
34% 94	94
14% 54	54

Net External Trips for Multi-Use Development

	Land Use A	*Land Use B*	*Land Use C*	*Total*
Enter	*248*	*679*	*311*	*1,238*
Exit	*708*	*215*	*212*	*1,135*
Total	*956*	*894*	*523*	*2,373*
Single-Use Trip Gen Est.	*1,003*	*1,015*	*661*	*2,679*

INTERNAL CAPTURE

306 ***Vehicles***

11 ***%***

2019 Proposed Development Program

Analyst Gorove/Slade Associates

Date 11/28/18

TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Project No.: 2737-001

Name of Dvlpt: Lanmark SAP

Time Period: PM

Land Use A

ITE LU Code Residential

Size

	Total	Internal	External
Enter	739	104	635
Exit	472	95	377
Total	1,211	199	1,012
%	100%	**16%**	84%

Exit to External: 377

Enter from External: 635

Demand	Balanced	Demand	Balanced
4% 19	4% 30	16% 76	16% 118
19	17	76	87
57% 201	2% 17	13% 126	9% 87

Land Use B

ITE LU Code Employment

Size

	Total	Internal	External
Enter	352	38	314
Exit	874	46	828
Total	1,226	84	1,142
%	100%	**7%**	93%

Exit to External: 828

Enter from External: 314

Demand	Balanced	Demand
17% 60	19	2% 19
6% 52	29	3% 29

Land Use C

ITE LU Code Commercial

Size

	Total	Internal	External
Enter	970	105	865
Exit	968	106	862
Total	1,938	211	1,727
%	100%	**11%**	89%

Enter from External: 865

Exit to External: 862

Net External Trips for Multi-Use Development

	Land Use A	*Land Use B*	*Land Use C*	*Total*
Enter	*635*	*314*	*865*	*1,814*
Exit	*377*	*828*	*862*	*2,067*
Total	*1,012*	*1,142*	*1,727*	*3,881*
Single-Use Trip Gen Est.	*1,211*	*1,226*	*1,938*	*4,375*

INTERNAL CAPTURE

494 ***Vehicles***

11 ***%***

2019 Proposed Development Program

Analyst Gorove/Slade Associates

Date 11/28/18

Project No.: 2737-001

Name of Dvlpt: Landmark SAP

Time Period: Daily

TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Land Use A

ITE LU Code Residential

Size

	Total	Internal	External
Enter	8,550	1,161	7,389
Exit	8,550	1,710	6,840
Total	17,100	2,871	14,229
%	100%	17%	83%

Exit to External: 6,840

Enter from External: 7,389

4% 342 *Demand*	4% 342 *Demand*	16% 1368 *Demand*	16% 1368 *Demand*
342 *Balanced*	129 *Balanced*	1368 *Balanced*	1032 *Balanced*
57% 3683 *Demand*	2% 129 *Demand*	13% 1490 *Demand*	9% 1032 *Demand*

Land Use B

ITE LU Code Employment

Size

	Total	Internal	External
Enter	6,461	571	5,890
Exit	6,461	473	5,988
Total	12,922	1,044	11,878
%	100%	8%	92%

Exit to External: 5,988

Enter from External: 5,890

Demand	*Balanced*	*Demand*
17% 1098	229	2% 229
6% 388 *Demand*	344 *Balanced*	3% 344 *Demand*

Land Use C

ITE LU Code Commercial

Size

	Total	Internal	External
Enter	11,465	1,712	9,753
Exit	11,465	1,261	10,204
Total	22,929	2,973	19,956
%	100%	13%	87%

Enter from External: 9,753

Exit to External: 10,204

Net External Trips for Multi-Use Development

	Land Use A	*Land Use B*	*Land Use C*	*Total*
Enter	*7,389*	*5,890*	*9,753*	*23,032*
Exit	*6,840*	*5,988*	*10,204*	*23,032*
Total	*14,229*	*11,878*	*19,956*	*46,063*
Single-Use Trip Gen Est.	*17,100*	*12,922*	*22,929*	*52,951*

INTERNAL CAPTURE

6,888 ***Vehicles***

13 ***%***

APPENDIX G:

Intersection Capacity Analysis - Future with Development Condition (2040) with 2009 Approved Development Program

Queues
1: Walker Street/Sears Entr. & Duke Street

03/15/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	286	2064	364	24	2063	223	475	165	47	63
v/c Ratio	0.95	0.73	0.36	0.18	0.92	0.26	0.80	0.35	0.17	0.22
Control Delay	98.6	27.6	6.0	49.2	26.1	2.4	65.6	2.0	49.0	1.8
Queue Delay	0.0	0.0	0.0	0.0	14.6	0.5	0.0	0.0	0.0	0.0
Total Delay	98.6	27.6	6.0	49.2	40.8	2.9	65.6	2.0	49.0	1.8
Queue Length 50th (ft)	261	587	35	23	469	9	215	0	37	0
Queue Length 95th (ft)	#441	700	108	m31	#823	m26	268	0	72	0
Internal Link Dist (ft)		1533			318			740		259
Turn Bay Length (ft)	800		310			250				
Base Capacity (vph)	301	2839	1017	176	2243	847	711	475	412	321
Starvation Cap Reductn	0	0	0	0	225	323	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	0.95	0.73	0.36	0.14	1.02	0.43	0.67	0.35	0.11	0.20

Intersection Summary

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	277	2002	353	23	2001	216	461	0	160	46	0	61
Future Volume (vph)	277	2002	353	23	2001	216	461	0	160	46	0	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	4988	1568	1719	5036	1615	3433	1568		1805	1509	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	4988	1568	1719	5036	1615	3433	1568		1805	1509	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	286	2064	364	24	2063	223	475	0	165	47	0	63
RTOR Reduction (vph)	0	0	134	0	0	130	0	154	0	0	60	0
Lane Group Flow (vph)	286	2064	230	24	2063	93	475	11	0	47	3	0
Heavy Vehicles (%)	0%	4%	3%	5%	3%	0%	2%	0%	3%	0%	0%	7%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	25.9	75.7	75.7	8.6	58.4	58.4	24.4	9.5		20.6	5.7	
Effective Green, g (s)	25.9	75.7	75.7	8.6	58.4	58.4	24.4	9.5		20.6	5.7	
Actuated g/C Ratio	0.18	0.54	0.54	0.06	0.42	0.42	0.17	0.07		0.15	0.04	
Clearance Time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	2.0	2.0	2.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	333	2697	847	105	2100	673	598	106		265	61	
v/s Ratio Prot	c0.16	0.41		0.01	c0.41		c0.14	0.01		c0.03	0.00	
v/s Ratio Perm			0.15			0.06						
v/c Ratio	0.86	0.77	0.27	0.23	0.98	0.14	0.79	0.11		0.18	0.04	
Uniform Delay, d1	55.3	25.2	17.3	62.5	40.3	25.2	55.4	61.3		52.3	64.5	
Progression Factor	1.00	1.00	1.00	0.81	0.51	0.64	1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.2	2.1	0.8	0.3	12.7	0.3	7.2	0.4		0.3	0.3	
Delay (s)	74.5	27.3	18.1	50.8	33.3	16.4	62.6	61.7		52.6	64.8	
Level of Service	E	C	B	D	C	B	E	E		D	E	
Approach Delay (s)		31.1			31.8			62.4			59.6	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	35.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	93.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	232	236	459	19	48	522	1687	14	431	91
v/c Ratio	0.76	0.77	0.32	0.16	0.23	0.87	0.70	0.14	0.24	0.13
Control Delay	61.0	61.5	0.6	56.3	2.5	30.0	15.8	25.8	19.1	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.0	61.5	0.6	56.3	2.5	30.0	15.8	25.8	19.1	3.1
Queue Length 50th (ft)	181	184	0	14	0	191	403	6	99	0
Queue Length 95th (ft)	252	256	0	39	0	#516	632	25	158	24
Internal Link Dist (ft)		359		138			713		891	
Turn Bay Length (ft)	150					150		200		250
Base Capacity (vph)	420	424	1427	156	243	603	2405	97	1762	698
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	0.55	0.56	0.32	0.12	0.20	0.87	0.70	0.14	0.24	0.13

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	437	12	441	11	8	46	501	1613	7	13	414	87
Future Volume (vph)	437	12	441	11	8	46	501	1613	7	13	414	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	5.0	5.0	4.0		5.0	5.0	0.0	0.0		0.0	0.0	0.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99		1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.95	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1578	1589	1427		1872	1723	1499	3535		1796	3487	1275
Flt Permitted	0.95	0.95	1.00		0.97	1.00	0.43	1.00		0.10	1.00	1.00
Satd. Flow (perm)	1578	1589	1427		1872	1723	675	3535		192	3487	1275
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	455	12	459	11	8	48	522	1680	7	14	431	91
RTOR Reduction (vph)	0	0	0	0	0	46	0	0	0	0	0	46
Lane Group Flow (vph)	232	236	459	0	19	2	522	1687	0	14	431	45
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	4%	0%	7%	9%	0%	0%	21%	6%	0%	0%	3%	24%
Turn Type	Split	NA	Free	Split	NA	Perm	pm+pt	NA		Perm	NA	Perm
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases			Free			4	2			6		6
Actuated Green, G (s)	23.3	23.3	120.0		6.1	6.1	75.6	75.6		54.6	54.6	54.6
Effective Green, g (s)	23.3	23.3	120.0		6.1	6.1	80.6	80.6		59.6	59.6	59.6
Actuated g/C Ratio	0.19	0.19	1.00		0.05	0.05	0.67	0.67		0.50	0.50	0.50
Clearance Time (s)	5.0	5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	0.2		3.0	3.0	3.0
Lane Grp Cap (vph)	306	308	1427		95	87	597	2374		95	1731	633
v/s Ratio Prot	0.15	c0.15			0.01		c0.15	c0.48			0.12	
v/s Ratio Perm			c0.32			0.00	0.43			0.07		0.04
v/c Ratio	0.76	0.77	0.32		0.20	0.03	0.87	0.71		0.15	0.25	0.07
Uniform Delay, d1	45.7	45.8	0.0		54.6	54.1	10.9	12.4		16.4	17.3	15.8
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	10.3	10.8	0.6		1.0	0.1	13.4	1.8		0.7	0.1	0.0
Delay (s)	56.0	56.6	0.6		55.6	54.3	24.3	14.2		17.1	17.4	15.8
Level of Service	E	E	A		E	D	C	B		B	B	B
Approach Delay (s)		28.7			54.7			16.6			17.1	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	31	108	33	111	165	327	1463	349	851
v/c Ratio	0.30	0.56	0.21	0.63	0.54	0.60	0.53	0.29	0.40
Control Delay	64.3	23.2	54.8	71.1	14.3	21.0	7.9	2.1	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.3	23.2	54.8	71.1	14.3	21.0	7.9	2.1	11.0
Queue Length 50th (ft)	27	3	26	91	0	69	221	12	108
Queue Length 95th (ft)	61	64	58	149	65	139	365	51	132
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	199	270	231	255	367	541	2754	1219	2132
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.40	0.14	0.44	0.45	0.60	0.53	0.29	0.40

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	0	102	32	109	162	320	1434	342	0	834	0
Future Volume (vph)	34	0	102	32	109	162	320	1434	342	0	834	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	0.0	0.0	5.0		0.0	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.86		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1617	1453		1583	1749	1553	1745	3641	1583		3451	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.26	1.00	1.00		1.00	
Satd. Flow (perm)	1617	1453		1583	1749	1553	485	3641	1583		3451	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	35	0	104	33	111	165	327	1463	349	0	851	0
RTOR Reduction (vph)	0	97	0	0	0	148	0	0	83	0	0	0
Lane Group Flow (vph)	31	11	0	33	111	17	327	1463	266	0	851	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	5%	0%	5%	14%	5%	4%	5%	4%	7%	0%	2%	5%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm		NA	
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases						4	2		2			
Actuated Green, G (s)	8.5	8.5		13.2	13.2	13.2	93.3	93.3	93.3		75.3	
Effective Green, g (s)	8.5	8.5		13.2	13.2	13.2	98.3	98.3	93.3		80.3	
Actuated g/C Ratio	0.07	0.07		0.10	0.10	0.10	0.76	0.76	0.72		0.62	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		5.0	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0	2.5	2.5		2.5	
Lane Grp Cap (vph)	105	95		160	177	157	541	2753	1136		2131	
v/s Ratio Prot	c0.02	0.01		0.02	c0.06		c0.08	0.40			0.25	
v/s Ratio Perm						0.01	c0.37		0.17			
v/c Ratio	0.30	0.11		0.21	0.63	0.11	0.60	0.53	0.23		0.40	
Uniform Delay, d1	57.9	57.2		53.6	56.0	53.0	19.2	6.5	6.2		12.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		0.78	
Incremental Delay, d2	1.1	0.4		0.5	5.9	0.2	1.3	0.7	0.5		0.5	
Delay (s)	59.0	57.6		54.1	61.9	53.3	20.5	7.2	6.7		10.3	
Level of Service	E	E		D	E	D	C	A	A		B	
Approach Delay (s)		57.9			56.5			9.2			10.3	
Approach LOS		E			E			A			B	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	122	2278	2535	51	48
v/c Ratio	0.48	0.51	0.72	0.41	0.31
Control Delay	47.0	0.7	4.4	71.9	20.8
Queue Delay	0.0	0.1	0.5	0.0	0.0
Total Delay	47.0	0.8	5.0	72.0	20.8
Queue Length 50th (ft)	116	9	147	45	0
Queue Length 95th (ft)	m165	13	154	89	41
Internal Link Dist (ft)		318	322	148	
Turn Bay Length (ft)	200				
Base Capacity (vph)	252	4492	3519	316	322
Starvation Cap Reductn	0	899	492	0	0
Spillback Cap Reductn	0	288	388	18	3
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.48	0.63	0.84	0.17	0.15

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	112	2096	2196	136	47	44
Future Volume (vph)	112	2096	2196	136	47	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5041		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	5041		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	122	2278	2387	148	51	48
RTOR Reduction (vph)	0	0	3	0	0	45
Lane Group Flow (vph)	122	2278	2532	0	51	3
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	20.0	121.7	96.7		8.3	8.3
Effective Green, g (s)	20.0	121.7	96.7		8.3	8.3
Actuated g/C Ratio	0.14	0.87	0.69		0.06	0.06
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	252	4420	3481		104	93
v/s Ratio Prot	0.07	c0.45	c0.50		c0.03	
v/s Ratio Perm						0.00
v/c Ratio	0.48	0.52	0.73		0.49	0.03
Uniform Delay, d1	55.2	2.2	13.5		63.8	62.1
Progression Factor	0.75	0.16	0.28		1.00	1.00
Incremental Delay, d2	1.1	0.3	0.6		3.6	0.1
Delay (s)	42.7	0.7	4.4		67.4	62.2
Level of Service	D	A	A		E	E
Approach Delay (s)		2.8	4.4		64.9	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	4.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	151	1283	896	25	2343	253	257	138	24	47	46
v/c Ratio	0.74	0.67	0.57	0.17	0.92	0.83	0.83	0.24	0.21	0.39	0.15
Control Delay	58.2	22.0	6.5	61.2	40.2	77.3	77.5	5.8	65.1	71.3	5.4
Queue Delay	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.2	22.4	6.5	61.2	40.2	77.3	77.5	5.8	65.1	71.3	5.4
Queue Length 50th (ft)	131	213	726	21	748	234	237	0	21	42	0
Queue Length 95th (ft)	197	341	191	52	#986	332	337	46	52	84	17
Internal Link Dist (ft)		322			1053		359			289	
Turn Bay Length (ft)	200			250		150					
Base Capacity (vph)	233	1924	1583	177	2542	360	364	560	184	193	340
Starvation Cap Reductn	0	225	0	0	0	0	1	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.76	0.57	0.14	0.92	0.70	0.71	0.25	0.13	0.24	0.14

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	139	1180	824	23	1927	228	364	105	127	22	43	42
Future Volume (vph)	139	1180	824	23	1927	228	364	105	127	22	43	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3539	1583	1770	4989		1681	1700	1583	1719	1810	1538
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3539	1583	1770	4989		1681	1700	1583	1719	1810	1538
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)	151	1283	896	25	2095	248	396	114	138	24	47	46
RTOR Reduction (vph)	0	0	0	0	8	0	0	0	102	0	0	38
Lane Group Flow (vph)	151	1283	896	25	2335	0	253	257	36	24	47	8
Heavy Vehicles (%)	5%	2%	2%	2%	2%	5%	2%	5%	2%	5%	5%	5%
Turn Type	Prot	NA	Free	Prot	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		8	8	1	4	4	5
Permitted Phases			Free						8			4
Actuated Green, G (s)	16.5	75.1	140.0	11.5	70.1		25.4	25.4	36.9	8.0	8.0	24.5
Effective Green, g (s)	16.5	75.1	140.0	11.5	70.1		25.4	25.4	36.9	8.0	8.0	24.5
Actuated g/C Ratio	0.12	0.54	1.00	0.08	0.50		0.18	0.18	0.26	0.06	0.06	0.18
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	1898	1583	145	2498		304	308	473	98	103	269
v/s Ratio Prot	c0.09	0.36		0.01	c0.47		0.15	c0.15	0.01	0.01	0.03	0.00
v/s Ratio Perm			c0.57						0.02			0.00
v/c Ratio	0.75	0.68	0.57	0.17	0.93		0.83	0.83	0.08	0.24	0.46	0.03
Uniform Delay, d1	59.7	23.6	0.0	59.8	32.8		55.2	55.3	38.7	63.1	63.9	47.9
Progression Factor	0.65	0.79	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.5	1.7	1.3	0.6	8.1		17.4	17.4	0.1	1.3	3.2	0.0
Delay (s)	51.3	20.4	1.3	60.4	40.9		72.6	72.7	38.8	64.4	67.1	47.9
Level of Service	D	C	A	E	D		E	E	D	E	E	D
Approach Delay (s)		15.1			41.1			65.4			59.0	
Approach LOS		B			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	33	33	28	1742	958	124
v/c Ratio	0.29	0.25	0.05	0.54	0.34	0.10
Control Delay	64.1	22.6	0.5	1.1	5.5	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.1	22.6	0.5	1.2	5.5	1.1
Queue Length 50th (ft)	27	0	1	13	140	0
Queue Length 95th (ft)	62	34	m2	42	187	17
Internal Link Dist (ft)	314			434	643	
Turn Bay Length (ft)			250			250
Base Capacity (vph)	340	331	588	3211	2783	1269
Starvation Cap Reductn	0	0	0	130	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.10	0.05	0.57	0.34	0.10

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	30	30	26	1603	881	114
Future Volume (vph)	30	30	26	1603	881	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			-5%	5%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1814	3628	3451	1544
Flt Permitted	0.95	1.00	0.28	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	536	3628	3451	1544
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	33	28	1742	958	124
RTOR Reduction (vph)	0	31	0	0	0	28
Lane Group Flow (vph)	33	2	28	1742	958	96
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	6.9	6.9	113.1	113.1	100.9	100.9
Effective Green, g (s)	6.9	6.9	113.1	113.1	100.9	100.9
Actuated g/C Ratio	0.05	0.05	0.87	0.87	0.78	0.78
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	93	84	537	3156	2678	1198
v/s Ratio Prot	c0.02		0.00	c0.48	0.28	
v/s Ratio Perm		0.00	0.04			0.06
v/c Ratio	0.35	0.02	0.05	0.55	0.36	0.08
Uniform Delay, d1	59.4	58.3	2.2	2.1	4.5	3.5
Progression Factor	1.00	1.00	0.22	0.24	1.00	1.00
Incremental Delay, d2	2.3	0.1	0.0	0.6	0.4	0.1
Delay (s)	61.7	58.4	0.5	1.1	4.9	3.6
Level of Service	E	E	A	A	A	A
Approach Delay (s)	60.1			1.1	4.7	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	3.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues
1: Walker Street/Sears Entr. & Duke Street

03/15/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	162	1986	809	88	2634	145	467	148	345	420
v/c Ratio	0.89	0.91	0.68	0.67	1.26	0.15	1.02	0.62	1.36	1.71
Control Delay	109.1	36.9	4.4	60.7	134.1	0.5	110.3	17.4	230.2	357.7
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	109.1	37.0	4.4	60.7	134.1	0.5	110.3	17.4	230.2	357.7
Queue Length 50th (ft)	159	619	5	91	~1168	1	~248	0	~435	~446
Queue Length 95th (ft)	#297	705	62	m101	#1252	m4	#363	50	#673	#666
Internal Link Dist (ft)		1533			318			740		259
Turn Bay Length (ft)	800		310			250				
Base Capacity (vph)	185	2182	1198	134	2094	948	457	260	254	246
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	8	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	0.88	0.91	0.68	0.66	1.26	0.15	1.02	0.57	1.36	1.71

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	157	1926	785	85	2555	141	453	0	144	335	0	407
Future Volume (vph)	157	1926	785	85	2555	141	453	0	144	335	0	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3871	1509	1770	3900	1615	3433	1583		1805	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3871	1509	1770	3900	1615	3433	1583		1805	1583	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	162	1986	809	88	2634	145	467	0	148	345	0	420
RTOR Reduction (vph)	0	0	348	0	0	67	0	141	0	0	154	0
Lane Group Flow (vph)	162	1986	461	88	2634	78	467	7	0	345	266	0
Heavy Vehicles (%)	0%	34%	7%	2%	33%	0%	2%	0%	2%	0%	0%	2%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	15.1	84.6	84.6	11.1	80.6	80.6	20.0	7.5		21.2	8.7	
Effective Green, g (s)	15.1	84.6	84.6	11.1	80.6	80.6	20.0	7.5		21.2	8.7	
Actuated g/C Ratio	0.10	0.56	0.56	0.07	0.54	0.54	0.13	0.05		0.14	0.06	
Clearance Time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	2.0	2.0	2.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	181	2183	851	130	2095	867	457	79		255	91	
v/s Ratio Prot	c0.09	0.51		0.05	c0.68		c0.14	0.00		c0.19	c0.17	
v/s Ratio Perm			0.31			0.05						
v/c Ratio	0.90	0.91	0.54	0.68	1.26	0.09	1.02	0.09		1.35	2.92	
Uniform Delay, d1	66.7	29.3	20.5	67.7	34.7	16.9	65.0	68.0		64.4	70.7	
Progression Factor	1.00	1.00	1.00	0.74	0.31	0.36	1.00	1.00		1.00	1.00	
Incremental Delay, d2	38.5	7.1	2.5	4.2	117.4	0.1	47.8	0.5		182.4	892.1	
Delay (s)	105.2	36.4	23.0	54.2	128.0	6.2	112.8	68.5		246.8	962.7	
Level of Service	F	D	C	D	F	A	F	E		F	F	
Approach Delay (s)		36.5			119.6			102.1			639.9	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	139.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.33		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	116.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	268	266	691	10	35	392	1170	56	1316	332
v/c Ratio	0.83	0.81	0.53	0.09	0.17	0.97	0.56	0.25	0.94	0.40
Control Delay	66.5	63.8	1.5	55.3	1.8	73.9	12.5	15.7	24.9	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.5	63.8	1.5	55.3	1.8	73.9	12.5	15.7	24.9	2.0
Queue Length 50th (ft)	208	206	0	8	0	256	257	15	~566	16
Queue Length 95th (ft)	304	300	0	26	0	#467	353	m17	m#616	m19
Internal Link Dist (ft)		359		138			713		891	
Turn Bay Length (ft)	150					150		200		250
Base Capacity (vph)	383	390	1305	114	203	404	2098	226	1403	820
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	0.70	0.68	0.53	0.09	0.17	0.97	0.56	0.25	0.94	0.40

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	462	34	643	6	4	33	365	1080	8	52	1224	309
Future Volume (vph)	462	34	643	6	4	33	365	1080	8	52	1224	309
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	5.0	5.0	4.0		5.0	5.0	0.0	0.0		0.0	0.0	0.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99		1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1534	1562	1305		1956	1723	1778	3049		1796	2828	1379
Flt Permitted	0.95	0.96	1.00		0.97	1.00	0.07	1.00		0.24	1.00	1.00
Satd. Flow (perm)	1534	1562	1305		1956	1723	130	3049		457	2828	1379
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	497	37	691	6	4	35	392	1161	9	56	1316	332
RTOR Reduction (vph)	0	0	0	0	0	34	0	0	0	0	0	141
Lane Group Flow (vph)	268	266	691	0	10	1	392	1170	0	56	1316	191
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	7%	0%	17%	1%	0%	0%	2%	23%	0%	0%	27%	15%
Turn Type	Split	NA	Free	Split	NA	Perm	pm+pt	NA		Perm	NA	Perm
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases			Free			4	2			6		6
Actuated Green, G (s)	25.2	25.2	120.0		4.2	4.2	75.6	75.6		52.6	52.6	52.6
Effective Green, g (s)	25.2	25.2	120.0		4.2	4.2	80.6	80.6		57.6	57.6	57.6
Actuated g/C Ratio	0.21	0.21	1.00		0.04	0.04	0.67	0.67		0.48	0.48	0.48
Clearance Time (s)	5.0	5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	0.2		0.2	0.2	0.2
Lane Grp Cap (vph)	322	328	1305		68	60	403	2047		219	1357	661
v/s Ratio Prot	c0.17	0.17			0.01		c0.19	0.38			c0.47	
v/s Ratio Perm			c0.53			0.00	0.47			0.12		0.14
v/c Ratio	0.83	0.81	0.53		0.15	0.02	0.97	0.57		0.26	0.97	0.29
Uniform Delay, d1	45.4	45.1	0.0		56.2	55.9	38.6	10.5		18.5	30.4	18.8
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		0.65	0.57	0.31
Incremental Delay, d2	16.6	14.1	1.5		1.0	0.1	37.4	1.2		0.8	7.6	0.3
Delay (s)	61.9	59.2	1.5		57.2	56.1	76.0	11.7		12.8	25.0	6.2
Level of Service	E	E	A		E	E	E	B		B	C	A
Approach Delay (s)		27.3			56.3			27.8			20.9	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	119	544	52	65	144	201	1078	396	1685
v/c Ratio	0.51	0.97	0.36	0.46	0.55	0.47	0.42	0.24	1.00
Control Delay	55.6	45.2	58.5	62.5	16.3	39.6	11.2	0.3	40.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
Total Delay	55.6	45.2	58.5	62.5	16.3	39.6	11.2	0.3	43.4
Queue Length 50th (ft)	90	122	39	49	0	94	144	0	~592
Queue Length 95th (ft)	155	#369	78	93	61	m175	166	0	#896
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	242	566	250	247	352	424	2593	1645	1684
Starvation Cap Reductn	0	0	0	0	0	0	0	0	16
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.96	0.21	0.26	0.41	0.47	0.42	0.24	1.01

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	124	0	499	49	61	135	189	1013	372	0	1584	0
Future Volume (vph)	124	0	499	49	61	135	189	1013	372	0	1584	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	0.0	0.0	4.0		0.0	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1617	1451		1770	1749	1615	1745	3749	1645		3485	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.07	1.00	1.00		1.00	
Satd. Flow (perm)	1617	1451		1770	1749	1615	127	3749	1645		3485	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	132	0	531	52	65	144	201	1078	396	0	1685	0
RTOR Reduction (vph)	0	351	0	0	0	132	0	0	0	0	0	0
Lane Group Flow (vph)	119	193	0	52	65	12	201	1078	396	0	1685	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	5%	5%	5%	2%	5%	0%	5%	1%	3%	0%	1%	5%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Free		NA	
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases						4	2		Free			
Actuated Green, G (s)	17.3	17.3		9.7	9.7	9.7	78.0	78.0	120.0		53.0	
Effective Green, g (s)	17.3	17.3		9.7	9.7	9.7	83.0	83.0	120.0		58.0	
Actuated g/C Ratio	0.14	0.14		0.08	0.08	0.08	0.69	0.69	1.00		0.48	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0	2.5			2.5	
Lane Grp Cap (vph)	233	209		143	141	130	424	2593	1645		1684	
v/s Ratio Prot	0.07	c0.13		0.03	c0.04		c0.10	0.29			c0.48	
v/s Ratio Perm						0.01	0.23		0.24			
v/c Ratio	0.51	0.92		0.36	0.46	0.09	0.47	0.42	0.24		1.00	
Uniform Delay, d1	47.4	50.7		52.2	52.7	51.1	37.9	8.0	0.0		31.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.17	1.28	1.00		0.65	
Incremental Delay, d2	1.4	41.3		1.1	1.7	0.2	0.2	0.4	0.3		18.7	
Delay (s)	48.9	92.0		53.4	54.4	51.3	44.4	10.7	0.3		39.0	
Level of Service	D	F		D	D	D	D	B	A		D	
Approach Delay (s)		84.3			52.5			12.3			39.0	
Approach LOS		F			D			B			D	

Intersection Summary			
HCM 2000 Control Delay	36.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	93.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	135	2479	2806	271	267
v/c Ratio	0.50	0.63	0.95	0.94	0.59
Control Delay	60.3	2.9	13.4	100.3	16.7
Queue Delay	0.0	1.6	33.4	17.1	0.2
Total Delay	60.3	4.5	46.7	117.5	16.9
Queue Length 50th (ft)	139	152	174	264	32
Queue Length 95th (ft)	m153	m164	m171	#439	127
Internal Link Dist (ft)		318	322	148	
Turn Bay Length (ft)	200				
Base Capacity (vph)	271	3914	2957	295	454
Starvation Cap Reductn	0	1179	341	0	0
Spillback Cap Reductn	0	421	346	26	15
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.50	0.91	1.07	1.01	0.61

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	124	2281	2535	47	249	246
Future Volume (vph)	124	2281	2535	47	249	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5071		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	5071		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	135	2479	2755	51	271	267
RTOR Reduction (vph)	0	0	1	0	0	192
Lane Group Flow (vph)	135	2479	2805	0	271	75
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	23.0	115.5	87.5		24.5	24.5
Effective Green, g (s)	23.0	115.5	87.5		24.5	24.5
Actuated g/C Ratio	0.15	0.77	0.58		0.16	0.16
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	271	3915	2958		289	258
v/s Ratio Prot	0.08	c0.49	c0.55		c0.15	
v/s Ratio Perm						0.05
v/c Ratio	0.50	0.63	0.95		0.94	0.29
Uniform Delay, d1	58.2	7.7	29.1		62.0	55.1
Progression Factor	0.98	0.33	0.33		1.00	1.00
Incremental Delay, d2	0.6	0.3	3.0		36.3	0.6
Delay (s)	57.5	2.9	12.7		98.3	55.8
Level of Service	E	A	B		F	E
Approach Delay (s)		5.7	12.7		77.2	
Approach LOS		A	B		E	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	124	1709	916	91	2505	175	178	385	103	229	196
v/c Ratio	0.58	0.96	0.58	0.55	1.05	0.76	0.76	0.78	0.43	0.91	0.44
Control Delay	55.5	35.8	1.7	78.3	70.8	83.0	82.5	47.3	65.3	100.0	23.4
Queue Delay	0.0	15.0	0.0	0.0	11.1	0.0	0.0	6.9	0.0	0.0	0.0
Total Delay	55.5	50.8	1.7	78.3	81.9	83.0	82.5	54.2	65.3	100.0	23.4
Queue Length 50th (ft)	116	716	10	87	~985	175	178	259	93	223	83
Queue Length 95th (ft)	m179	#1088	m22	149	#1134	257	261	373	158	#377	129
Internal Link Dist (ft)		322			1053		359			289	
Turn Bay Length (ft)	200			250		150					
Base Capacity (vph)	212	1771	1583	165	2388	291	296	496	247	260	443
Starvation Cap Reductn	0	113	0	0	0	0	0	74	0	0	0
Spillback Cap Reductn	0	0	0	0	60	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	1.03	0.58	0.55	1.08	0.60	0.60	0.91	0.42	0.88	0.44

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	114	1572	843	84	2130	175	272	52	354	95	211	180
Future Volume (vph)	114	1572	843	84	2130	175	272	52	354	95	211	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	5027		1681	1711	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	5027		1681	1711	1583	1770	1863	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)	124	1709	916	91	2315	190	296	57	385	103	229	196
RTOR Reduction (vph)	0	0	0	0	6	0	0	0	83	0	0	38
Lane Group Flow (vph)	124	1709	916	91	2499	0	175	178	302	103	229	158
Turn Type	Prot	NA	Free	Prot	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		8	8	1	4	4	5
Permitted Phases			Free						8			4
Actuated Green, G (s)	18.0	75.1	150.0	14.0	71.1		20.5	20.5	34.5	20.4	20.4	38.4
Effective Green, g (s)	18.0	75.1	150.0	14.0	71.1		20.5	20.5	34.5	20.4	20.4	38.4
Actuated g/C Ratio	0.12	0.50	1.00	0.09	0.47		0.14	0.14	0.23	0.14	0.14	0.26
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	212	1771	1583	165	2382		229	233	416	240	253	405
v/s Ratio Prot	0.07	0.48		0.05	c0.50		0.10	0.10	c0.07	0.06	c0.12	0.05
v/s Ratio Perm			c0.58						0.12			0.05
v/c Ratio	0.58	0.96	0.58	0.55	1.05		0.76	0.76	0.73	0.43	0.91	0.39
Uniform Delay, d1	62.5	36.2	0.0	65.0	39.5		62.4	62.4	53.4	59.5	63.8	46.1
Progression Factor	0.74	0.62	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.0	11.9	1.2	3.9	33.0		14.0	13.8	6.2	1.2	32.4	0.6
Delay (s)	49.5	34.4	1.2	68.9	72.4		76.5	76.2	59.6	60.7	96.3	46.7
Level of Service	D	C	A	E	E		E	E	E	E	F	D
Approach Delay (s)		24.0			72.3			67.6			70.9	
Approach LOS		C			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	51.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	218	95	95	1288	1687	115
v/c Ratio	0.81	0.22	0.43	0.46	0.75	0.11
Control Delay	71.8	25.9	21.5	3.4	17.3	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.7	0.0
Total Delay	71.8	25.9	21.5	3.4	18.0	2.2
Queue Length 50th (ft)	162	42	13	80	436	2
Queue Length 95th (ft)	#272	84	66	107	588	25
Internal Link Dist (ft)	314			434	643	
Turn Bay Length (ft)			250			250
Base Capacity (vph)	295	494	288	2773	2258	1047
Starvation Cap Reductn	0	0	0	206	0	0
Spillback Cap Reductn	0	1	0	0	250	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.19	0.33	0.50	0.84	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	201	87	87	1185	1552	106
Future Volume (vph)	201	87	87	1185	1552	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			-5%	5%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1814	3628	3451	1544
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	141	3628	3451	1544
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	218	95	95	1288	1687	115
RTOR Reduction (vph)	0	19	0	0	0	37
Lane Group Flow (vph)	218	76	95	1288	1687	78
Turn Type	Prot	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	18.3	26.5	91.7	91.7	78.5	78.5
Effective Green, g (s)	18.3	26.5	91.7	91.7	78.5	78.5
Actuated g/C Ratio	0.15	0.22	0.76	0.76	0.65	0.65
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	269	415	222	2772	2257	1010
v/s Ratio Prot	c0.12	0.01	0.03	c0.36	c0.49	
v/s Ratio Perm		0.04	0.30			0.05
v/c Ratio	0.81	0.18	0.43	0.46	0.75	0.08
Uniform Delay, d1	49.2	38.0	13.9	5.2	14.0	7.6
Progression Factor	1.00	1.00	2.63	0.52	1.00	1.00
Incremental Delay, d2	16.7	0.2	1.2	0.5	2.3	0.1
Delay (s)	65.8	38.2	37.9	3.2	16.4	7.7
Level of Service	E	D	D	A	B	A
Approach Delay (s)	57.4			5.6	15.8	
Approach LOS	E			A	B	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX H:

Intersection Capacity Analysis - Future with Development Condition (2040) with 2019 Proposed Development Program

Queues
1: Walker Street/Sears Entr. & Duke Street

03/15/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	111	1859	364	24	2142	98	475	165	48	68
v/c Ratio	0.60	0.62	0.34	0.27	0.83	0.10	0.80	0.35	0.17	0.24
Control Delay	73.1	21.9	4.0	56.2	15.8	0.3	65.6	2.0	49.1	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
Total Delay	73.1	21.9	4.0	56.2	16.6	0.3	65.6	2.0	49.1	1.9
Queue Length 50th (ft)	97	435	16	24	597	0	215	0	37	0
Queue Length 95th (ft)	159	556	77	m32	#819	m1	268	0	73	0
Internal Link Dist (ft)		1533			318			740		259
Turn Bay Length (ft)	800		310			250				
Base Capacity (vph)	301	2975	1065	176	2567	936	711	475	412	321
Starvation Cap Reductn	0	0	0	0	160	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	0.37	0.62	0.34	0.14	0.89	0.10	0.67	0.35	0.12	0.21

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	1803	353	23	2078	95	461	0	160	47	0	66
Future Volume (vph)	108	1803	353	23	2078	95	461	0	160	47	0	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	4988	1568	1719	5036	1615	3433	1568		1805	1509	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	4988	1568	1719	5036	1615	3433	1568		1805	1509	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	111	1859	364	24	2142	98	475	0	165	48	0	68
RTOR Reduction (vph)	0	0	140	0	0	51	0	154	0	0	65	0
Lane Group Flow (vph)	111	1859	224	24	2142	47	475	11	0	48	3	0
Heavy Vehicles (%)	0%	4%	3%	5%	3%	0%	2%	0%	3%	0%	0%	7%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	16.9	79.5	79.5	4.8	67.4	67.4	24.4	9.5		20.6	5.7	
Effective Green, g (s)	16.9	79.5	79.5	4.8	67.4	67.4	24.4	9.5		20.6	5.7	
Actuated g/C Ratio	0.12	0.57	0.57	0.03	0.48	0.48	0.17	0.07		0.15	0.04	
Clearance Time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	2.0	2.0	2.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	217	2832	890	58	2424	777	598	106		265	61	
v/s Ratio Prot	c0.06	c0.37		0.01	c0.43		c0.14	0.01		c0.03	0.00	
v/s Ratio Perm			0.14			0.03						
v/c Ratio	0.51	0.66	0.25	0.41	0.88	0.06	0.79	0.11		0.18	0.05	
Uniform Delay, d1	57.7	20.8	15.3	66.2	32.8	19.4	55.4	61.3		52.3	64.5	
Progression Factor	1.00	1.00	1.00	0.80	0.39	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.0	1.2	0.7	1.2	3.8	0.1	7.2	0.4		0.3	0.3	
Delay (s)	59.7	22.0	15.9	54.3	16.6	19.5	62.6	61.7		52.6	64.8	
Level of Service	E	C	B	D	B	B	E	E		D	E	
Approach Delay (s)		22.9			17.2			62.4			59.8	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	181	180	478	19	48	375	1641	14	458	111
v/c Ratio	0.72	0.71	0.33	0.16	0.23	0.61	0.65	0.11	0.24	0.15
Control Delay	63.2	62.4	0.6	56.3	2.5	12.8	12.3	20.7	16.3	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.2	62.4	0.6	56.3	2.5	12.8	12.3	20.7	16.3	3.9
Queue Length 50th (ft)	142	141	0	14	0	105	338	5	98	0
Queue Length 95th (ft)	211	209	0	39	0	200	525	22	154	33
Internal Link Dist (ft)		359		138			713		891	
Turn Bay Length (ft)	150					150		200		250
Base Capacity (vph)	420	424	1427	156	243	624	2526	125	1926	754
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	0.43	0.42	0.33	0.12	0.20	0.60	0.65	0.11	0.24	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	334	12	459	11	8	46	360	1569	7	13	440	107
Future Volume (vph)	334	12	459	11	8	46	360	1569	7	13	440	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	5.0	5.0	4.0		5.0	5.0	0.0	0.0		0.0	0.0	0.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99		1.00	1.00	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1578	1592	1427		1872	1723	1499	3535		1795	3487	1275
Flt Permitted	0.95	0.96	1.00		0.97	1.00	0.42	1.00		0.12	1.00	1.00
Satd. Flow (perm)	1578	1592	1427		1872	1723	670	3535		227	3487	1275
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	348	12	478	11	8	48	375	1634	7	14	458	111
RTOR Reduction (vph)	0	0	0	0	0	46	0	0	0	0	0	51
Lane Group Flow (vph)	181	180	478	0	19	2	375	1641	0	14	458	60
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	4%	0%	7%	9%	0%	0%	21%	6%	0%	0%	3%	24%
Turn Type	Split	NA	Free	Split	NA	Perm	pm+pt	NA		Perm	NA	Perm
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases			Free			4	2			6		6
Actuated Green, G (s)	19.2	19.2	120.0		6.1	6.1	79.7	79.7		60.2	60.2	60.2
Effective Green, g (s)	19.2	19.2	120.0		6.1	6.1	84.7	84.7		65.2	65.2	65.2
Actuated g/C Ratio	0.16	0.16	1.00		0.05	0.05	0.71	0.71		0.54	0.54	0.54
Clearance Time (s)	5.0	5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	0.2		3.0	3.0	3.0
Lane Grp Cap (vph)	252	254	1427		95	87	607	2495		123	1894	692
v/s Ratio Prot	c0.11	0.11			0.01		0.10	c0.46			0.13	
v/s Ratio Perm			c0.34			0.00	0.34			0.06		0.05
v/c Ratio	0.72	0.71	0.33		0.20	0.03	0.62	0.66		0.11	0.24	0.09
Uniform Delay, d1	47.8	47.8	0.0		54.6	54.1	7.5	9.7		13.3	14.4	13.1
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	9.4	8.7	0.6		1.0	0.1	1.9	1.4		0.4	0.1	0.1
Delay (s)	57.2	56.5	0.6		55.6	54.3	9.4	11.1		13.8	14.5	13.2
Level of Service	E	E	A		E	D	A	B		B	B	B
Approach Delay (s)		24.8			54.7			10.8			14.2	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	53	158	33	54	169	146	1487	356	794
v/c Ratio	0.43	0.63	0.28	0.41	0.67	0.25	0.53	0.29	0.36
Control Delay	67.6	21.3	61.2	65.5	26.2	7.2	7.2	2.0	10.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.6	21.3	61.2	65.5	26.2	7.2	7.2	2.0	10.0
Queue Length 50th (ft)	46	5	27	45	19	25	205	12	103
Queue Length 95th (ft)	89	76	60	85	90	60	362	51	131
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	199	312	231	255	351	579	2810	1239	2186
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.51	0.14	0.21	0.48	0.25	0.53	0.29	0.36

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	0	149	32	53	166	143	1457	349	0	778	0
Future Volume (vph)	58	0	149	32	53	166	143	1457	349	0	778	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	0.0	0.0	5.0		0.0	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.86		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1617	1454		1583	1749	1553	1745	3641	1583		3451	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.29	1.00	1.00		1.00	
Satd. Flow (perm)	1617	1454		1583	1749	1553	533	3641	1583		3451	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	59	0	152	33	54	169	146	1487	356	0	794	0
RTOR Reduction (vph)	0	141	0	0	0	135	0	0	79	0	0	0
Lane Group Flow (vph)	53	17	0	33	54	34	146	1487	277	0	794	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	5%	0%	5%	14%	5%	4%	5%	4%	7%	0%	2%	5%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Perm		NA	
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases						4	2		2			
Actuated Green, G (s)	9.8	9.8		9.8	9.8	9.8	95.4	95.4	95.4		77.4	
Effective Green, g (s)	9.8	9.8		9.8	9.8	9.8	100.4	100.4	95.4		82.4	
Actuated g/C Ratio	0.08	0.08		0.08	0.08	0.08	0.77	0.77	0.73		0.63	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0		5.0	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0	2.5	2.5		2.5	
Lane Grp Cap (vph)	121	109		119	131	117	579	2811	1161		2187	
v/s Ratio Prot	c0.03	0.01		0.02	c0.03		0.03	c0.41			0.23	
v/s Ratio Perm						0.02	0.16		0.18			
v/c Ratio	0.44	0.16		0.28	0.41	0.29	0.25	0.53	0.24		0.36	
Uniform Delay, d1	57.5	56.2		56.8	57.4	56.8	9.6	5.7	5.6		11.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		0.78	
Incremental Delay, d2	1.8	0.5		0.9	1.5	1.0	0.1	0.7	0.5		0.5	
Delay (s)	59.3	56.8		57.7	58.9	57.8	9.7	6.4	6.1		9.3	
Level of Service	E	E		E	E	E	A	A	A		A	
Approach Delay (s)		57.4			58.0			6.6			9.3	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	82	2103	2394	67	58
v/c Ratio	0.33	0.49	0.70	0.49	0.33
Control Delay	49.7	0.7	6.0	73.2	19.0
Queue Delay	0.0	0.1	0.3	0.0	0.0
Total Delay	49.7	0.8	6.2	73.2	19.0
Queue Length 50th (ft)	76	10	119	60	0
Queue Length 95th (ft)	m128	16	127	108	45
Internal Link Dist (ft)		318	322	148	
Turn Bay Length (ft)	200				
Base Capacity (vph)	252	4327	3408	316	330
Starvation Cap Reductn	0	630	358	0	0
Spillback Cap Reductn	0	0	302	0	3
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.33	0.57	0.78	0.21	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	75	1935	2143	60	62	53
Future Volume (vph)	75	1935	2143	60	62	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5065		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	5065		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	2103	2329	65	67	58
RTOR Reduction (vph)	0	0	2	0	0	54
Lane Group Flow (vph)	82	2103	2392	0	67	4
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	20.0	119.2	94.2		10.8	10.8
Effective Green, g (s)	20.0	119.2	94.2		10.8	10.8
Actuated g/C Ratio	0.14	0.85	0.67		0.08	0.08
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	252	4329	3408		136	122
v/s Ratio Prot	0.05	c0.41	c0.47		c0.04	
v/s Ratio Perm						0.00
v/c Ratio	0.33	0.49	0.70		0.49	0.04
Uniform Delay, d1	53.9	2.6	14.2		62.0	59.8
Progression Factor	0.86	0.12	0.35		1.00	1.00
Incremental Delay, d2	0.6	0.3	0.8		2.8	0.1
Delay (s)	46.9	0.7	5.8		64.8	59.9
Level of Service	D	A	A		E	E
Approach Delay (s)		2.4	5.8		62.5	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	88	1297	785	25	2143	179	179	160	37	65	72
v/c Ratio	0.52	0.62	0.50	0.23	0.77	0.74	0.73	0.32	0.29	0.48	0.24
Control Delay	51.1	13.9	3.9	66.3	28.5	74.7	74.0	6.8	65.6	72.8	10.5
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.1	14.0	3.9	66.3	28.5	74.7	74.0	6.8	65.6	72.8	10.5
Queue Length 50th (ft)	79	171	381	22	543	166	166	0	32	58	8
Queue Length 95th (ft)	125	271	743	52	#815	242	242	52	69	106	34
Internal Link Dist (ft)		322			1053		359			289	
Turn Bay Length (ft)	200			250		150					
Base Capacity (vph)	233	2094	1583	177	2801	360	363	497	184	193	355
Starvation Cap Reductn	0	198	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.68	0.50	0.14	0.77	0.50	0.49	0.32	0.20	0.34	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	1193	722	23	1855	117	283	46	147	34	60	66
Future Volume (vph)	81	1193	722	23	1855	117	283	46	147	34	60	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3539	1583	1770	5031		1681	1694	1583	1719	1810	1538
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3539	1583	1770	5031		1681	1694	1583	1719	1810	1538
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)	88	1297	785	25	2016	127	308	50	160	37	65	72
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	127	0	0	49
Lane Group Flow (vph)	88	1297	785	25	2139	0	179	179	33	37	65	23
Heavy Vehicles (%)	5%	2%	2%	2%	2%	5%	2%	5%	2%	5%	5%	5%
Turn Type	Prot	NA	Free	Prot	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		8	8	1	4	4	5
Permitted Phases			Free						8			4
Actuated Green, G (s)	13.7	81.9	140.0	8.7	76.9		20.2	20.2	28.9	9.2	9.2	22.9
Effective Green, g (s)	13.7	81.9	140.0	8.7	76.9		20.2	20.2	28.9	9.2	9.2	22.9
Actuated g/C Ratio	0.10	0.59	1.00	0.06	0.55		0.14	0.14	0.21	0.07	0.07	0.16
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	168	2070	1583	109	2763		242	244	383	112	118	251
v/s Ratio Prot	0.05	0.37		0.01	c0.43		c0.11	0.11	0.01	0.02	0.04	0.01
v/s Ratio Perm			c0.50						0.02			0.01
v/c Ratio	0.52	0.63	0.50	0.23	0.77		0.74	0.73	0.09	0.33	0.55	0.09
Uniform Delay, d1	60.0	19.0	0.0	62.5	24.7		57.4	57.3	44.9	62.5	63.4	49.7
Progression Factor	0.69	0.60	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.6	1.3	1.0	1.1	2.2		11.2	10.8	0.1	1.7	5.5	0.2
Delay (s)	43.8	12.6	1.0	63.5	26.9		68.6	68.2	45.0	64.2	68.9	49.9
Level of Service	D	B	A	E	C		E	E	D	E	E	D
Approach Delay (s)		9.7			27.4			61.2			60.0	
Approach LOS		A			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	40	66	43	1784	825	57
v/c Ratio	0.34	0.39	0.07	0.56	0.31	0.05
Control Delay	64.9	19.9	0.6	1.2	6.1	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.9	19.9	0.6	1.2	6.1	1.5
Queue Length 50th (ft)	33	0	1	24	116	0
Queue Length 95th (ft)	71	45	m2	43	159	12
Internal Link Dist (ft)	314			434	643	
Turn Bay Length (ft)			250			250
Base Capacity (vph)	340	357	651	3199	2682	1212
Starvation Cap Reductn	0	0	0	113	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.18	0.07	0.58	0.31	0.05

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	37	61	40	1641	759	52
Future Volume (vph)	37	61	40	1641	759	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			-5%	5%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1814	3628	3451	1544
Flt Permitted	0.95	1.00	0.32	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	618	3628	3451	1544
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	66	43	1784	825	57
RTOR Reduction (vph)	0	62	0	0	0	14
Lane Group Flow (vph)	40	4	43	1784	825	43
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	7.4	7.4	112.6	112.6	98.0	98.0
Effective Green, g (s)	7.4	7.4	112.6	112.6	98.0	98.0
Actuated g/C Ratio	0.06	0.06	0.87	0.87	0.75	0.75
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	100	90	623	3142	2601	1163
v/s Ratio Prot	c0.02		0.01	c0.49	0.24	
v/s Ratio Perm		0.00	0.05			0.03
v/c Ratio	0.40	0.04	0.07	0.57	0.32	0.04
Uniform Delay, d1	59.2	57.9	2.1	2.3	5.2	4.1
Progression Factor	1.00	1.00	0.25	0.22	1.00	1.00
Incremental Delay, d2	2.6	0.2	0.0	0.7	0.3	0.1
Delay (s)	61.8	58.1	0.6	1.2	5.5	4.1
Level of Service	E	E	A	A	A	A
Approach Delay (s)	59.5			1.2	5.4	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues
1: Walker Street/Sears Entr. & Duke Street

03/15/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	113	2056	809	88	2440	112	467	148	167	205
v/c Ratio	0.71	0.93	0.67	0.72	1.13	0.12	1.02	0.62	0.67	0.85
Control Delay	89.5	38.2	4.5	70.5	77.9	0.3	110.3	17.4	75.6	46.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	89.5	38.2	4.5	70.5	77.9	0.3	110.3	17.4	75.6	46.4
Queue Length 50th (ft)	109	665	8	91	~1013	0	~248	0	156	40
Queue Length 95th (ft)	#187	#760	72	m108	#1100	m2	#363	50	#263	#175
Internal Link Dist (ft)		1533			318			740		259
Turn Bay Length (ft)	800		310			250				
Base Capacity (vph)	173	2216	1201	134	2154	970	457	260	248	246
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	0.65	0.93	0.67	0.66	1.13	0.12	1.02	0.57	0.67	0.83

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1994	785	85	2367	109	453	0	144	162	0	199
Future Volume (vph)	110	1994	785	85	2367	109	453	0	144	162	0	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3871	1509	1770	3900	1615	3433	1583		1805	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3871	1509	1770	3900	1615	3433	1583		1805	1583	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	113	2056	809	88	2440	112	467	0	148	167	0	205
RTOR Reduction (vph)	0	0	337	0	0	50	0	141	0	0	155	0
Lane Group Flow (vph)	113	2056	472	88	2440	62	467	7	0	167	50	0
Heavy Vehicles (%)	0%	34%	7%	2%	33%	0%	2%	0%	2%	0%	0%	2%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	13.3	85.9	85.9	10.3	82.9	82.9	20.0	7.5		20.7	8.2	
Effective Green, g (s)	13.3	85.9	85.9	10.3	82.9	82.9	20.0	7.5		20.7	8.2	
Actuated g/C Ratio	0.09	0.57	0.57	0.07	0.55	0.55	0.13	0.05		0.14	0.05	
Clearance Time (s)	6.6	5.7	5.7	6.6	5.7	5.7	7.0	6.3		7.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	2.0	2.0	2.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	160	2216	864	121	2155	892	457	79		249	86	
v/s Ratio Prot	c0.06	0.53		0.05	c0.63		c0.14	0.00		c0.09	0.03	
v/s Ratio Perm			0.31			0.04						
v/c Ratio	0.71	0.93	0.55	0.73	1.13	0.07	1.02	0.09		0.67	0.58	
Uniform Delay, d1	66.5	29.2	19.9	68.5	33.5	15.6	65.0	68.0		61.4	69.2	
Progression Factor	1.00	1.00	1.00	0.76	0.31	1.76	1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.3	8.3	2.5	9.5	63.1	0.1	47.8	0.5		6.9	9.6	
Delay (s)	79.7	37.5	22.4	61.8	73.4	27.5	112.8	68.5		68.3	78.8	
Level of Service	E	D	C	E	E	C	F	E		E	E	
Approach Delay (s)		35.0			71.0			102.1			74.1	
Approach LOS		D			E			F			E	

Intersection Summary			
HCM 2000 Control Delay	57.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	97.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	219	223	547	10	35	378	1196	56	1246	265
v/c Ratio	0.77	0.76	0.42	0.09	0.17	0.87	0.55	0.24	0.85	0.32
Control Delay	63.2	62.7	1.0	55.3	1.8	49.4	11.3	13.8	18.3	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.2	62.7	1.0	55.3	1.8	49.4	11.3	13.8	18.3	1.8
Queue Length 50th (ft)	170	173	0	8	0	211	241	9	112	4
Queue Length 95th (ft)	245	249	0	26	0	#406	366	m17	m#628	m20
Internal Link Dist (ft)		359		138			713		891	
Turn Bay Length (ft)	150					150		200		250
Base Capacity (vph)	383	391	1305	114	203	435	2170	231	1471	827
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	0.57	0.57	0.42	0.09	0.17	0.87	0.55	0.24	0.85	0.32

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	377	34	509	6	4	33	352	1104	8	52	1159	246
Future Volume (vph)	377	34	509	6	4	33	352	1104	8	52	1159	246
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	14	14	12	13	14	12	12	12
Grade (%)		2%			0%			-1%			1%	
Total Lost time (s)	5.0	5.0	4.0		5.0	5.0	0.0	0.0		0.0	0.0	0.0
Lane Util. Factor	0.95	0.95	1.00		1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99		1.00	1.00	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.96	1.00		0.97	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1534	1567	1305		1956	1723	1778	3049		1796	2828	1379
Flt Permitted	0.95	0.96	1.00		0.97	1.00	0.10	1.00		0.24	1.00	1.00
Satd. Flow (perm)	1534	1567	1305		1956	1723	182	3049		445	2828	1379
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	405	37	547	6	4	35	378	1187	9	56	1246	265
RTOR Reduction (vph)	0	0	0	0	0	34	0	0	0	0	0	114
Lane Group Flow (vph)	219	223	547	0	10	1	378	1196	0	56	1246	151
Confl. Peds. (#/hr)			1	1					2	2		2
Heavy Vehicles (%)	7%	0%	17%	1%	0%	0%	2%	23%	0%	0%	27%	15%
Turn Type	Split	NA	Free	Split	NA	Perm	pm+pt	NA		Perm	NA	Perm
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases			Free			4	2			6		6
Actuated Green, G (s)	22.4	22.4	120.0		4.2	4.2	78.4	78.4		55.4	55.4	55.4
Effective Green, g (s)	22.4	22.4	120.0		4.2	4.2	83.4	83.4		60.4	60.4	60.4
Actuated g/C Ratio	0.19	0.19	1.00		0.04	0.04	0.70	0.70		0.50	0.50	0.50
Clearance Time (s)	5.0	5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	0.2		0.2	0.2	0.2
Lane Grp Cap (vph)	286	292	1305		68	60	432	2119		223	1423	694
v/s Ratio Prot	c0.14	0.14			0.01		c0.17	0.39			c0.44	
v/s Ratio Perm			c0.42			0.00	0.44			0.13		0.11
v/c Ratio	0.77	0.76	0.42		0.15	0.02	0.88	0.56		0.25	0.88	0.22
Uniform Delay, d1	46.3	46.3	0.0		56.2	55.9	32.3	9.2		16.9	26.5	16.6
Progression Factor	1.00	1.00	1.00		1.00	1.00	1.00	1.00		0.59	0.48	0.31
Incremental Delay, d2	11.6	11.2	1.0		1.0	0.1	17.6	1.1		1.2	3.8	0.3
Delay (s)	57.9	57.5	1.0		57.2	56.1	49.9	10.3		11.2	16.6	5.4
Level of Service	E	E	A		E	E	D	B		B	B	A
Approach Delay (s)		26.3			56.3			19.8			14.5	
Approach LOS		C			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBT
Lane Group Flow (vph)	82	315	52	68	147	177	1020	415	1719
v/c Ratio	0.52	0.76	0.36	0.48	0.55	0.42	0.37	0.25	0.93
Control Delay	62.4	18.4	58.1	62.9	16.1	34.8	7.9	0.3	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Total Delay	62.4	18.4	58.1	62.9	16.1	34.8	7.9	0.3	28.6
Queue Length 50th (ft)	65	6	39	51	0	73	116	0	528
Queue Length 95th (ft)	114	102	78	96	61	155	135	0	#927
Internal Link Dist (ft)		273		334			891		97
Turn Bay Length (ft)			100		100	620		200	
Base Capacity (vph)	242	477	250	247	354	425	2764	1645	1843
Starvation Cap Reductn	0	0	0	0	0	0	0	0	25
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.66	0.21	0.28	0.42	0.42	0.37	0.25	0.95

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	0	288	49	64	138	166	959	390	0	1616	0
Future Volume (vph)	86	0	288	49	64	138	166	959	390	0	1616	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	11	12	12	13	13	12	12	12
Grade (%)		2%			0%			-3%			5%	
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	0.0	0.0	4.0		0.0	
Lane Util. Factor	0.95	0.95		1.00	1.00	1.00	1.00	0.95	1.00		0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1617	1452		1770	1749	1615	1745	3749	1645		3485	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.06	1.00	1.00		1.00	
Satd. Flow (perm)	1617	1452		1770	1749	1615	116	3749	1645		3485	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	91	0	306	52	68	147	177	1020	415	0	1719	0
RTOR Reduction (vph)	0	276	0	0	0	135	0	0	0	0	0	0
Lane Group Flow (vph)	82	39	0	52	68	12	177	1020	415	0	1719	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	5%	0%	5%	2%	5%	0%	5%	1%	3%	0%	1%	5%
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA	Free		NA	
Protected Phases	3	3		4	4		5	2			6	
Permitted Phases						4	2		Free			
Actuated Green, G (s)	11.7	11.7		9.9	9.9	9.9	83.4	83.4	120.0		58.4	
Effective Green, g (s)	11.7	11.7		9.9	9.9	9.9	88.4	88.4	120.0		63.4	
Actuated g/C Ratio	0.10	0.10		0.08	0.08	0.08	0.74	0.74	1.00		0.53	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0			5.0	
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5	2.0	2.5			2.5	
Lane Grp Cap (vph)	157	141		146	144	133	424	2761	1645		1841	
v/s Ratio Prot	c0.05	0.03		0.03	c0.04		c0.09	0.27			c0.49	
v/s Ratio Perm						0.01	0.22		0.25			
v/c Ratio	0.52	0.28		0.36	0.47	0.09	0.42	0.37	0.25		0.93	
Uniform Delay, d1	51.5	50.2		52.0	52.6	50.9	36.5	5.7	0.0		26.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.13	1.18	1.00		0.68	
Incremental Delay, d2	2.4	0.8		1.1	1.8	0.2	0.2	0.3	0.3		8.0	
Delay (s)	53.9	51.0		53.1	54.3	51.1	41.5	7.1	0.3		25.9	
Level of Service	D	D		D	D	D	D	A	A		C	
Approach Delay (s)		51.6			52.3			9.1			25.9	
Approach LOS		D			D			A			C	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	136	2365	2707	146	140
v/c Ratio	0.50	0.57	0.85	0.70	0.45
Control Delay	58.2	1.4	8.7	80.7	13.0
Queue Delay	0.0	0.6	2.6	0.1	0.0
Total Delay	58.2	2.0	11.3	80.8	13.1
Queue Length 50th (ft)	140	66	143	140	0
Queue Length 95th (ft)	m163	90	154	208	63
Internal Link Dist (ft)		318	322	148	
Turn Bay Length (ft)	200				
Base Capacity (vph)	271	4145	3185	295	380
Starvation Cap Reductn	0	1247	353	0	0
Spillback Cap Reductn	0	428	267	6	7
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.50	0.82	0.96	0.51	0.38

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	125	2176	2431	60	134	129
Future Volume (vph)	125	2176	2431	60	134	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5067		1770	1583
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	5085	5067		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	2365	2642	65	146	140
RTOR Reduction (vph)	0	0	1	0	0	123
Lane Group Flow (vph)	136	2365	2706	0	146	17
Turn Type	Prot	NA	NA		Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases						4
Actuated Green, G (s)	23.0	122.3	94.3		17.7	17.7
Effective Green, g (s)	23.0	122.3	94.3		17.7	17.7
Actuated g/C Ratio	0.15	0.82	0.63		0.12	0.12
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	271	4145	3185		208	186
v/s Ratio Prot	0.08	c0.47	c0.53		c0.08	
v/s Ratio Perm						0.01
v/c Ratio	0.50	0.57	0.85		0.70	0.09
Uniform Delay, d1	58.2	4.8	22.2		63.6	59.0
Progression Factor	0.93	0.21	0.31		1.00	1.00
Incremental Delay, d2	0.7	0.3	1.4		10.2	0.2
Delay (s)	55.0	1.3	8.2		73.8	59.2
Level of Service	D	A	A		E	E
Approach Delay (s)		4.2	8.2		66.7	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	130	1600	780	91	2471	168	170	316	62	128	126
v/c Ratio	0.66	0.84	0.49	0.61	0.96	0.75	0.75	0.61	0.34	0.67	0.33
Control Delay	58.8	24.3	0.9	83.0	45.2	82.2	82.2	28.1	66.2	81.2	18.7
Queue Delay	0.0	0.7	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0
Total Delay	58.8	25.0	0.9	83.0	45.2	82.2	82.2	29.5	66.2	81.2	18.7
Queue Length 50th (ft)	118	331	0	87	841	168	170	135	57	122	44
Queue Length 95th (ft)	192	#967	1	149	#1110	247	250	228	103	189	76
Internal Link Dist (ft)		322			1053		359			289	
Turn Bay Length (ft)	200			250		150					
Base Capacity (vph)	206	1910	1583	160	2586	291	293	519	240	253	386
Starvation Cap Reductn	0	95	0	0	0	0	0	76	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.88	0.49	0.57	0.96	0.58	0.58	0.71	0.26	0.51	0.33

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1472	718	84	2108	166	266	45	291	57	118	116
Future Volume (vph)	120	1472	718	84	2108	166	266	45	291	57	118	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		0.95	0.95	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3539	1583	1719	5030		1681	1694	1583	1719	1810	1538
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1719	3539	1583	1719	5030		1681	1694	1583	1719	1810	1538
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)	130	1600	780	91	2291	180	289	49	316	62	128	126
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	123	0	0	40
Lane Group Flow (vph)	130	1600	780	91	2466	0	168	170	193	62	128	86
Heavy Vehicles (%)	5%	2%	2%	5%	2%	2%	2%	5%	2%	5%	5%	5%
Turn Type	Prot	NA	Free	Prot	NA		Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	5	2		1	6		8	8	1	4	4	5
Permitted Phases			Free						8			4
Actuated Green, G (s)	17.1	81.0	150.0	13.1	77.0		20.1	20.1	33.2	15.8	15.8	32.9
Effective Green, g (s)	17.1	81.0	150.0	13.1	77.0		20.1	20.1	33.2	15.8	15.8	32.9
Actuated g/C Ratio	0.11	0.54	1.00	0.09	0.51		0.13	0.13	0.22	0.11	0.11	0.22
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	195	1911	1583	150	2582		225	226	403	181	190	337
v/s Ratio Prot	c0.08	0.45		0.05	c0.49		0.10	c0.10	0.04	0.04	c0.07	0.03
v/s Ratio Perm			c0.49						0.08			0.03
v/c Ratio	0.67	0.84	0.49	0.61	0.95		0.75	0.75	0.48	0.34	0.67	0.26
Uniform Delay, d1	63.7	29.0	0.0	66.0	34.8		62.5	62.6	50.9	62.3	64.6	48.4
Progression Factor	0.70	0.64	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.0	3.8	0.9	6.8	9.9		12.6	13.2	0.9	1.1	9.1	0.4
Delay (s)	51.9	22.5	0.9	72.7	44.8		75.1	75.7	51.8	63.4	73.7	48.8
Level of Service	D	C	A	E	D		E	E	D	E	E	D
Approach Delay (s)		17.3			45.8			64.0			61.8	
Approach LOS		B			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	36.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	114	86	104	1182	1735	80
v/c Ratio	0.59	0.23	0.44	0.40	0.72	0.07
Control Delay	62.7	28.5	20.3	2.6	14.6	2.4
Queue Delay	0.0	0.0	0.0	0.1	0.5	0.0
Total Delay	62.7	28.5	20.3	2.7	15.1	2.4
Queue Length 50th (ft)	85	42	10	72	373	2
Queue Length 95th (ft)	141	79	72	105	610	21
Internal Link Dist (ft)	314			434	643	
Turn Bay Length (ft)			250			250
Base Capacity (vph)	295	425	300	2929	2395	1093
Starvation Cap Reductn	0	0	0	363	0	0
Spillback Cap Reductn	0	1	0	0	267	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.20	0.35	0.46	0.82	0.07

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	105	79	96	1087	1596	74
Future Volume (vph)	105	79	96	1087	1596	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			-5%	5%	
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1814	3628	3451	1544
Flt Permitted	0.95	1.00	0.08	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	149	3628	3451	1544
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	86	104	1182	1735	80
RTOR Reduction (vph)	0	17	0	0	0	22
Lane Group Flow (vph)	114	69	104	1182	1735	58
Turn Type	Prot	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	13.1	21.7	96.9	96.9	83.3	83.3
Effective Green, g (s)	13.1	21.7	96.9	96.9	83.3	83.3
Actuated g/C Ratio	0.11	0.18	0.81	0.81	0.69	0.69
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	352	239	2929	2395	1071
v/s Ratio Prot	c0.06	0.01	0.03	c0.33	c0.50	
v/s Ratio Perm		0.03	0.32			0.04
v/c Ratio	0.59	0.20	0.44	0.40	0.72	0.05
Uniform Delay, d1	50.9	41.7	12.3	3.3	11.3	5.8
Progression Factor	1.00	1.00	2.83	0.62	1.00	1.00
Incremental Delay, d2	4.8	0.3	1.2	0.4	1.9	0.1
Delay (s)	55.7	42.0	36.0	2.4	13.2	5.9
Level of Service	E	D	D	A	B	A
Approach Delay (s)	49.8			5.1	12.9	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			