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MEMORANDUM



To: Michael J. Gallagher, PE
Town of Vienna

From: Michael R. Pinkoske, PTP
John A. Schick

Re: Maple Avenue Consolidation (Marco Polo Site)

Subject: Multimodal Traffic Impact Analysis

Date: March 17, 2016
Updated: December 12, 2017

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INTRODUCTION

This technical memorandum provides an update to the multimodal traffic impact analysis prepared for the rezoning application of the Maple Avenue Consolidation (Marco Polo restaurant) site, dated March 17, 2016. The site is generally located in the northeast quadrant of the Maple Avenue W/Pleasant Street intersection in the Town of Vienna, Virginia. This update reflects a revised development program and site plan which now includes 44 residential dwelling units (DU) and 8,200 square feet (SF) of retail uses.

The Applicant, Vienna Visions LLC, is seeking to consolidate and rezone the subject site to the Maple Avenue Corridor (MAC) zone from the existing C-1A commercial zoning and redevelop the existing retail property with a new mixed-use development. The Town of Vienna's *"Assessment of Regulatory Options for Maple Avenue Commercial Area Feasibility Study"* allows for mixed-use development if the majority of the building's uses are retail oriented and accessible at street level. The study also recommends Maple Avenue frontage improvements with an emphasis on promoting walkability and less dependence on vehicular traffic.

The subject site is bounded by Maple Avenue (VA 123) to the south, Pleasant Street NW to the west, Church Street NW to the north, and a private alley to the east as shown on Figure 1. It includes five (5) parcels (Tax Map 38-4 ((4)) Parcels 2 and 4, and 38-4 (((2))) Parcels 15, 16 and 17) and is occupied with approximately 41,000 square (SF) of retail/restaurant uses and surface parking. These existing uses are partially occupied with underperforming retail uses with approximately 22,000 SF of vacant space including the former Marco Polo Restaurant.



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The Applicant proposes to raze the existing uses and redevelop the site with approximate 8,200 SF of retail uses and 44 condominium units. The proposed development would include one (1) level of structured parking to serve the retail uses, individual garages (2 spaces each) to serve the condominiums, and surface parking spaces to serve the residential guest parking. As will be discussed herein, the currently proposed development is a less intense mix of uses than the previous application and the by-right option.

Existing access to the site is currently provided via two (2) driveways on Maple Avenue W, two (2) driveways on Pleasant Street NW, and four (4) driveways on Church Street NW. All of the existing driveways operate as stop-controlled, full movement access points to/from the property. As proposed, access would be consolidated to one (1) driveway on Maple Avenue W and two (2) driveways on Church Street NW. Residential access would be provided at the site driveways along Church Street NW and retail access to the parking garage would be from the Maple Avenue W driveway.

The redeveloped site would consolidate the existing access points and result in five (5) fewer driveways than the current site. An off-street loading zone will be provided internal to the building which would be access from Maple Avenue W to accommodate retail deliveries and trash collection. New sidewalks will be provided along the site frontage as well as curb and gutter installation along Pleasant Avenue and Church Street, where no pedestrian facilities currently exist.

A copy of the site plan is shown on Figure 2.



Figure 1
Site Location and Study Intersections

Maple Avenue Consolidation
Town of Vienna, Virginia

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PLEASANT STREET NW

CHURCH STREET NW

MAPLE AVENUE WEST - ROUTE 123

Figure 2
Conceptual Plan (Grade Level)

Maple Avenue Consolidation
Town of Vienna, Virginia



SOURCE: SMITH ENGINEERING





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This multimodal traffic study is based on a traffic scoping agreement with the Town of Vienna Public Works staff which is included in Appendix A. A build out year of 2018 was assumed for purposes of this analysis and assumes the full buildout and occupancy of the property.

Tasks undertaken in this study included the following:

1. Confirmation of the traffic study scope with Town Vienna (see Appendix A).
2. Collection of existing 2016 vehicular, pedestrian, and bicycle counts during the AM and PM peak hours at Church Street/Pleasant Street and Church Street/Lawyers Road intersections and all existing site driveways. The intersections of Maple Avenue/Lawyers Road and Pleasant Street/Maple Avenue were also analyzed using peak hour traffic counts provided by the Town of Vienna from the *Traffic Signal System Review and Optimization Study*.
3. Capacity analyses for existing AM and PM peak hour conditions at each of the site driveways and study intersections utilizing the Synchro 9.1 analysis software and the Highway Capacity Manual (HCM) 2000 methodology.
4. Preparation of the AM and PM peak hour traffic forecasts for future conditions without development (2018) that include existing traffic, an ambient growth rate of 1.0 percent, compounded annually, for two (2) years, and the by-right 41,000 SF of retail use.
5. Capacity analyses for future conditions without development (2018) based on the peak hour traffic forecasts without development and the HCM 2000 methodology computed by Synchro 9.1 and the planned traffic signal timings for the Maple Avenue corridor.
6. Calculation of the number of AM and PM peak hour trips that would be generated by the proposed development based on standard Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition rates and equations.
7. Preparation of the AM and PM peak hour traffic forecasts for future conditions with development (2018).
8. Capacity analyses for future conditions with development (2018) based on the peak hour traffic forecasts without development and the HCM 2000 methodology computed by Synchro 9.1 and the planned traffic signal timings for the Maple Avenue W corridor.



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Sources of data for this analysis included previous traffic study information, the Virginia Department of Transportation (VDOT); ITE; The Town of Vienna; *Traffic Signal System Review and Optimization Study*, by Gorove Slade; Smith Engineering; Kylo + Pattana Architects; and the files of Wells + Associates Inc. (W+A).

BACKGROUND INFORMATION

Compliance with VDOT Chapter 870 Guidelines

As confirmed during the scoping process and summarized later in this document, the proposed development is estimated to generate less than 5,000 daily (24-hour) trips and is therefore exempt from the VDOT Chapter 870 Guidelines.

Study Area and Road Network

The following intersections were included as part of this traffic study:

1. Church Street NW/Pleasant Street NW
2. Church Street NW/Lawyers Road NW (Route 673)
3. Maple Avenue W (Route 123)/Pleasant Street NW**
4. Maple Avenue W/Lawyers Road NW/Courthouse Road SW**
5. Church Street NW/Residential Site Driveway (Future)
6. Church Street NW/Retail Site Driveway (Future)
7. Pleasant Street NW/Residential Site Driveway (Future)
8. Maple Avenue W/Retail Site Driveway (Future)
9. Maple Avenue W/Nutley Street**

** Traffic count data provided by the Town of Vienna in the *Traffic Signal System Review and Optimization Study*.

Existing Road Network

The existing lane use and traffic controls at key study intersections in the site vicinity are shown on Figure 3.

Maple Avenue W (Route 123) is a four-lane, undivided, Urban Principal Arterial with a posted speed limit of 30 mph adjacent to the site. A two-way left turn lane is provided the length of Maple Avenue along the site frontage. A traffic signal and turn left-lanes exist at the Lawyers Road NW intersection. Maple Avenue W in the area of the site carries 33,000 average daily vehicles.



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Lawyers Road NW (Route 673) is a two-lane, undivided, Minor Arterial with a posted speed limit of 25 mph in the vicinity of the site. Lawyers Road NW in the area of the site carries 13,000 average daily vehicles.

Pleasant Street NW is a two-lane local street with a posted speed limit of 25.

Church Street NW is a two-lane local street with a posted speed limit of 25. Church Street NW is one-way eastbound between Pleasant Street NW and a midblock barricade then becomes two-way between the barricade and Lawyers Road NW. The barricade restricts westbound through traffic to eliminate a potential cut-through route for vehicles attempting to avoid the signalized intersection of Maple Avenue W/Lawyers Road NW.

Nutley Street (Route 243) is a four-lane, undivided, Urban Minor Arterial with a posted speed limit of 30 mph east of the Maple Avenue intersection and an Urban Collector with a speed limit of 30 mph to the west of the Maple Avenue intersection. Nutley Street in the area of the site carries 18,000 average daily trips.

Existing Traffic Counts

W+A conducted AM and PM peak hour vehicular, pedestrian, and bicycle counts at the aforementioned intersections on Wednesday, February 17, 2016 from 6:00 to 9:00 AM and 4:00 to 7:00 PM. Traffic data provided by the Town of Vienna for the intersections of Maple Avenue W/Lawyers Road/Courthouse Road and Maple Avenue W/Pleasant Street were collected on Thursday May 8, 2014 as part of the Gorove Slade optimization study. Traffic count information for the Maple Avenue/Nutley Street intersection was provided by the Town of Vienna. The existing thru traffic counts along Maple Avenue W and Lawyers Road were balanced up to within 10 percent to account for the different count dates. The baseline AM and PM peak hour traffic volumes are summarized on Figure 4 and detailed count data is provided in Appendix B.



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Multimodal Facilities

Sidewalks are provided along both sides of Maple Avenue W and Lawyers Road NW, but are not currently provided along Pleasant Street and Church Street. At the signalized intersection of Maple Avenue W/Lawyers Road crosswalks with pedestrian countdown signal heads are provided on all legs of the intersection.

Within the study area *Bike Fairfax* does not identify any of the streets as bicycle routes. To the east of the site Center Street is identified as a Preferred Route as well as the Washington Old Dominion Trail. To the south Courthouse Road W and Locust Street SW are identified as Preferred Routes.

The existing pedestrian and bicycle counts at the study intersections are summarized on Figures 5 and 6, and the detailed count data is included in Appendix B.

In addition to the above described pedestrian and bicycle infrastructure that exists nearby the site, three (3) bus lines have stops within close proximity. The list below provides a summary of bus lines located within a half-mile or 10-minute walk.

Fairfax Connector 461 (Flint Hill – Vienna) is a weekday rush hour service route that has stops located approximately a ½ mile west of the site along Maple Avenue W and Nutley Street SW and a ½ east of the site along Maple Avenue E. This route operates in a loop beginning and ending at the Vienna Metro Station. It runs primarily along Virginia Center Boulevard, Nutley Street, Maple Avenue, Malcolm Road, Park Street and Tapawingo Road. The route operates on weekday mornings with 5 to 7-minute headways and weekday afternoons with 6 to 10 minute headways.

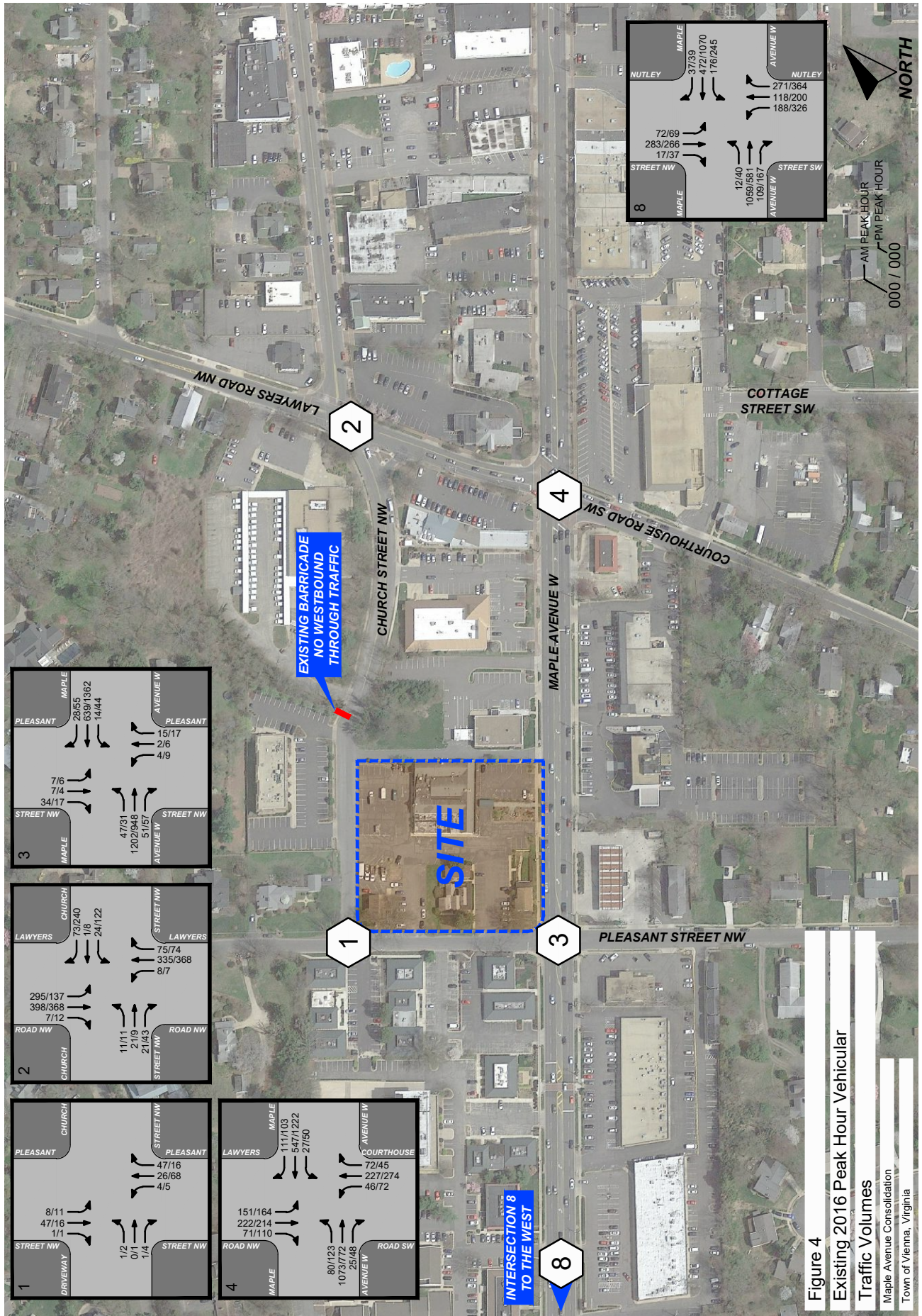
Fairfax Connector 463 (Maple Avenue – Vienna) has multiple stops located within ¼ mile to the east and west of the site along Maple Avenue W. This route operates between the Vienna Metro Station and the Tysons Corner Metro Station. It runs primarily along Nutley Street, Maple Avenue, Chain Bridge Road and Gosnell Road. The route operates on weekdays, Saturdays, and Sundays with approximately 7 to 11-minute headways.

Fairfax Connector 466 (Vienna – Oakton) has stops located approximately a ½ mile west of the site along Nutley Street and Maple Avenue W. This route operates in a loop beginning and ending at the Vienna Metro Station. It runs primarily along Chain Bridge Road, Nutley Street, and Blake Lane. The route operates on weekdays only with approximately 7 to 10-minute headways.



Figure 3
Existing 2016 Lane Use and Traffic Controls

Maple Avenue Consolidation
Town of Vienna, Virginia



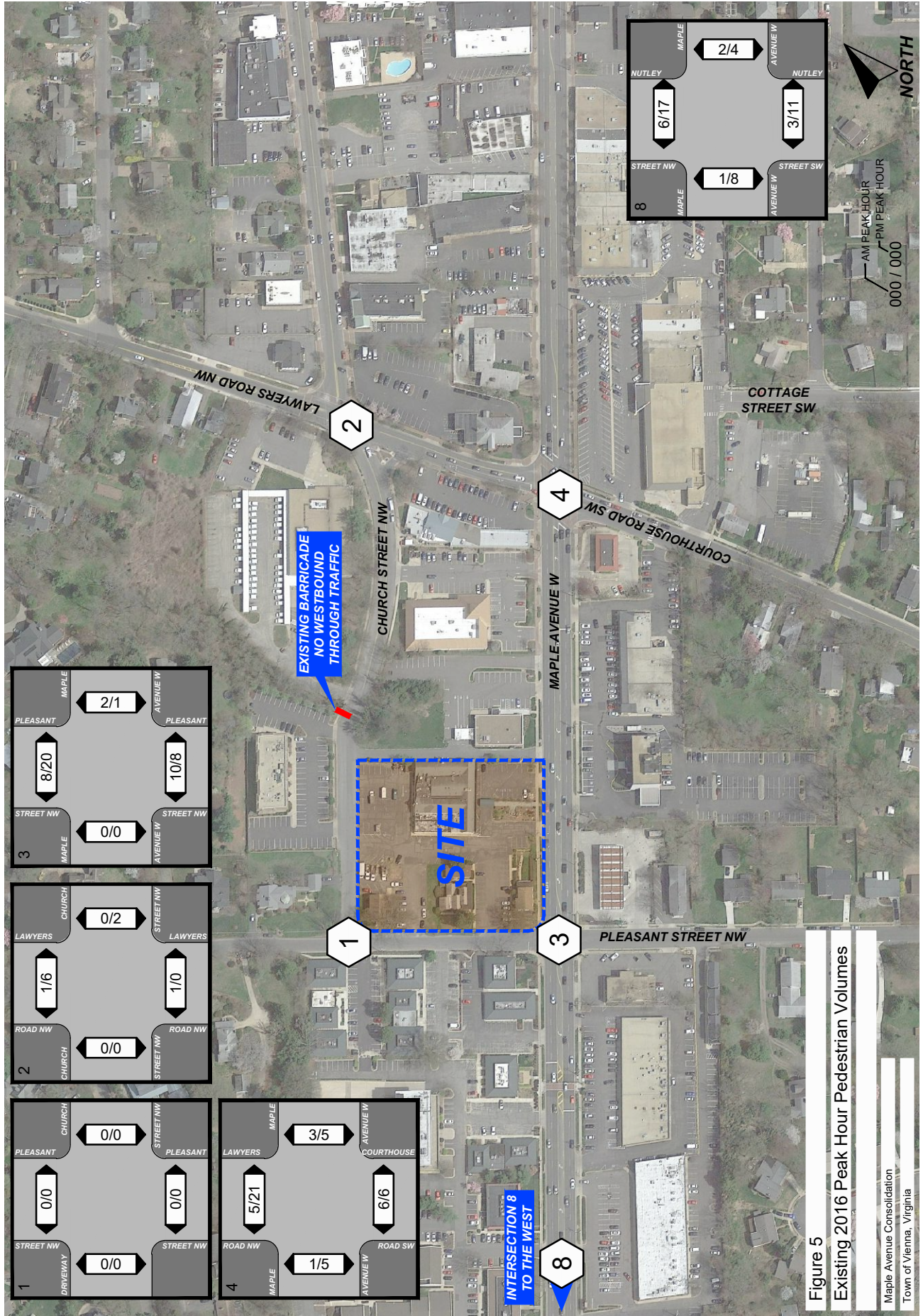


Figure 5
Existing 2016 Peak Hour Pedestrian Volumes



Figure 6
Existing 2016 Peak Hour Bicycle Volumes

Maple Avenue Consolidation
Town of Vienna, Virginia



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ANALYSIS OF EXISTING CONDITIONS

Existing Conditions Operational Analysis

Existing peak hour levels of service (LOS) and the 50th and 95th percentile queues were estimated at the study intersections based on the existing lane usage and traffic control, baseline traffic volumes, and the 2000 HCM methodology using Synchro, version 9.1. The base Synchro files including traffic signal timings at the intersections of Maple Avenue W and Lawyers Road NW were provided by the Town of Vienna. These files were modified account for the effects of peak hour factors, pedestrian calls and bus blockages where applicable. The results are presented in Appendix C and summarized in Tables 1 and 2.

Levels of Service. The existing LOS results are summarized in Table 1 and indicate the following:

- The signalized intersection of Maple Avenue W/Lawyers Road NW currently operates at an overall acceptable LOS “D” during the AM peak hour and near capacity at LOS “E” during the PM peak hour. Most individual movements operate near or at capacity during the peak periods. The deficient levels of service realized at the intersection are partly attributed to the protected left turn phasing on all approaches and the long cycle length.
- The signalized intersection of Maple Avenue W/Nutley Street currently operates at an overall LOS “E” during both the AM and PM peak hours. Some individual movements operate at or beyond capacity during both peak periods. Delay on the Nutley Street approaches is partly due to the north/south split phasing of the traffic signal and time allocated to mainline Maple Avenue.
- At the stop controlled intersection of Church Street NW/Lawyers Road NW the eastbound and westbound stopped controlled approaches currently operate LOS “E” or “F” during the AM peak hour. During the PM peak hour, the westbound approach currently operates at LOS “F”. The stop-controlled side street approaches operate poorly due to the heavy through movement along Lawyers Road NW during the peak periods. Mainline traffic along Lawyers Road operates at acceptable levels of service during both the AM and PM peak hours.
- All of the approaches at the stop controlled intersections of Church Street NW/Pleasant Street NW and Maple Avenue W/Pleasant Street NW currently operate at acceptable levels of service (at LOS “D” or better) during the AM and PM peak hours.



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Queues. The 50th and 95th percentile queues of existing conditions are used to establish a datum against which to compare future conditions. The 50th percentile (or average) queue is defined as the maximum back of queue associated with a typical signal cycle. The 95th percentile queue is defined as the maximum back of queue with 95th percentile traffic volumes. The 95th percentile queue is not necessarily ever observed, it is simply based on statistical calculations¹.

As shown in Table 2, the left/right turn storage at study intersections is currently adequate to accommodate the estimated 95th percentile queue with the following exceptions:

- The southbound left turn from Lawyers Road NW to Maple Avenue W during the AM and PM peak hours.
- The westbound left turn from Maple Avenue to Nutley Street during the AM peak hour.

Based on field observations the southbound queue along Lawyers Road NW at Maple Avenue W generally extended back to or beyond the Church Street NW intersection during a typical cycle during peak periods. This queue clears each cycle and allowed ingress/egress to/from Church Street. At the intersection of Maple Avenue/Nutley Street the peak hour delay extends beyond the delineated exclusive turn lane into the two way left turn lane. The queue does not block westbound through traffic and typically clears each cycle.

¹ Synchro Studio 9, Traffic Signal Software – User Guide

Table 1
 Marco Polo Site
 Existing Intersection Level of Service ¹

Intersection	Intersection Control	Lane Group/Approach	2016 Existing Conditions			
			AM Peak Hour		PM Peak Hour	
			LOS	Delay	LOS	Delay
(1) Church Street/ Pleasant Street	Unsignalized	EB	A	8.9	A	8.9
		WB	-	-	-	-
		NB	A	0.4	A	0.4
		SB	A	1.2	A	3.1
(2) Church Street/ Lawyers Road	Unsignalized	EB	F	84.0	D	26.3
		WB	F	53.6	F	304.2
		NB	A	0.3	A	0.2
		SB	A	4.0	A	2.4
(3) Maple Avenue/ Pleasant Street	Unsignalized	EBL	A	8.8	B	11.7
		EBTR	A	0.0	A	0.0
		WBL	B	12.6	B	11.2
		WBTR	A	0.0	A	0.0
		NBLTR	C	20.9	C	21.7
		SBLTR	B	14.3	C	18.3
(4) Maple Avenue/ Lawyers Road	Signalized	EBL	F	63.8	F	121.9
		EBTR	D	37.4	C	33.2
		WBL	E	71	F	102.5
		WBTR	C	34.7	F	81.8
		NBL	E	72.3	F	88.1
		NBTR	E	73.4	F	94.7
		SBL	F	85.6	F	115.9
		SBTR	D	46.4	E	62.4
		Overall	D	46.3	E	72.5
(5) Church Street/ Site Driveway	Unsignalized	EB WB NB	Future Intersection		Future Intersection	
(6) Church Street/ Site Driveway	Unsignalized	EB WB NB	Future Intersection		Future Intersection	
(7) Pleasant Street/ Site Driveway	Unsignalized	WB NB SB	Future Intersection		Future Intersection	
(8) Maple Avenue/ Site Driveway	Unsignalized	EBL EBT WBTR SBLR	Future Intersection		Future Intersection	
(9) Maple Avenue/ Nutley Street	Signalized	EBL	C	25.8	D	36.8
		EBTR	D	54.6	D	47
		WBL	F	92.9	D	47
		WBTR	C	26.4	D	47.3
		NBLT	F	88.6	F	109.3
		NBR	E	58.9	D	54.1
		SBL	E	64.2	E	63.8
		SBTR	F	96.1	F	97.7
		Overall	E	60.5	E	62.3

Notes:

1. Analysis performed using Synchro software, version 9.

Table 2
Marco Polo Site
Existing Intersection Queuing Summary ¹

Intersection	Intersection Control	Lane Group/Approach	Storage Length (Feet)	2016 Existing Conditions			
				AM Peak Hour		PM Peak Hour	
				50th Percentile	95th Percentile	50th Percentile	95th Percentile
(1) Church Street/ Pleasant Street	Unsignalized	EBLTR	-	-	0	-	1
		WBLTR	-	-	-	-	-
		NBLTR	-	-	0	-	0
		SBLTR	-	-	0	-	1
(2) Church Street/ Lawyers Road	Unsignalized	EB	-	-	75	-	26
		WB	-	-	94	-	612
		NB	-	-	1	-	1
		SBL	50	-	30	-	13
		SBTR	-	-	0	-	0
(3) Maple Avenue/ Pleasant Street	Unsignalized	EBL	50	-	4	-	5
		EBTR	-	-	0	-	0
		WBL	50	-	3	-	6
		WBTR	-	-	0	-	0
		NBLTR	-	-	8	-	13
		SBLTR	-	-	11	-	9
(4) Maple Avenue/ Lawyers Road	Signalized	EBL	140	77	136	144	#292
		EBTR	-	527	#640	374	454
		WBL	140	28	60	55	107
		WBTR	-	290	341	~867	#1005
		NBL	150	46	91	84	#151
		NBTR	-	289	#447	368	#554
		SBL	200	157	#257	201	#335
		SBTR	-	265	355	354	457
(5) Church Street/ Site Driveway	Unsignalized	EBTR	-	Future Intersection		Future Intersection	
		WBT	-				
		NBLR	-				
(6) Church Street/ Site Driveway	Unsignalized	EBTR	-	Future Intersection		Future Intersection	
		WBT	-				
		NBLR	-				
(7) Pleasant Street/ Site Driveway	Unsignalized	WBLR	-	Future Intersection		Future Intersection	
		NBTR	-				
		SBLT	-				
(8) Maple Avenue/ Site Driveway	Unsignalized	EBL	-	Future Intersection		Future Intersection	
		EBT	-				
		WBTR	-				
		SBLR	-				
(9) Maple Avenue/ Nutley Street	Signalized	EBL	60	8	21	27	51
		EBTR	-	836	#971	428	503
		WBL	285	188	#346	197	#281
		WBTR	-	212	289	723	806
		NBLT	-	234	297	409	#565
		NBR	-	72	138	108	197
		SBL	-	82	137	78	132
		SBTR	-	395	#556	398	#566

Notes:

1. Analysis performed using Synchro software, version 9.
2. "~" - 50th percentile volume exceeds capacity, queue may be longer.
3. "#" - 95th percentile volume exceeds capacity, queue may be longer.
4. "m" - Volume for 95th percentile queue is metered by upstream signal.



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ANALYSIS OF FUTURE CONDITIONS WITHOUT DEVELOPMENT (2018)

Traffic Volumes

This section presents an analysis of future transportation conditions including projections of 2018 future traffic forecasts without the proposed development, as well as capacity and queuing analyses.

Regional Growth. As identified during the scoping process and detailed in the traffic scoping agreement contained in Appendix A, regional growth of through traffic was included in the future traffic forecasts. A growth rate of one (1.0) percent was applied to all traffic movements along Maple Ave W, Lawyers Road NW, Pleasant Street NW, and Church Street NW to account for ambient growth and for future development not assumed herein and is summarized on Figure 7. It is noted that a review of VDOT Average Annual Daily Traffic (AADT) indicates the traffic volumes on Maple Avenue W and Lawyers Road NW have shown no growth over the past four (4) year period.

Pipeline Developments. Per the scoping document, no pipeline developments were identified for inclusion in this traffic study. As noted above the 1.0 percent growth was assumed to account for future development.

By-Right Development. As mentioned previously the site is currently only partially occupied and generating less peak hour traffic than a typical retail use. As such, the future conditions without the proposed development assume the site would be fully occupied with 41,000 SF of retail uses as permitted by-right.

In order to accurately compare future conditions and isolate the impacts of the site redevelopment, the peak hour trip generation of by-right uses was calculated using the ITE Trip Generation Manual, 9th Edition rates and equations. The site was assumed to be occupied by “General Retail” ITE Land Use Code 820.

As shown in Table 3, the by-right development is estimated to generate 67 AM peak hour trips, 247 PM peak hour trips, and 2,853 daily trips. This assumed a 25 percent pass-by reduction. The observed peak hour traffic was subtracted from the ITE estimates to derive the additional traffic that the site would be generated if fully occupied and operating to the site’s full potential. The additional traffic was assigned to the roadway network based on current traffic patterns. Figure 8 summarizes the additional peak hour traffic that was added to the network for the by-right development.



2018 Regional Growth

Maple Avenue Consolidation
Town of Vienna, Virginia

Table 3
 Marco Polo Site
 By-Right Trip Generation Analysis ¹

Land Use	Land Use Code	Size	Units	<u>AM Peak Hour</u>			<u>PM Peak Hour</u>			Weekday ADT
				In	Out	Total	In	Out	Total	
<u>Existing Development</u>										
Observed Peak Hour Traffic Counts (February 17, 2016)				12	2	14	4	9	13	
<i>Pass-by Reduction (25%) ²</i>				<u>(3)</u>	<u>(1)</u>	<u>(4)</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	
ITE - Shopping Center	820	41,000	SF	56	34	90	158	172	330	3,804
<i>Pass-by Reduction (25%) ²</i>				<u>(14)</u>	<u>(9)</u>	<u>(23)</u>	<u>(40)</u>	<u>(43)</u>	<u>(83)</u>	<u>(951)</u>
Total By-Right Trips				42	25	67	118	129	247	2,853
Additonal Trips (By-Right minus Observed)				33	24	57	115	122	237	2,853

Notes:

1. Trip estimates calculated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition.
2. Pass-by percentage consistent with the VDOT Traffic Impact Analysis Regulations Administrative Guidelines.



Figure 8
2018 By-Right Development Trips

Maple Avenue Consolidation
Town of Vienna, Virginia



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Future Forecasts without Development (2018)

Future peak hour traffic forecasts without the proposed development are shown on Figure 9 and are a composite of the baseline peak hour traffic volumes, regional growth, and the by-right development.

Maple Avenue Traffic Signal Timings

The Town of Vienna is in the process of implementing traffic signal timing improvements along the Maple Avenue corridor that include, but are not limited to, updated cycle lengths and phasing, and the optimization of the timing to provide improved coordination between adjacent signals. These timing files have been received from the Town and are assumed in place by 2018.

Operational Analysis without Development (2018)

Peak hour levels of service and queuing analyses for future conditions without redevelopment of the site and were estimated at the study intersections based on the existing lane usage, updated traffic signal timings, the future peak hour traffic forecasts without redevelopment, and the 2000 HCM methodology using Synchro version 9.1. The results are presented in Appendix D and summarized in Tables 4 and 5.

Levels of Service. The 2018 LOS results without the proposed development assuming the addition of regional growth and the by-right development are summarized in Table 4 and indicate the following:

- The signalized intersection of Maple Avenue W/Lawyers Road NW would continue to operate at an overall LOS “D” during the AM peak hour and LOS “E” during the PM peak hour. Most individual movements operate would continue to operate LOS “E” or “F” during the peak periods. As mentioned previously the levels of services at the intersection are partly attributed to the protected left turns phasing on all approaches and the cycle length.
- The signalized intersection of Maple Avenue W/Nutley Street would continue to operate at overall LOS “E” during both peak periods, with some individual movements operating beyond capacity consistent with existing conditions.
- At the stop controlled intersection of Church Street NW/Lawyers Road NW the eastbound and westbound stopped controlled approaches would continue to operate LOS “E” or “F” during peak periods. Mainline traffic along Lawyers Road



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would continue to operate at acceptable levels of service during both the AM and PM peak hours.

- The stop controlled intersections of Church Street NW/Pleasant Street NW and Maple Avenue W/Pleasant Street NW would continue to operate at acceptable levels of service during the AM and PM peak hours (LOS “D” or better).

Maple Avenue W and Lawyers Road NW. Consistent with existing conditions the improved traffic signal timings at the intersection include protected left-turn phasing on all approaches. Two improvement scenarios were evaluated in order to mitigate an existing and future condition without the proposed development. The first improvement scenario converted the left-turn phasing for the eastbound and westbound approaches along Maple Avenue W to protected/permitted phasing. The second improvement scenario converted all the left-turn phasing at the intersection to protected/permitted phasing.

As shown in Table 4, converting the eastbound and westbound left-turn phasing from protected only phasing to protected/permitted phasing would reduce the delay on each of the left-turn on from Maple Avenue W substantially. The modified timing would result in a reduction of overall delay per vehicle at the intersection between four (4) and 13 seconds.

The second scenario evaluated the conversion of all the protected left-turns at the intersection to protected/permitted. As shown in Table 4, with the modification to the signal phasing to include protected/permitted phasing on all approaches the AM and PM peak hour would operate at overall acceptable levels of service (LOS “D”), with a further reduction of the overall and lane group delay per vehicle. When compared to the existing phasing at the intersection this improvement would reduce overall delay per vehicle during peak period by approximately 10 to 21 seconds per vehicle.

Queues. The future estimated 50th and 95th percentile peak hour queue results without the proposed development for the turning movements are presented in Table 5. As shown in Table 5, the estimated peak hour queues at study intersections would remain generally consistent with existing condition in future. During peak periods the southbound left turn on Lawyers Road at Maple Avenue and the westbound left turn on Maple Avenue at Nutley Street would continue to exceed the available storage. Implementing the recommended timing improvements at the Maple Avenue W/Lawyers Road NW intersection could reduce peak hour queues.

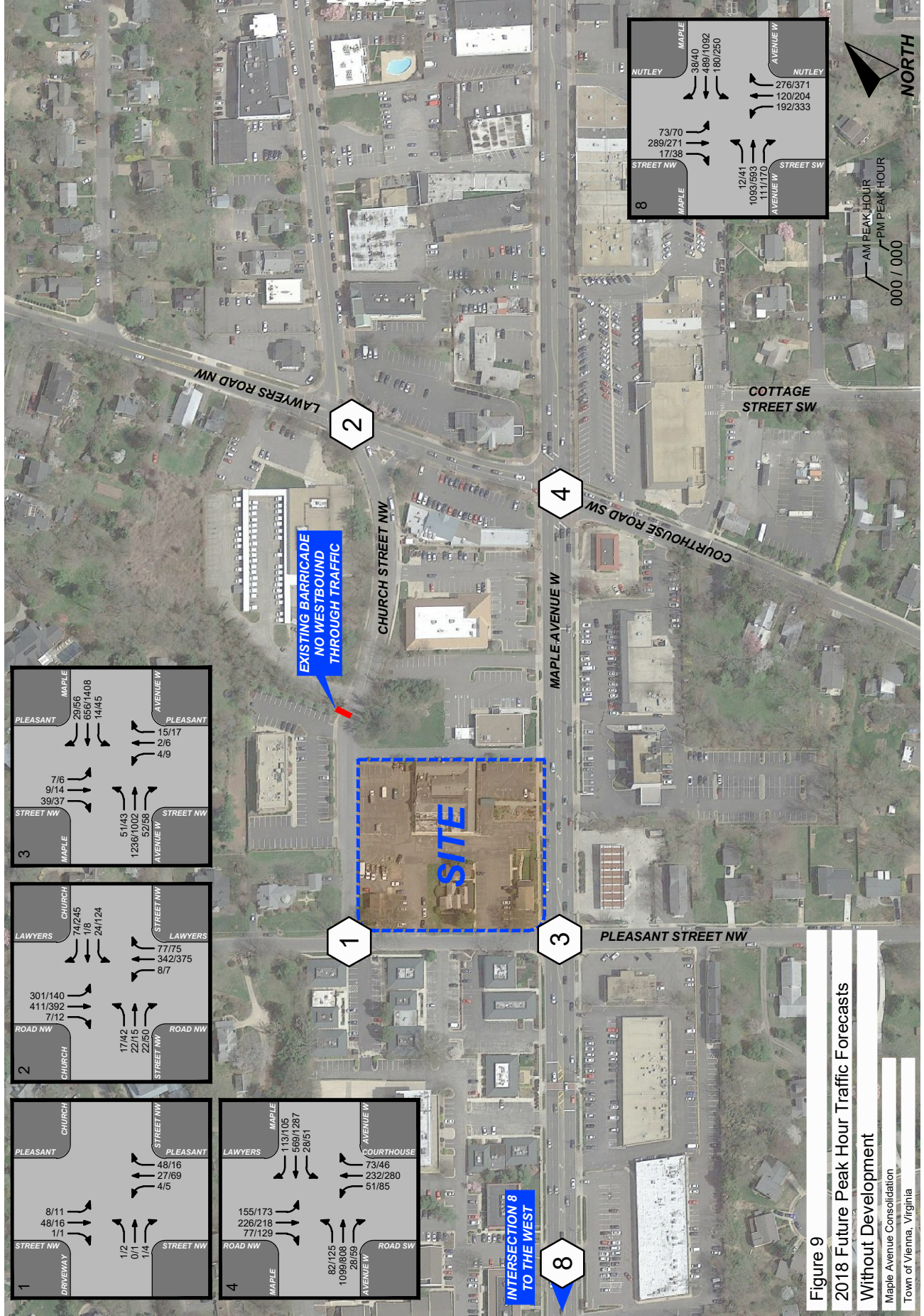


Table 4
 Marco Polo Site
 Background Intersection Level of Service ¹

Intersection	Intersection Control	Lane Group/Approach	2016 Existing Conditions				2018 Background Conditions ²			
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
			LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
(1) Church Street/ Pleasant Street	Unsignalized	EB	A	8.9	A	8.9	A	8.9	A	8.9
		WB	-	-	-	-	-	-	-	-
		NB	A	0.4	A	0.4	A	0.4	A	0.4
		SB	A	1.2	A	3.1	A	1.1	A	3.0
(2) Church Street/ Lawyers Road	Unsignalized	EB	F	84.0	D	26.3	F	112.9	F	109.5
		WB	F	53.6	F	304.2	F	57.7	F	343.0
		NB	A	0.3	A	0.2	A	0.3	A	0.2
		SB	A	4.0	A	2.4	A	4.0	A	2.3
(3) Maple Avenue/ Pleasant Street	Unsignalized	EBL	A	8.8	B	11.7	A	8.9	B	11.9
		EBTR	A	0.0	A	0.0	A	0.0	A	0.0
		WBL	B	12.6	B	11.2	B	12.8	B	11.5
		WBTR	A	0.0	A	0.0	A	0.0	A	0.0
		NBLTR	C	20.9	C	21.7	C	21.2	C	24.1
		SBLTR	B	14.3	C	18.3	C	15.3	C	21.4
(4) Maple Avenue/ Lawyers Road	Signalized	EBL	F	63.8	F	121.9	F	93.1	F	135.8
		EBTR	D	37.4	C	33.2	B	18.8	C	21.0
		WBL	E	71	F	102.5	E	70.3	F	102.5
		WBTR	C	34.7	F	81.8	C	33.6	F	99.4
		NBL	E	72.3	F	88.1	E	73.6	F	97.0
		NBTR	E	73.4	F	94.7	E	72.9	F	93.8
		SBL	F	85.6	F	115.9	F	82.5	F	113.5
		SBTR	D	46.4	E	62.4	D	46.6	E	64.0
		Overall	D	46.3	E	72.5	D	39.0	E	77.1
		<i>Signal Phasing Improvements</i>								
		<i>Modify eastbound and westbound</i>								
		<i>Maple Avenue left turns to protected/</i>								
		<i>permitted.</i>								
		EBL					A	8.0	F	113.3
		EBTR					B	20.0	B	16.5
		WBL					C	23.9	B	15.4
		WBTR					C	30.4	E	60.1
		NBL					E	73.6	F	122.3
		NBTR					E	75.2	F	121.1
		SBL					F	86.6	F	125.2
		SBTR					D	47.6	E	70.3
		Overall					D	36.3	E	62.0
		<i>Modify all</i>					A	7.0	F	110.1
		<i>Modify all left turns to protected/</i>					B	17.9	B	15.6
		<i>permitted.</i>					C	22.0	B	14.8
		EBL					C	28.3	E	55.6
		EBTR					D	41.3	D	53.7
		WBL					E	70.8	F	101.9
		WBTR					D	44.4	F	83.7
		NBL					D	47.5	E	64.2
		NBTR					C	31.3	D	53.5
		SBL								
		SBTR								
		Overall								
(5) Church Street/ Site Driveway	Unsignalized	EB WB NB	Future Intersection		Future Intersection		Future Intersection		Future Intersection	
(6) Church Street/ Site Driveway	Unsignalized	EB WB NB	Future Intersection		Future Intersection		Future Intersection		Future Intersection	
(7) Pleasant Street/ Site Driveway	Unsignalized	WB NB SB	Future Intersection		Future Intersection		Future Intersection		Future Intersection	
(8) Maple Avenue/ Site Driveway	Unsignalized	EBL EBT WBTR SBLR	Future Intersection		Future Intersection		Future Intersection		Future Intersection	
(9) Maple Avenue/ Nutley Street	Signalized	EBL	C	25.8	D	36.8	C	24.7	D	40.8
		EBTR	D	54.6	D	47	E	57.1	D	54.1
		WBL	F	92.9	D	47	F	101.4	E	63.0
		WBTR	C	26.4	D	47.3	B	12.3	D	37.3
		NBLT	F	88.6	F	109.3	E	70.1	F	91.2
		NBR	E	58.9	D	54.1	D	45.2	D	38.7
		SBL	E	64.2	E	63.8	D	50.2	D	54.7
		SBTR	F	96.1	F	97.7	F	112.8	F	96.8
		Overall	E	60.5	E	62.3	E	57.5	E	57.0

Notes:

1. Analysis performed using Synchro software, version 9.

2. Signal timings for future conditionsthe Maple Avenue signalized intersections utilize the planned signal timings received from the Town of Vienna.

Table 5
Marco Polo Site
Background Intersection Queuing Summary ¹

Intersection	Intersection Control	Lane Group/Approach	Storage Length (Feet)	2016 Existing Conditions				2018 Background Conditions ⁵			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				50th Percentile	95th Percentile	50th Percentile	95th Percentile	50th Percentile	95th Percentile	50th Percentile	95th Percentile
(1) Church Street/ Pleasant Street	Unsignalized	EBLTR	-	-	0	-	1	-	0	-	1
		WBLTR	-	-	-	-	-	-	-	-	-
		NBLTR	-	-	0	-	0	-	0	-	0
		SBLTR	-	-	0	-	1	-	0	-	1
(2) Church Street/ Lawyers Road	Unsignalized	EB	-	-	75	-	26	-	95	-	140
		WB	-	-	94	-	612	-	95	-	650
		NB	-	-	1	-	1	-	1	-	1
		SBL	50	-	30	-	13	-	31	-	13
		SBTR	-	-	0	-	0	-	0	-	0
(3) Maple Avenue/ Pleasant Street	Unsignalized	EBL	50	-	4	-	5	-	4	-	7
		EBTR	-	-	0	-	0	-	0	-	0
		WBL	50	-	3	-	6	-	2	-	7
		WBTR	-	-	0	-	0	-	0	-	0
		NBLTR	-	-	8	-	13	-	7	-	14
		SBLTR	-	-	11	-	9	-	13	-	21
(4) Maple Avenue/ Lawyers Road	Signalized	EBL	140	77	136	144	#292	85	145	148	#300
		EBTR	-	527	#640	374	454	293	#696	222	283
		WBL	140	28	60	55	107	26	61	56	111
		WBTR	-	290	341	~867	#1005	274	350	~951	#1088
		NBL	150	46	91	84	#151	49	96	96	#186
		NBTR	-	289	#447	368	#554	284	#447	361	#554
		SBL	200	157	#257	201	#335	150	#259	198	#355
		SBTR	-	265	355	354	457	255	365	353	486
		EBL	-	-	-	-	-	13	27	103	#242
		EBTR	-	-	-	-	-	454	687	183	233
	Signal Phasing Improvements <i>Modify eastbound and westbound Maple Avenue left turns to protected/ permitted.</i>	WBL	-	-	-	-	-	12	29	15	32
		WBTR	-	-	-	-	-	255	318	831	#996
		NBL	-	-	-	-	-	49	96	97	#209
		NBTR	-	-	-	-	-	286	#459	~390	#602
		SBL	-	-	-	-	-	151	#270	199	#366
		SBTR	-	-	-	-	-	260	372	362	#534
		EBL	-	-	-	-	-	13	25	102	#241
		EBTR	-	-	-	-	-	432	675	179	223
		WBL	-	-	-	-	-	12	27	15	31
		WBTR	-	-	-	-	-	252	305	812	#974
(5) Church Street/ Site Driveway	Unsignalized	NBL	-	-	-	-	-	32	65	68	114
		NBTR	-	-	-	-	-	281	#435	367	#578
		SBL	-	-	-	-	-	105	#179	148	#308
		SBTR	-	-	-	-	-	255	365	356	#510
		EBL	-	-	-	-	-	-	-	-	-
		EBTR	-	-	-	-	-	-	-	-	-
		WBL	-	-	-	-	-	-	-	-	-
		WBTR	-	-	-	-	-	-	-	-	-
		NBLR	-	-	-	-	-	-	-	-	-
		NBLR	-	-	-	-	-	-	-	-	-
(6) Church Street/ Site Driveway	Unsignalized	EBTR	-	-	-	-	-	-	-	-	-
		WBT	-	-	-	-	-	-	-	-	-
		NBLR	-	-	-	-	-	-	-	-	-
		NBLR	-	-	-	-	-	-	-	-	-
(7) Pleasant Street/ Site Driveway	Unsignalized	WBLR	-	-	-	-	-	-	-	-	-
		NBTR	-	-	-	-	-	-	-	-	-
		SBLT	-	-	-	-	-	-	-	-	-
		SBLT	-	-	-	-	-	-	-	-	-
(8) Maple Avenue/ Site Driveway	Unsignalized	EBL	-	-	-	-	-	-	-	-	-
		EBT	-	-	-	-	-	-	-	-	-
		WBTR	-	-	-	-	-	-	-	-	-
		SBLR	-	-	-	-	-	-	-	-	-
(9) Maple Avenue/ Nutley Street	Signalized	EBL	60	8	21	27	51	5	17	25	49
		EBTR	-	836	#971	428	503	608	#770	409	493
		WBL	285	188	#346	197	#281	147	#299	168	#335
		WBTR	-	212	289	723	806	72	92	593	737
		NBLT	-	234	297	409	#565	157	242	323	#503
		NBR	-	72	138	108	197	72	164	82	187
		SBL	-	82	137	78	132	63	114	68	120
		SBTR	-	395	#556	398	#566	~326	#525	348	#546
		SBTR	-	-	-	-	-	-	-	-	-

Notes:

- Analysis performed using Synchro software, version 9.
- "~" - 50th percentile volume exceeds capacity, queue may be longer.
- "#" - 95th percentile volume exceeds capacity, queue may be longer.
- "m" - Volume for 95th percentile queue is metered by upstream signal.
- Signal timings for future conditionthe Maple Avenue signalized intersections utilize the planned signal timings received from the Town of Vienna.



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ANALYSIS OF FUTURE CONDITIONS WITH DEVELOPMENT (2018)

Site Trip Generation

The number of AM and PM peak hour trips that would be generated by the proposed development were estimated based on the ITE Trip Generation Manual, 9th Edition trip rates and equations. ITE Land Use Code 820 (Shopping Center) and 230 (Residential Condominium/Townhouse) were used to complete the analysis.

As shown in Table 6, the proposed development is estimated to generate 39 AM peak hour primary trips (13 in and 26 out) and 71 PM peak hour primary trips (40 in and 31 out). The trip generation estimates include a 60 percent pass-by reduction and an internal capture between the residential and retail uses of five (5) percent during the AM peak hour and 10 percent during the PM peak hour.

Pass-by trips are vehicles already driving past the site today that would in the future pull into the site to patronize the retail uses. When departing the site, these vehicles proceed on to their original destination. These trips would account for approximately 20 AM peak hour trips and 66 PM peak hour trips.

The reductions assumed herein are consistent with ITE and VDOT standard practices. Pass-by rates were derived by taking an average of pass-by rates published in the ITE handbook of developments of similar size. It should also be noted that the alternative trip generation model noted in VDOT's Traffic Impact Analysis Regulations Administrative Guidelines was reviewed, but were not used to complete this analysis. The alternative trip generation method is better applied to large scale mixed-use developments.

As noted previously, the by-right development is estimated to generate 67 AM peak hour trips and 247 PM peak hour trips. When compared to the by-right development, the proposed redevelopment would generate approximately 28 fewer AM peak hour primary trips, 176 fewer PM peak primary hour trips and 2,069 fewer daily primary trips.

Existing Site Generated Traffic. Peak hour traffic generated by the existing uses on site was removed from the surrounded road network based on the existing travel patterns. These trips are shown on Figure 10.

Table 6
Marco Polo Site
Site Trip Generation Analysis¹

Land Use	Land Use Code	Size	Units	AM Peak Hour		PM Peak Hour		Weekday ADT
				In	Out	In	Out	Total
<u>Proposed Development</u>								
ITE - Shopping Center	820	8,200	SF	21	13	54	58	112
<i>Internal Capture (5% AM, 10% PM, 15% ADT)²</i>				(11)	-	(1)	(2)	(3)
				20	13	53	56	109
<i>Pass-by Reduction (60%)³</i>				(12)	(8)	(32)	(34)	(66)
Retail Primary Trips				8	5	21	22	43
								516
Townhouses	230	44	DU	5	22	21	10	31
<i>Internal Capture (5% AM, 10% PM, 15% ADT)²</i>				-	(1)	(2)	(1)	(3)
Residential Subtotal				5	21	19	9	28
								268
<u>Proposed Development (Primary Trips)</u>				13	26	40	31	71
								784

Notes:

1. Trip estimates calculated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition.
2. Internal capture rate based on capture rates provided in the VDOT *Traffic Impact Analysis Regulations Administrative Guidelines*.
3. Pass-by percentage based on ITE's Trip Generation Handbook, 9th Edition.



Figure 10
2018 Removed Existing Site Generated Traffic

Maple Avenue Consolidation
Town of Vienna, Virginia



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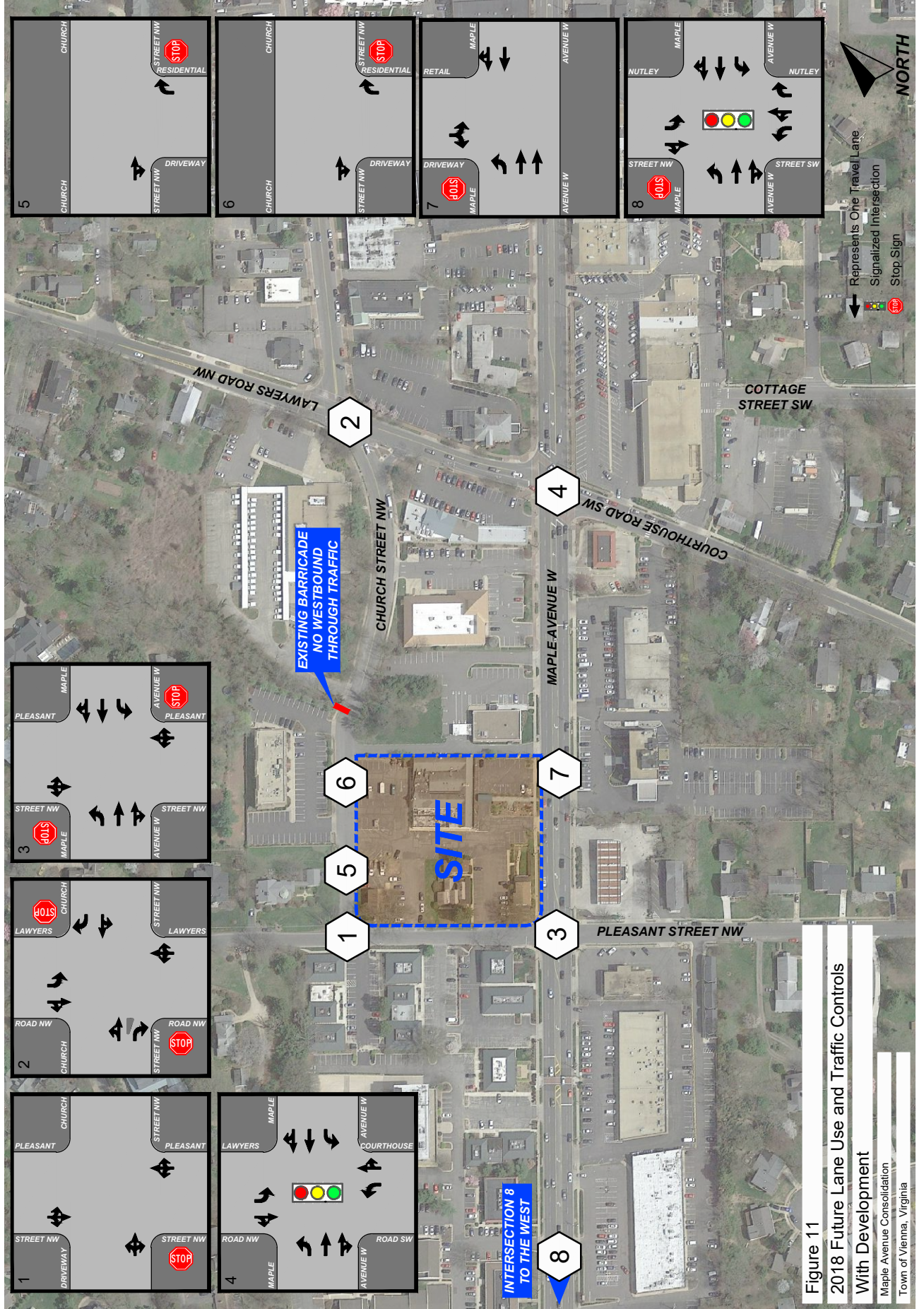
Site Access

As shown on Figure 1 and previously discussed, eight (8) driveways currently serve the site along Maple Avenue W, Pleasant Street NW, and Church Street NW. All of the existing driveways operate under stop-controlled conditions providing full-movement access to/from the site. Two (2) of the site driveways are located along Maple Avenue, two (2) of the site driveways along Pleasant Street, and four (4) site driveways along Church Street. The driveways along Maple Avenue are served by a two-way left turn lane that runs the length of the site frontage.

As proposed, the existing eight (8) driveways will be closed and three (3) new site driveways will be constructed, reducing the number of curb-cuts serving the site by five (5). One (1) full-movement driveway is proposed to be constructed along Maple Avenue W serving the ground floor retail uses and loading/trash. The upper residential portion of the site is proposed to be served by two (2) new driveways along Church Street.

Unlike the previous application, Church Street is proposed to remain under its current one-way configuration. The future lane use and traffic controls with the proposed development are shown on Figure 11.

Once on site, employees and retail patrons would have access to approximately 35 parking spaces provided on the ground level. The Fairfax County Zoning Ordinance (as required by the Town) calls for the site to provide a minimum of 35 parking spaces thus the proposal falls well within these guidelines. Parking for the residential portion of the site will be provided via individual garages beneath each condominium unit and surface parking for the residential visitors.





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Future Pedestrian and Bicycle Accommodations

The site is currently served by sidewalks along Maple Avenue, but not along Pleasant or Church Streets. The redeveloped site proposes to improve the sidewalks along with installation of landscaping along Maple Avenue and construct new sidewalks along both the Pleasant and Church Street site frontages. In addition to improving the pedestrian facilities, the applicant also proposes to relocate existing utility lines underground that would further reduce conflicts. Bicycle racks to serve both customers and residents of the site will also be installed.

The modifications identified above would improve the appearance of the site from Maple Avenue, improve the pedestrian experience, and create a multi-modal, connected network that promotes pedestrian activity and is consistent with the Maple Avenue Corridor plan.

Site Generated Traffic Distributions and Assignments

Trip distributions for the proposed development are based on recent traffic counts, the surrounding road network, local knowledge and engineering judgement. The following trip distributions were assumed for the proposed development's retail primary trips.

To/From the North on Lawyers Road:	15%
To/From the East on Maple Avenue:	35%
To/From the South Courthouse:	25%
<u>To/From the West on Maple Avenue:</u>	<u>25%</u>
Total:	100%

The following distributions were assumed for the proposed development's primary residential trips.

To/From the North on Lawyers Road:	10%
To/From the East on Maple Avenue:	35%
To/From the South Lawyers Road:	10%
To/From the South Pleasant Street:	5%
To/From the West on Maple Avenue:	25%
<u>To/From the North on Windover Avenue:</u>	<u>15%</u>
Total:	100%

The peak hour vehicle-trips shown in Table 6 were assigned to the public road network according to the directional distribution described above. These site generated traffic assignments are shown on Figure 12. The site's pass-by trips are based on the existing travels patterns on Maple Avenue W and are summarized on Figure 13.



Figure 12
2018 Primary Site Trips

Maple Avenue Consolidation
Town of Vienna, Virginia

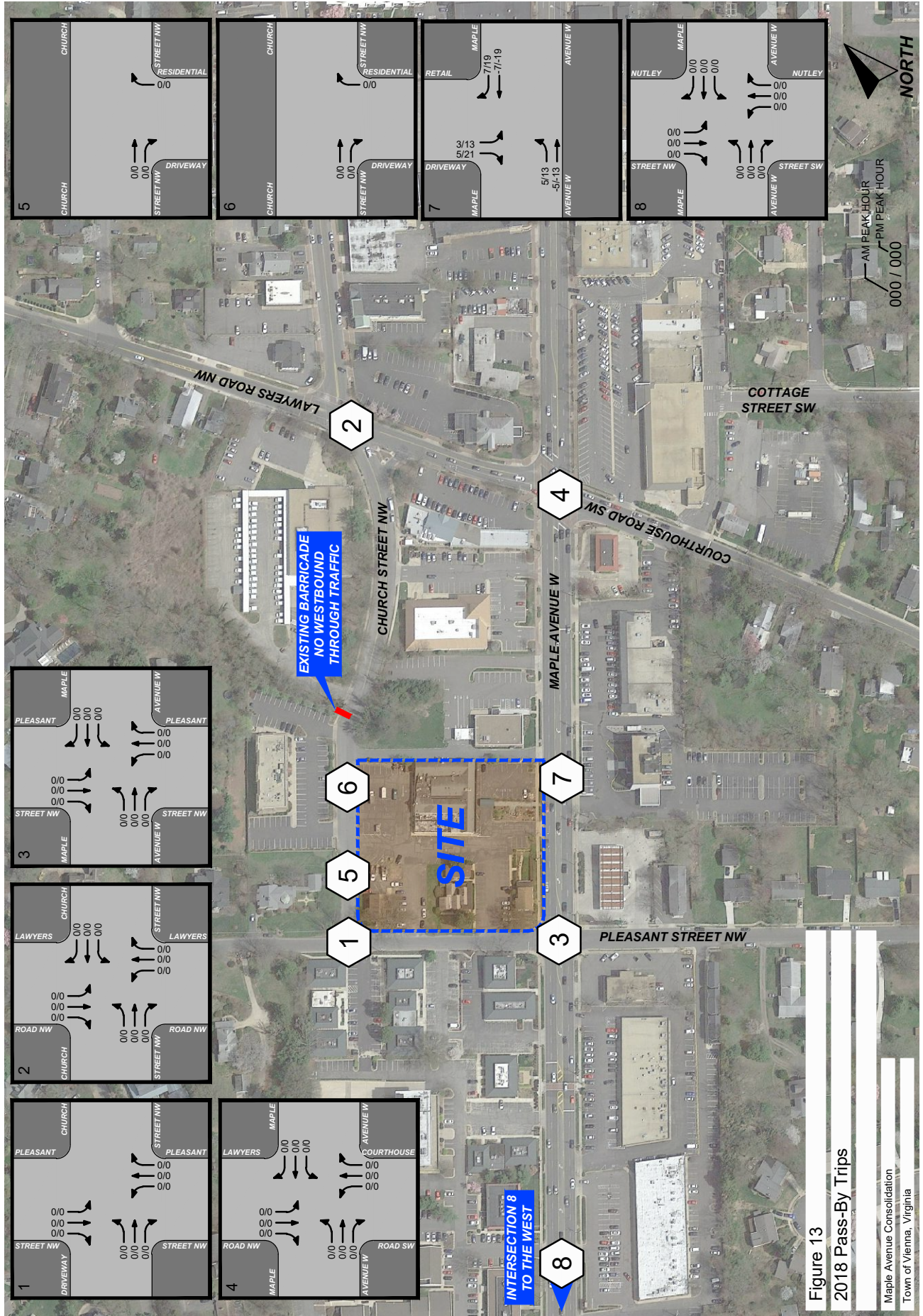


Figure 13
2018 Pass-By Trips

Maple Avenue Consolidation
Town of Vienna, Virginia



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Future Traffic Forecasts with Development (2018)

Future peak hour traffic forecasts with the proposed development were prepared by combining the baseline peak hour traffic volumes with the proposed the development's primary and pass-by trips, and the removal of existing site generated traffic. The resulting future peak hour traffic forecasts with the proposed development are shown on Figure 14.

2018 Operational Analysis with Development

Peak hour levels of service and queuing analyses were prepared for future conditions with development based on the future lane use and traffic controls, the planned traffic signal timings, the future traffic forecasts with development, and the Synchro (version 9.1) capacity analysis using the HCM 2000 methodology. No changes were made to the planned signal timings used to complete the future conditions without development at the study intersections in order to show the impacts of the proposed development. Additionally, both of the signal timing phasing improvements recommended previously in addition to the planned timings were evaluated to show the impacts of the phasing adjustments at the Maple Avenue W/Lawyers Road NW intersection. The results are presented in Appendix E and summarized in Tables 7 and 8.

Levels of Service. The 2018 LOS results with the proposed development are summarized in Table 7 and indicate the following:

- The signalized intersections of Maple Avenue W/Lawyers Road NW and Maple Avenue/Nutley Street would continue to operate at consistent overall levels of service during the AM and PM peak hours as future conditions without development. When compared to existing and future conditions without development, increase in delay would be minimal and not perceived by drivers (four (4) seconds or less).
- At the stop-controlled intersection of Church Street NW/Lawyers Road NW the eastbound and westbound stopped controlled approaches would continue to operate LOS "E" or "F" during peak periods consistent with existing and future conditions without development. Side-street traffic would continue to rely on gaps in through traffic created by the Maple Avenue traffic signal and motorists allowing access between queued vehicles during peak periods.



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- The stop controlled intersections of Church Street NW/Pleasant Street NW, Maple Avenue W/Pleasant Street NW and all future site driveways would continue to operate at acceptable levels of service during the AM and PM peak hours (LOS “D” or better).

As described previously, in order to address the existing delay and capacity constraints, two alternative timing scenarios were reviewed at the intersection of Maple Avenue W and Lawyers Road NW.

Consistent with future conditions without development, the traffic signal phasing adjustment to allow protected/permitted left turn on all four (4) approaches at the intersection would provide the greatest mitigation in overall delay per vehicle (approximately 10 seconds during the AM peak hour and 22 seconds during the PM peak hour). When compared to existing conditions with either timing adjustment (to either Maple Avenue W or all four (4) legs of the intersections) the overall delay per vehicle could be reduced to below the existing average delay per vehicle at the intersection.

The potential traffic signal phasing and timing adjustments, consolidation of site driveways, and non-auto improvements (sidewalk upgrades, utility relocation, and bicycle facilities), would effectively mitigate site generated vehicle trips and is consistent with the goals of the Maple Avenue Corridor Plan.

Queues. The future estimated 50th and 95th percentile peak hour queue results with the proposed development for the turning movements are presented in Table 8. As shown in Table 2, the estimated peak hour queues at study intersections would remain generally consistent to future conditions without development and only increase marginally when compared to existing conditions. Implementing either of the alternative left-turn signal phasing at the intersection of Maple Avenue W and Lawyers Road NW would aid in reducing peak hour queuing. The estimated westbound left turn queue on Maple Avenue at Nutley Street would increase by approximately 20 feet or one (1) vehicle when compared to future conditions without development. This queue extends into the existing two way left turn consistent with existing conditions, but would not block through traffic on mainline Maple Avenue.

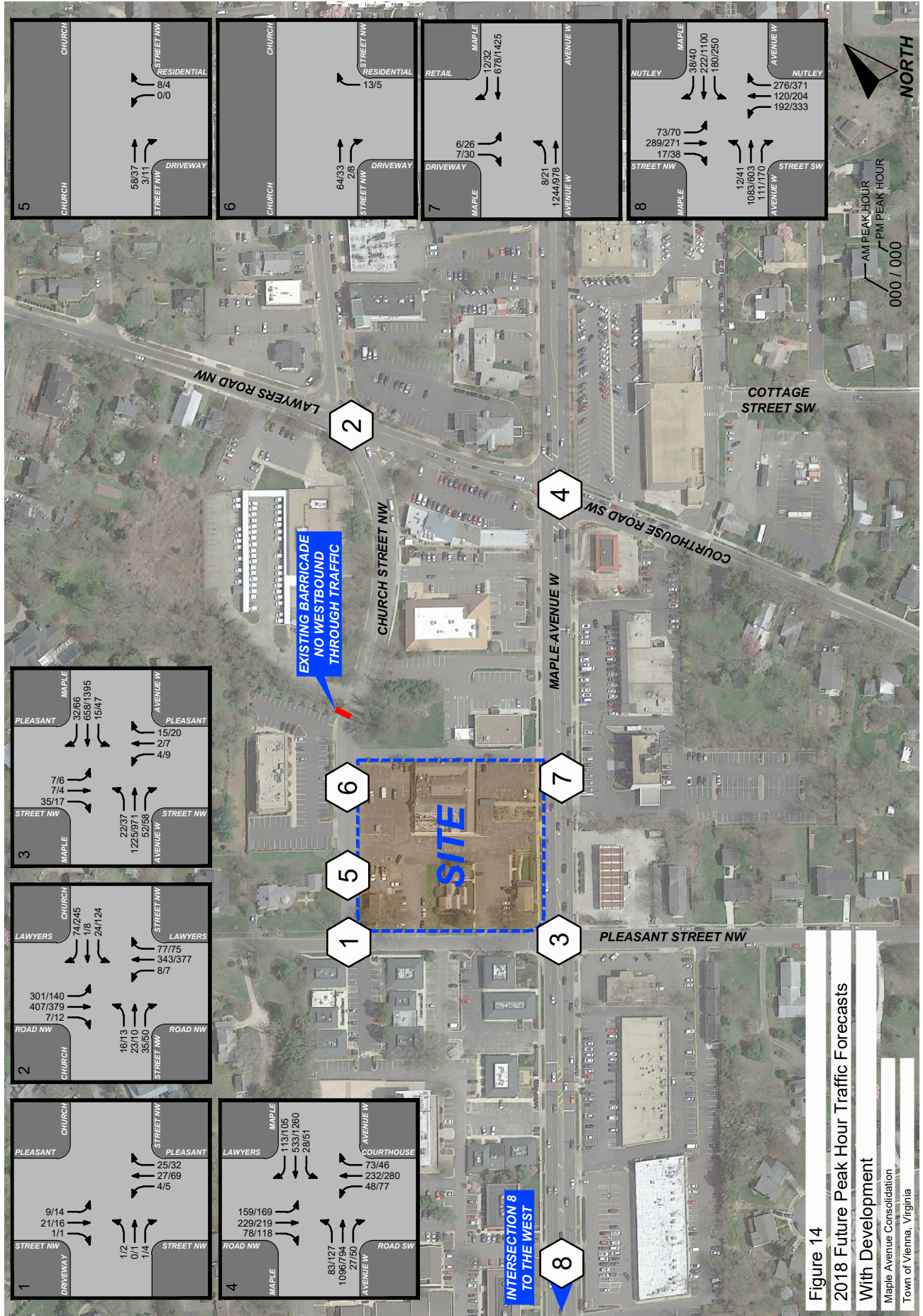


Table 7
Marco Polo Site
Total Future Intersection Level of Service ¹

Intersection	Intersection Control	Lane Group/Approach	2016 Existing Conditions				2018 Background Conditions ²				2018 Total Future Conditions ²			
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
			LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
(1) Church Street/ Pleasant Street	Unsignalized	EB	A	8.9	A	8.9	A	8.9	A	8.9	A	8.8	A	9.0
		NB	A	0.4	A	0.4	A	0.4	A	0.4	A	0.5	A	0.3
		SB	A	1.2	A	3.1	A	1.1	A	3.0	A	2.2	A	3.4
(2) Church Street/ Lawyers Road	Unsignalized	EB	F	84.0	D	26.3	F	112.9	F	109.5	F	93.2	D	26.4
		WB	F	53.6	F	304.2	F	57.7	F	343.0	F	74.7	F	301.2
		NB	A	0.3	A	0.2	A	0.3	A	0.2	A	0.2	A	0.2
		SB	A	4.0	A	2.4	A	4.0	A	2.3	A	9.7	A	9.0
(3) Maple Avenue/ Pleasant Street	Unsignalized	EBL	A	8.8	B	11.7	A	8.9	B	11.9	A	8.9	B	11.9
		EBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		WBL	B	12.6	B	11.2	B	12.8	B	11.5	B	12.8	B	11.3
		WBTR	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
		NBLTR	C	20.9	C	21.7	C	21.2	C	24.1	C	20.1	C	22.7
		SBLTR	B	14.3	C	18.3	C	15.3	C	21.4	B	14.3	C	18.7
(4) Maple Avenue/ Lawyers Road	Signalized	EBL	F	63.8	F	121.9	F	93.1	F	135.8	F	92.5	F	135.2
		EBTR	D	37.4	C	33.2	B	18.8	C	21.0	B	17.9	C	20.8
		WBL	E	71	F	102.5	E	70.3	F	102.5	E	71.9	F	102.5
		WBTR	C	34.7	F	81.8	C	33.6	F	99.4	C	33.2	F	92.2
		NBL	E	72.3	F	88.1	E	73.6	F	97.0	E	72.3	F	90.1
		NBTR	E	73.4	F	94.7	E	72.9	F	93.8	E	72.9	F	92.9
		SBL	F	85.6	F	115.9	F	82.5	F	113.5	F	84.6	F	111.2
		SBTR	D	46.4	E	62.4	D	46.6	E	64.0	D	46.5	E	61.8
		Overall	D	46.3	E	72.5	D	39.0	E	77.1	D	38.8	E	73.6
		Signal Phasing Improvements												
		<i>Modify eastbound and westbound</i>												
		<i>Maple Avenue left turns to protected/</i>												
		<i>permitted.</i>												
		EBL					A	8.0	F	113.3	A	8.4	F	116.8
		EBTR					B	20.0	B	16.5	C	20.0	B	16.7
		WBL					C	23.9	B	15.4	C	28.3	B	15.3
		WBTR					C	30.4	E	60.1	C	24.2	E	56.2
		NBL					E	73.6	F	122.3	E	72.3	F	122.7
		NBTR					E	75.2	F	121.1	E	75.2	F	120.1
		SBL					F	86.6	F	125.2	F	84.6	F	118.1
		SBTR					D	47.6	E	70.3	D	46.9	E	65.1
		Overall					D	36.3	E	62.0	C	34.8	E	59.8
		<i>Modify all</i>					A	7.0	F	110.1	A	7.3	F	114.9
		<i>Modify all left turns to protected/</i>					B	17.9	B	15.6	B	17.9	B	15.4
		<i>permitted.</i>					C	22.0	B	14.8	C	21.3	B	14.5
		EBL					C	28.3	E	55.6	C	20.2	D	51.0
		EBTR					D	41.3	D	53.7	D	41.2	D	50.6
		WBL					E	70.8	F	101.9	E	70.8	F	101.1
		WBTR					D	44.4	F	83.7	D	45.1	F	80.6
		NBL					D	47.5	E	64.2	D	47.5	E	62.6
		NBTR					C	31.3	D	53.5	C	29.5	D	51.4
		SBL												
		SBTR												
		Overall												
(5) Church Street/ Residential Site Driveway	Unsignalized	EB	Future Intersection		Future Intersection		Future Intersection		Future Intersection		A	0.0	A	0.0
		WB									A	0.0	A	0.0
		NB									A	8.6	A	8.5
(6) Church Street/ Residential Site Driveway	Unsignalized	EB	Future Intersection		Future Intersection		Future Intersection		Future Intersection		A	0.0	A	0.0
		WB									A	0.0	A	0.0
		NB									A	8.7	A	8.5
(7) Maple Avenue/ Retail Site Driveway	Unsignalized	EBL	Future Intersection		Future Intersection		Future Intersection		Future Intersection		A	8.6	B	11.4
		EBT									A	0.0	A	0.0
		WBTR									A	0.0	A	0.0
		SBLR									B	11.7	C	16.0
(8) Maple Avenue/ Nutley Street	Signalized	EBL	C	25.8	D	36.8	C	24.7	D	40.8	C	24.8	D	41.1
		EBTR	D	54.6	D	47	E	57.1	D	54.1	E	56.4	D	54.1
		WBL	F	92.9	D	47	F	101.4	E	63.0	F	95.6	E	65.7
		WBTR	C	26.4	D	47.3	B	12.3	D	37.3	B	18.4	D	37.5
		NBLT	F	88.6	F	109.3	E	70.1	F	91.2	E	70.1	F	91.2
		NBR	E	58.9	D	54.1	D	45.2	D	38.7	D	45.5	D	38.6
		SBL	E	64.2	E	63.8	D	50.2	D	54.7	D	50.0	D	54.8
		SBTR	F	96.1	F	97.7	F	112.8	F	96.8	F	109.1	F	96.8
		Overall	E	60.5	E	62.3	E	57.5	E	57.0	E	61.5	E	57.2

Notes:

1. Analysis performed using Synchro software, version 9.

2. Signal timings for future conditionsthe Maple Avenue signalized intersections utilize the planned signal timings received from the Town of Vienna.

Table 8
Marco Polo Site
Total Future Intersection Queuing Summary ¹

Intersection	Intersection Control	Lane Group/Approach	Storage Length (Feet)	2016 Existing Conditions				2018 Background Conditions ⁵				2018 Total Future Conditions ⁵			
				AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
				50th Percentile	95th Percentile	50th Percentile	95th Percentile	50th Percentile	95th Percentile	50th Percentile	95th Percentile	50th Percentile	95th Percentile	50th Percentile	95th Percentile
(1) Church Street/ Pleasant Street	Unsignalized	EBLTR	-	-	0	-	1	-	0	-	1	-	0	-	1
		NBLTR	-	-	0	-	0	-	0	-	0	-	0	-	0
		SBLTR	-	-	0	-	1	-	0	-	1	-	0	-	1
(2) Church Street/ Lawyers Road	Unsignalized	EB	-	-	75	-	26	-	95	-	140	-	100	-	27
		WB	-	-	94	-	612	-	95	-	650	-	106	-	613
		NB	-	-	1	-	1	-	1	-	1	-	1	-	1
		SBL	50	-	30	-	13	-	31	-	13	-	31	-	13
		SBTR	-	-	0	-	0	-	0	-	0	-	0	-	0
(3) Maple Avenue/ Pleasant Street	Unsignalized	EBL	50	-	4	-	5	-	4	-	7	-	2	-	6
		EBTR	-	-	0	-	0	-	0	-	0	-	0	-	0
		WBL	50	-	3	-	6	-	2	-	7	-	3	-	7
		WBTR	-	-	0	-	0	-	0	-	0	-	0	-	0
		NBLTR	-	-	8	-	13	-	7	-	14	-	7	-	14
		SBLTR	-	-	11	-	9	-	13	-	21	-	10	-	8
(4) Maple Avenue/ Lawyers Road	Signalized	EBL	140	77	136	144	#292	85	145	148	#300	86	146	~152	#305
		EBTR	-	527	#640	374	454	293	#696	222	283	203	#533	216	262
		WBL	140	28	60	55	107	26	61	56	111	28	65	56	109
		WBTR	-	290	341	~867	#1005	274	350	~951	#1088	170	274	~918	#1056
		NBL	150	46	91	84	#151	49	96	96	#186	46	92	87	#164
		NBTR	-	289	#447	368	#554	284	#447	361	#554	284	#447	361	#554
		SBL	200	157	#257	201	#335	150	#259	198	#355	155	#272	193	#344
		SBTR	-	265	355	354	457	255	365	353	486	258	368	340	469
		EBL	-	-	-	-	-	13	27	103	#242	15	28	105	#248
		EBTR	-	-	-	-	-	454	687	183	233	434	#699	180	233
	Signal Phasing Improvements <i>Modify eastbound and westbound Maple Avenue left turns to protected/ permitted.</i>	WBL	-	-	-	-	-	12	29	15	32	9	33	15	32
		WBTR	-	-	-	-	-	255	318	831	#996	137	211	804	#964
		NBL	-	-	-	-	-	49	96	97	#209	46	92	89	#199
		NBTR	-	-	-	-	-	286	#459	~390	#602	286	#459	~390	#602
		SBL	-	-	-	-	-	151	#270	199	#366	155	#272	194	#355
		SBTR	-	-	-	-	-	260	372	362	#534	261	372	347	#488
		EBL	-	-	-	-	-	13	25	102	#241	14	25	104	#247
		EBTR	-	-	-	-	-	432	675	179	223	408	642	175	223
		WBL	-	-	-	-	-	12	27	15	31	9	24	14	30
		WBTR	-	-	-	-	-	252	305	812	#974	134	170	784	#941
	<i>Modify all Modify all left turns to protected/ permitted.</i>	NBL	-	-	-	-	-	32	65	68	114	30	62	61	106
		NBTR	-	-	-	-	-	281	#435	367	#578	281	#435	367	#578
		SBL	-	-	-	-	-	105	#179	148	#308	108	#192	144	#296
		SBTR	-	-	-	-	-	255	365	356	#510	259	368	344	474
		EBL	-	-	-	-	-	13	25	102	#241	14	25	104	#247
		EBTR	-	-	-	-	-	432	675	179	223	408	642	175	223
(5) Church Street/ Site Driveway	Unsignalized	EBTR	-	Future Intersection		Future Intersection		Future Intersection		Future Intersection		-	0	-	0
		WBT	-									-	0	-	0
		NBLR	-									-	1	-	0
(6) Church Street/ Site Driveway	Unsignalized	EBTR	-	Future Intersection		Future Intersection		Future Intersection		Future Intersection		-	0	-	0
		WBT	-									-	0	-	0
		NBLR	-									-	1	-	4
(7) Maple Avenue/ Site Driveway	Unsignalized	EBL	-	Future Intersection		Future Intersection		Future Intersection		Future Intersection		-	1	-	3
		EBT	-									-	0	-	0
		WBTR	-									-	0	-	0
		SBLR	-									-	2	-	14
(8) Maple Avenue/ Nutley Street	Signalized	EBL	60	8	21	27	51	5	17	25	49	5	17	25	49
		EBTR	-	836	#971	428	503	608	#770	409	493	600	#757	415	513
		WBL	285	188	#346	197	#281	147	#299	168	#335	147	#300	174	#356
		WBTR	-	212	289	723	806	72	92	593	737	52	68	598	761
		NBLT	-	234	297	409	#565	157	242	323	#503	153	242	309	#503
		NBR	-	72	138	108	197	72	164	82	187	71	164	323	188
		SBL	-	82	137	78	132	63	114	68	120	63	114	80	120
		SBTR	-	395	#556	398	#566	~326	#525	348	#546	~325	#525	347	#545
		EBL	60	8	21	27	51	5	17	25	49	5	17	25	49
		EBTR	-	836	#971	428	503	608	#770	409	493	600	#757	415	513

Notes:

- Analysis performed using Synchro software, version 9.
- "~" - 50th percentile volume exceeds capacity, queue may be longer.
- "#" - 95th percentile volume exceeds capacity, queue may be longer.
- "m" - Volume for 95th percentile queue is metered by upstream signal.
- Signal timings for future conditionsthe Maple Avenue signalized intersections utilize the planned signal timings received from the Town of Vienna.



WELLS + ASSOCIATES

MEMORANDUM

CONCLUSIONS

The proposed redevelopment of the Marco Polo site (8,200 SF of retail and 44 residential condominiums) is expected to generate 39 AM peak hour primary trips, 71 PM peak hour primary trips, and 784 daily primary trips. By comparison, the by-right retail uses (41,000 SF) would generate 67 AM peak hour primary trips, 247 PM peak hour primary trips, and 2,853 daily primary trips. Thus, the proposed redevelopment of the site would result in 27 fewer AM peak hour primary trips, 176 fewer PM peak hour primary trips, and 2,069 fewer daily primary trips than 41,000 SF of by-right retail uses.

Based on the analysis contained herein the proposed redevelopment would have a negligible impact on the operations of mainline of Maple Avenue W, Lawyers Road NW, and adjacent signalized intersection of Maple Avenue W and Lawyers Road NW. Minor increases in overall intersection delay (less than four (4) seconds) is expected when compared to existing conditions and future conditions without development. A review of the existing and planned traffic signal phasing and timings at the intersection of Maple Avenue and Lawyers Road indicate that the peak hour overall delay per vehicle and peak hour queuing could be reduced with adjustments to left-turn phasing at the intersection.

As mitigation measures, the potential traffic signal phasing/timing adjustments and consolidation of site driveways (from eight (8) to three (3)) would improve overall traffic operations when compared current conditions. The proposed development would consolidate access, improve connectivity to the adjacent neighborhood with new sidewalks, provide bicycle facilities, and frontage improvements along Maple Avenue to effectively mitigate the proposed development while achieving the goals of the Maple Avenue Corridor (MAC) zone.

Questions regarding this document should be directed to Wells + Associates.

Maple Avenue Consolidation

APPENDIX

A: Appendix A - Scoping Document

B: Appendix B - Traffic Counts

C: Appendix C - Existing Capacity Analysis

D: Appendix D - Background Capacity Analysis

E: Appendix E - Total Future Capacity Analysis



APPENDIX A

Appendix A - Scoping Document



PRE-SCOPE OF WORK MEETING FORM

Information on the Project Traffic Impact Analysis Base Assumptions

The locality will need to send this form to the project applicant at least two (2) weeks prior to the scheduled scope of work meeting on the proposed project. The applicant is responsible for having this form completed and returned to VDOT and the locality no less than three (3) business days prior to the Meeting. If a completed form is not received by this deadline, the scope of work meeting may be postponed.

Contact Information

Consultant Name:	Michael Pinkoske & John Schick
Tele:	Wells + Associates, Inc.
E-mail:	mrpinkoske@wellsandassociates.com & jaschick@wellsandassociates.com 703.676.3609
Developer/Owner Name:	Doug D'Alexander
Tele:	703.795.5570
E-mail:	Doug.d@icloud.com

Project Information

Project Name:	Maple Avenue Consolidation (Marco Polo Site)
Project Location: (Attach regional and site specific location map)	The subject site is generally located on the north side of Maple Avenue W (Route 123), south side of Church Street, and the east side of Pleasant Street in Vienna, Virginia as shown in Figure I .
Project Description: Including type of application (rezoning, subdivision, site plan), acreage, business square ft, number of dwelling units, access location, etc. Attach additional sheet if necessary)	As proposed the existing site would be razed and redeveloped with approximately 26,000 SF of retail and 49 townhomes. The site is currently improved with approximately 41,000 SF of retail uses. The Marco Polo restaurant (22,660 SF) located on site is currently vacant. The site is served by a total of eight (8) driveways, two (2) on Maple Avenue W, two (2) on Pleasant Street and four (4) on Church Street. As proposed vehicular access would be consolidated to four (4) driveways, one (1) full-movement on Maple Avenue W providing access to the lower retail portion of the site and loading, one (1) on Pleasant Street, and two (2) on Church Street. One (1) driveway on Church Street and the driveway on Pleasant Street will serve the upper level of the site where the townhomes are proposed, the final driveway would be a ramp down to the lower retail level. Each townhouse would be self-parked and a total of 108 parking spaces are planned within the garage to serve the retail and accommodate visitor parking. A copy of the proposed site plan is attached. The proposed development does not meet VDOT Chapter 870 requirements.

Locality/County:	Town of Vienna, Virginia			
Proposed Use: (Check all that apply; attach additional pages as necessary)	Residential ☐	Commercial ☐	Mixed Use ☒	Other ☐
	Residential: 49 Townhomes (LU Code 230)		Commercial: 26,000 SF (LU Code 826)	

Traffic Impact Analysis Assumptions

Study Period	Existing Year: <u>2016</u>	Build-out Year: <u>2018</u>	Design Year: N/A																	
Study Area Boundaries (Attach map)	North: Church Street NW	South: Maple Avenue (Route 123)																		
	East: Lawyers Road NW	West: Pleasant Street NW																		
External Factors That Could Affect Project (Planned road improvements, other nearby developments)	The proposed conversion of Church Street adjacent to the property to two-way traffic. The existing barricade just east of the property on Church Street restricting westbound traffic from traveling through from Lawyers Road to Pleasant Street would remain. No additional roadway planned improvements within the study area.																			
Consistency With Comprehensive Plan	Yes.																			
Available Traffic Data (Historical, forecasts)	Existing AM and PM peak hour vehicular, pedestrian and bicycle traffic counts will be provided by the Town for the intersection of Maple Avenue/Lawyers Road/Courthouse Road and Maple Avenue/Pleasant Street (Gorove Slade). The counts were conducted in May 2014. This data will be used and supplemented by additional count data to be collected by Wells + Associates. Traffic volumes will be balanced to within 10 percent of adjacent intersections. For reference only, VDOT published average annual daily traffic AADT for Maple Avenue W & Lawyers Road from 2011 to 2014. <table border="1"> <thead> <tr> <th></th> <th>2014</th> <th>2013</th> <th>2012</th> <th>2011</th> </tr> </thead> <tbody> <tr> <td>Maple Avenue W</td> <td>33,000</td> <td>32,000</td> <td>33,000</td> <td>36,000</td> </tr> <tr> <td>Lawyers Road</td> <td>13,000</td> <td>13,000</td> <td>13,000</td> <td>23,000</td> </tr> </tbody> </table>						2014	2013	2012	2011	Maple Avenue W	33,000	32,000	33,000	36,000	Lawyers Road	13,000	13,000	13,000	23,000
	2014	2013	2012	2011																
Maple Avenue W	33,000	32,000	33,000	36,000																
Lawyers Road	13,000	13,000	13,000	23,000																
Trip Distribution (Attach sketch) See Figure 1	Road Name: Maple Avenue W.	N ____%	S ____%	E <u>35%</u>	W <u>25%</u>															
	Road Name: Lawyers Road/Courthouse Road	N <u>15%</u>	S <u>10%</u>	E ____%	W ____%															
	Road Name: Pleasant Street SW	N ____%	S <u>15%</u>	E ____%	W ____%															
Annual Vehicle Trip Growth Rate:	A growth rate of (1.0) percent, to all movements at all study intersections.	Peak Period for Study	AM	PM	SAT															

Study Intersections and/or Road Segments (Attach additional sheets as necessary)	1. Pleasant Street NW/Church Street NW	4. Maple Avenue/Lawyers Road NW (traffic counts provided by the Town will be used for the weekday peak hours)
	2. Church Street NW/Lawyers Road NW	5. Future site driveways
	3. Maple Avenue/Pleasant Street NW (traffic counts provided by the Town will be used for the weekday peak hours)	
Trip Adjustment Factors	Internal allowance: ☒ Yes ☐ No Reduction: _____ % trips	Pass-by allowance: ☒ Yes ☐ No Reduction: 25 %
Software Methodology	☒ Synchro ☐ HCS (v.2000/+) ☐ aaSIDRA ☐ CORSIM ☐ Other	
Traffic Signal Proposed or Affected (Analysis software to be used, progression speed, cycle length)	No additional signals are proposed. Synchro version 9 software will be used for intersection analysis.	
Improvement(s) Assumed or to be Considered	The proposed conversion of Church Street (future with redevelopment). No roadway other improvements are assumed in the study area.	
Background Traffic Studies Considered	No pipeline developments are assumed, a regional growth of 1.0 will be applied to all through movements along Maple Avenue, Lawyers Road, and Courthouse Road. The existing restaurant on-site will be assumed as occupied in the background scenario.	
Plan Submission	☐ Master Development Plan (MDP) ☒ Generalized Development Plan (GDP) ☐ Preliminary/Sketch Plan	
Additional Issues to be addressed	☒ Queuing analysis ☐ Actuation/Coordination ☐ Weaving analysis ☐ Merge analysis ☒ Bike/Ped Accommodations ☒ Intersection(s) ☐ TDM Measures ☐ Other _____	

NOTES on ASSUMPTIONS:

1. Specific Synchro parameters will be applied to the model consistent with the VDOT Traffic Operations and Safety Analysis Manual (TOSAM), version 1.0.
2. Synchro 9.0 will be used to conduct capacity analysis with peak hour factors measured in the field. The field measured PHFs will be adjusted to $0.85 < PHF < 0.92$ under existing conditions. For future conditions (without and with development) analysis, PHFs of 0.92 will be used.
3. Level of service calculations for existing (2015) and projected conditions shall be in accordance with the Highway Capacity Manual (HCM) 2000 methodologies, as computed by Synchro software. Typical Synchro parameters to be utilized in this analysis will be consistent with those values provided in VDOT's Traffic Operations and Safety Analysis Manual, Version 1.0.

4. Percent heavy vehicles used in the Synchro analysis will be based on the 2014 VDOT traffic count data and/or recent traffic counts where available.

SIGNED: _____

SIGNED: Michael Pinkoske, PTP_____ DATE: February 3, 2016
Applicant or Consultant

SIGNED:

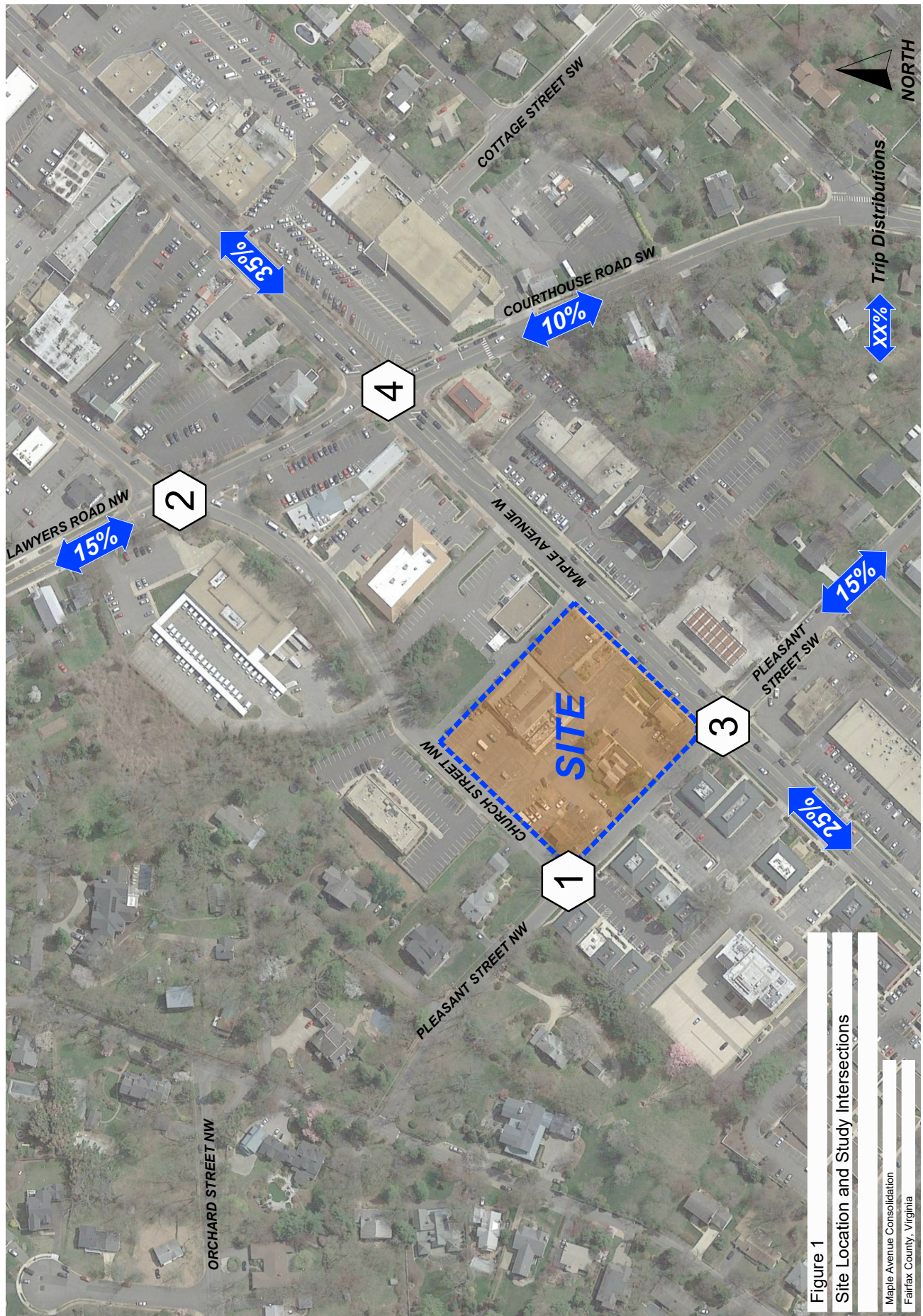
SIGNED: _____ DATE: _____
Local Government Representative

Attachment I
Marco Polo Site
Site Trip Generation Analysis ¹

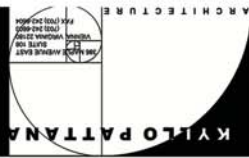
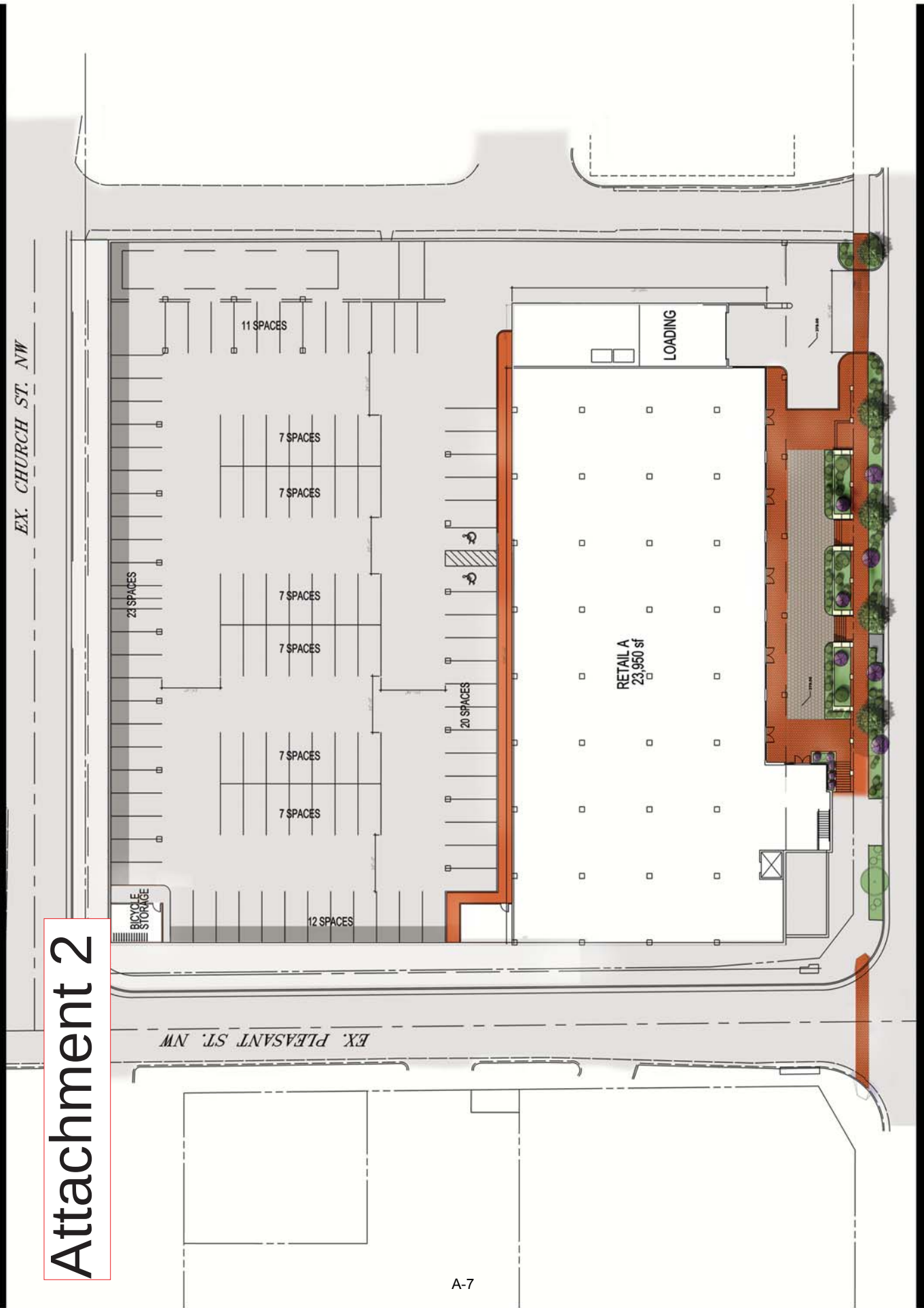
Land Use	Land Use Code	Size	Units	AM Peak Hour			PM Peak Hour			Weekday ADT
				In	Out	Total	In	Out	Total	
<u>Existing Development</u>										
Specialty Retail ²	826	41,000	SF	133	18	151	49	62	111	1,817
<i>Pass-by Reduction (25%)</i>				<u>(33)</u>	<u>(5)</u>	<u>(38)</u>	<u>(12)</u>	<u>(16)</u>	<u>(28)</u>	<u>(454)</u>
				100	13	113	37	46	83	1,363
<u>Proposed Development</u>										
Specialty Retail ²	826	26,000	SF	84	12	96	31	39	70	1,152
<i>Internal Capture (5% AM, 10% PM, 15% ADT) ³</i>				<u>(1)</u>	-	<u>(1)</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(52)</u>
<i>Pass-by Reduction (25%)</i>				83	12	95	30	37	67	1,100
Retail Subtotal				<u>(21)</u>	<u>(3)</u>	<u>(24)</u>	<u>(8)</u>	<u>(9)</u>	<u>(17)</u>	<u>(275)</u>
				62	9	71	22	28	50	825
Townhouses	230	49	DU	5	24	29	22	11	33	346
<i>Internal Capture (5% AM, 10% PM, 15% ADT) ³</i>				-	<u>(1)</u>	<u>(1)</u>	<u>(2)</u>	<u>(1)</u>	<u>(3)</u>	<u>(52)</u>
Residential Subtotal				5	23	28	20	10	30	294
Proposed Development				67	32	99	42	38	80	1,119
Comparison: Proposed minus Existing										
				(33)	19	(14)	5	(8)	(3)	(244)

Notes:

1. Trip estimates calculated based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 9th Edition.
2. Specialty Retail land use used to reflect local nature of neighborhood serving retail. AM peak hour rate based on: (AM peak hour of generator rate * (PM peak hour of adjacent street rate / PM peak hour of generator rate)).
3. Internal capture rate based on capture rates provided in the VDOT *Traffic Impact Analysis Regulations Administrative Guidelines*.
4. Pass-by percentage consistent with the VDOT *Traffic Impact Analysis Regulations Administrative Guidelines*.



Attachment 2



DATE:	JAN 12 2016
JOB NUMBER:	
SCALE:	1/8" = 1'-0"
DRAWN BY:	PD
CHECK BY:	X
REVISIONS:	

GROUND FLOOR PLAN
MARCO POLO DEVELOPMENT
245 MAPLE AVENUE WEST, VIENNA, VIRGINIA

A1

Attachment 2

convert to two-way traffic



APPENDIX B

Appendix B - Traffic Counts



Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - All Vehicles

PROJECT: Maple Avenue Consolidation					DATE: 2/17/2016					SOUTHBOUND ROAD: Pleasant Avenue													
W+A JOB NO: 6740					DAY: Wednesday					NORTHBOUND ROAD: Pleasant Avenue													
INTERSECTION: Lawyers Road & Maple Avenue					WEATHER: Cloudy					WESTBOUND ROAD: Church Street													
LOCATION: Vienna, VA					COUNTED BY: Geraldin					EASTBOUND ROAD: Church Street													
INPUTED BY: JAS																							
Time Period	Southbound Pleasant Avenue					Westbound Church Street					Northbound Pleasant Avenue					Eastbound Church Street					North & South	East & West	Total
	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF			
AM 15 Minute Volumes																							
6:00 AM - 6:15 AM	0	0	0	0		0	0	0	0		2	0	0	2		0	0	0	0		2	0	2
6:15 AM - 6:30 AM	0	4	2	6		0	0	0	0		4	0	0	4		0	0	0	0		10	0	10
6:30 AM - 6:45 AM	0	4	0	4		0	0	0	0		5	1	0	6		0	0	0	0		10	0	10
6:45 AM - 7:00 AM	0	4	0	4		0	0	0	0		3	2	0	5		0	0	0	0		9	0	9
7:00 AM - 7:15 AM	0	8	2	10		0	0	0	0		2	3	0	5		0	0	0	0		15	0	15
7:15 AM - 7:30 AM	0	5	2	7		0	0	0	0		10	3	1	14		0	0	0	0		21	0	21
7:30 AM - 7:45 AM	0	7	2	9		0	0	0	0		7	4	2	13		0	0	0	0		22	0	22
7:45 AM - 8:00 AM	0	7	0	7		0	0	0	0		4	5	3	12		1	0	0	1		19	1	20
8:00 AM - 8:15 AM	0	19	2	21		0	0	0	0		14	8	1	23		1	0	0	1		44	1	45
8:15 AM - 8:30 AM	0	8	1	9		0	0	0	0		11	5	0	16		0	0	1	1		25	1	26
8:30 AM - 8:45 AM	0	9	0	9		0	0	0	0		6	1	1	8		0	0	0	0		17	0	17
8:45 AM - 9:00 AM	1	11	5	17		0	0	0	0		8	6	1	15		0	0	0	0		32	0	32
Total	1	86	16	103		0	0	0	0		76	38	9	123		2	0	1	3		226	3	229
AM One Hour Volumes																							
6:00 AM - 7:00 AM	0	12	2	14	0.58	0	0	0	0	0.00	14	3	0	17	0.71	0	0	0	0	0.00	31	0	31
6:15 AM - 7:15 AM	0	20	4	24	0.60	0	0	0	0	0.00	14	6	0	20	0.83	0	0	0	0	0.00	44	0	44
6:30 AM - 7:30 AM	0	21	4	25	0.63	0	0	0	0	0.00	20	9	1	30	0.54	0	0	0	0	0.00	55	0	55
6:45 AM - 7:45 AM	0	24	6	30	0.75	0	0	0	0	0.00	22	12	3	37	0.66	0	0	0	0	0.00	67	0	67
7:00 AM - 8:00 AM	0	27	6	33	0.83	0	0	0	0	0.00	23	15	6	44	0.79	1	0	0	1	0.25	77	1	78
7:15 AM - 8:15 AM	0	38	6	44	0.52	0	0	0	0	0.00	35	20	7	62	0.67	2	0	0	2	0.50	106	2	108
7:30 AM - 8:30 AM	0	41	5	46	0.55	0	0	0	0	0.00	36	22	6	64	0.70	2	0	1	3	0.75	110	3	113
7:45 AM - 8:45 AM	0	43	3	46	0.55	0	0	0	0	0.00	35	19	5	59	0.64	2	0	1	3	0.75	105	3	108
8:00 AM - 9:00 AM	1	47	8	56	0.67	0	0	0	0	0.00	39	20	3	62	0.67	1	0	1	2	0.50	118	2	120
PM 15 Minute Volumes																							
4:00 PM - 4:15 PM	0	5	5	10		0	0	0	0		5	9	1	15		0	1	1	2		25	2	27
4:15 PM - 4:30 PM	1	7	2	10		0	0	0	0		5	9	2	16		3	0	1	4		26	4	30
4:30 PM - 4:45 PM	0	4	2	6		0	0	0	0		1	10	0	11		0	0	1	1		17	1	18
4:45 PM - 5:00 PM	2	1	1	4		0	0	0	0		6	14	0	20		3	0	0	3		24	3	27
5:00 PM - 5:15 PM	0	3	3	6		0	0	0	0		6	12	2	20		1	0	0	1		26	1	27
5:15 PM - 5:30 PM	1	4	3	8		0	0	0	0		2	23	1	26		0	0	1	1		34	1	35
5:30 PM - 5:45 PM	0	5	3	8		0	0	0	0		0	14	1	15		2	0	1	3		23	3	26
5:45 PM - 6:00 PM	0	4	2	6		0	0	0	0		8	19	1	28		1	1	0	2		34	2	36
6:00 PM - 6:15 PM	0	1	5	6		0	0	0	0		4	23	0	27		1	1	1	3		33	3	36
6:15 PM - 6:30 PM	0	1	2	3		0	0	0	0		3	15	0	18		0	1	0	1		21	1	22
6:30 PM - 6:45 PM	0	3	1	4		0	0	0	0		4	20	0	24		0	0	1	1		28	1	29
6:45 PM - 7:00 PM	0	1	3	4		0	0	0	0		11	16	1	28		1	0	1	2		32	2	34
Total	4	39	32	75		0	0	0	0		55	184	9	248		12	4	8	24		323	24	347
PM One Hour Volumes																							
4:00 PM - 5:00 PM	3	17	10	30	0.75	0	0	0	0	0.00	17	42	3	62	0.78	6	1	3	10	0.63	92	10	102
4:15 PM - 5:15 PM	3	15	8	26	0.65	0	0	0	0	0.00	18	45	4	67	0.84	7	0	2	9	0.56	93	9	102
4:30 PM - 5:30 PM	3	12	9	24	0.75	0	0	0	0	0.00	15	59	3	77	0.74	4	0	2	6	0.50	101	6	107
4:45 PM - 5:45 PM	3	13	10	26	0.81	0	0	0	0	0.00	14	63	4	81	0.78	6	0	2	8	0.67	107	8	115
5:00 PM - 6:00 PM	1	16	11	28	0.88	0	0	0	0	0.00	16	68	5	89	0.79	4	1	2	7	0.58	117	7	124
5:15 PM - 6:15 PM	1	14	13	28	0.88	0	0	0	0	0.00	14	79	3	96	0.86	4	2	3	9	0.75	124	9	133
5:30 PM - 6:30 PM	0	11	12	23	0.72	0	0	0	0	0.00	15	71	2	88	0.79	4	3	2	9	0.75	111	9	120
5:45 PM - 6:45 PM	0	9	10	19	0.79	0	0	0	0	0.00	19	77	1	97	0.87	2	3	2	7	0.58	116	7	123
6:00 PM - 7:00 PM	0	6	11	17	0.71	0	0	0	0	0.00	22	74	1	97	0.87	2	2	3	7	0.58	114	7	121

Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - Bicycles

PROJECT: Maple Avenue Consolidation				DATE: 2/17/2016				SOUTHBOUND ROAD: Pleasant Avenue											
W+A JOB NO: 6740				DAY: Wednesday				NORTHBOUND ROAD: Pleasant Avenue											
INTERSECTION: Lawyers Road & Maple Avenue				WEATHER: Cloudy				WESTBOUND ROAD: Church Street											
LOCATION: Vienna, VA				COUNTED BY: 0				EASTBOUND ROAD: Church Street											
INPUTED BY: JAS																			
Time Period	Southbound Pleasant Avenue				Westbound Church Street				Northbound Pleasant Avenue				Eastbound Church Street				North & South	East & West	Total
	Right	Thru	Left	Total	Right	Thru	Left	Total	Right	Thru	Left	Total	Right	Thru	Left	Total			
AM 15 Minute Volumes																			
6:00 AM - 6:15 AM				0				0				0				0	0	0	0
6:15 AM - 6:30 AM				0				0				0				0	0	0	0
6:30 AM - 6:45 AM				0				0				0				0	0	0	0
6:45 AM - 7:00 AM				0				0				0				0	0	0	0
7:00 AM - 7:15 AM				0				0				0				0	0	0	0
7:15 AM - 7:30 AM				0				0				0				0	0	0	0
7:30 AM - 7:45 AM				0				0				0				0	0	0	0
7:45 AM - 8:00 AM				0				0				0				0	0	0	0
8:00 AM - 8:15 AM				0				0				0				0	0	0	0
8:15 AM - 8:30 AM				0				0				0				0	0	0	0
8:30 AM - 8:45 AM				0				0				0				0	0	0	0
8:45 AM - 9:00 AM				0				0				0				0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AM One Hour Volumes																			
6:00 AM - 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM 15 Minute Volumes																			
4:00 PM - 4:15 PM				0				0				0				0	0	0	0
4:15 PM - 4:30 PM				0				0				0				0	0	0	0
4:30 PM - 4:45 PM				0				0				0				0	0	0	0
4:45 PM - 5:00 PM				0				0				0				0	0	0	0
5:00 PM - 5:15 PM				0				0				0				0	0	0	0
5:15 PM - 5:30 PM				0				0				0				0	0	0	0
5:30 PM - 5:45 PM				0				0				0				0	0	0	0
5:45 PM - 6:00 PM				0				0				0				0	0	0	0
6:00 PM - 6:15 PM				0				0				0				0	0	0	0
6:15 PM - 6:30 PM				0				0				0				0	0	0	0
6:30 PM - 6:45 PM				0				0				0				0	0	0	0
6:45 PM - 7:00 PM				0				0				0				0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM One Hour Volumes																			
4:00 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM - 6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM - 6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM - 6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM - 7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Wells + Associates, Inc.

McLean, Virginia

Pedestrian Volume Survey

PROJECT: Maple Avenue Consolidation W+A JOB NO: 6740 INTERSECTION: Lawyers Road & Maple Avenue LOCATION: Vienna, VA DATE: 2/17/2016 DAY: Wednesday WEATHER: Cloudy COUNTED BY: 0 INPUTED BY: JAS																			
Time Period	Movement																		
	1	2	3	4	5	6	7	8	1 + 2	3 + 4	5 + 6	7 + 8	Total						
AM 15 Minute Volumes																			
6:00 AM - 6:15 AM																			
6:15 AM - 6:30 AM																			
6:30 AM - 6:45 AM																			
6:45 AM - 7:00 AM																			
7:00 AM - 7:15 AM																			
7:15 AM - 7:30 AM																			
7:30 AM - 7:45 AM																			
7:45 AM - 8:00 AM																			
8:00 AM - 8:15 AM																			
8:15 AM - 8:30 AM																			
8:30 AM - 8:45 AM																			
8:45 AM - 9:00 AM																			
Total	0	0	0	0	0	0	0	0	0	0	0	0	0						
AM One Hour Volumes																			
6:00 AM - 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
6:15 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
6:30 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
6:45 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
7:00 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
7:15 AM - 8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
7:30 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
7:45 AM - 8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
8:00 AM - 9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0						
PM 15 Minute Volumes																			
4:00 PM - 4:15 PM																			
4:15 PM - 4:30 PM																			
4:30 PM - 4:45 PM																			
4:45 PM - 5:00 PM																			
5:00 PM - 5:15 PM																			
5:15 PM - 5:30 PM																			
5:30 PM - 5:45 PM																			
5:45 PM - 6:00 PM																			
6:00 PM - 6:15 PM																			
6:15 PM - 6:30 PM																			
6:30 PM - 6:45 PM																			
6:45 PM - 7:00 PM																			
Total	0	0	0	0	0	0	0	0	0	0	0	0	0						
PM One Hour Volumes																			
4:00 PM - 5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
4:15 PM - 5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
4:30 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
4:45 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
5:00 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
5:15 PM - 6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
5:30 PM - 6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
5:45 PM - 6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						
6:00 PM - 7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0						

Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - All Vehicles

PROJECT: Maple Avenue Consolidation					DATE: 2/17/2016					SOUTHBOUND ROAD: Lawyers Road													
W+A JOB NO: 6740					DAY: Wednesday					NORTHBOUND ROAD: Lawyers Road													
INTERSECTION: Lawyers Road & Maple Avenue					WEATHER: Cloudy					WESTBOUND ROAD: Church Street													
LOCATION: Vienna, VA					COUNTED BY: Jose & Salih					EASTBOUND ROAD: Church Street													
					INPUTED BY: JAS																		
Time Period	Southbound Lawyers Road					Westbound Church Street					Northbound Lawyers Road					Eastbound Church Street					North & South	East & West	Total
	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF			
AM 15 Minute Volumes																							
6:00 AM - 6:15 AM	3	25	11	39		2	1	0	3		5	8	2	15		4	0	0	4		54	7	61
6:15 AM - 6:30 AM	0	28	16	44		1	0	1	2		1	13	0	14		1	2	0	3		58	5	63
6:30 AM - 6:45 AM	4	63	24	91		6	0	4	10		5	28	0	33		2	1	3	6		124	16	140
6:45 AM - 7:00 AM	3	60	53	116		7	0	6	13		6	29	2	37		3	3	1	7		153	20	173
7:00 AM - 7:15 AM	2	84	50	136		10	0	1	11		5	35	2	42		7	0	1	8		178	19	197
7:15 AM - 7:30 AM	3	82	46	131		14	0	6	20		14	46	2	62		2	2	0	4		193	24	217
7:30 AM - 7:45 AM	2	99	57	158		36	0	7	43		10	75	3	88		6	3	2	11		246	54	300
7:45 AM - 8:00 AM	1	89	62	152		34	0	8	42		10	69	3	82		1	4	2	7		234	49	283
8:00 AM - 8:15 AM	2	100	88	190		22	0	1	23		14	74	3	91		4	5	2	11		281	34	315
8:15 AM - 8:30 AM	1	101	72	174		18	0	7	25		17	69	0	86		7	7	4	18		260	43	303
8:30 AM - 8:45 AM	2	101	67	170		22	1	7	30		16	69	2	87		4	5	1	10		257	40	297
8:45 AM - 9:00 AM	2	96	58	156		11	0	9	20		19	76	1	96		6	4	4	14		252	34	286
Total	25	928	604	1557		183	2	57	242		122	591	20	733		47	36	20	103		2290	345	2635
AM One Hour Volumes																							
6:00 AM - 7:00 AM	10	176	104	290	0.63	16	1	11	28	0.54	17	78	4	99	0.67	10	6	4	20	0.71	389	48	437
6:15 AM - 7:15 AM	9	235	143	387	0.71	24	0	12	36	0.69	17	105	4	126	0.75	13	6	5	24	0.75	513	60	573
6:30 AM - 7:30 AM	12	289	173	474	0.87	37	0	17	54	0.68	30	138	6	174	0.70	14	6	5	25	0.78	648	79	727
6:45 AM - 7:45 AM	10	325	206	541	0.86	67	0	20	87	0.51	35	185	9	229	0.65	18	8	4	30	0.68	770	117	887
7:00 AM - 8:00 AM	8	354	215	577	0.91	94	0	22	116	0.67	39	225	10	274	0.78	16	9	5	30	0.68	851	146	997
7:15 AM - 8:15 AM	8	370	253	631	0.83	106	0	22	128	0.74	48	264	11	323	0.89	13	14	6	33	0.75	954	161	1115
7:30 AM - 8:30 AM	6	389	279	674	0.89	110	0	23	133	0.77	51	287	9	347	0.95	18	19	10	47	0.65	1021	180	1201
7:45 AM - 8:45 AM	6	391	289	686	0.90	96	1	23	120	0.71	57	281	8	346	0.95	16	21	9	46	0.64	1032	166	1198
8:00 AM - 9:00 AM	7	398	285	690	0.91	73	1	24	98	0.82	66	288	6	360	0.94	21	21	11	53	0.74	1050	151	1201
PM 15 Minute Volumes																							
4:00 PM - 4:15 PM	1	79	46	126		47	5	21	73		18	66	1	85		19	3	4	26		211	99	310
4:15 PM - 4:30 PM	1	65	39	105		67	5	24	96		23	73	6	102		15	2	4	21		207	117	324
4:30 PM - 4:45 PM	2	70	33	105		52	5	9	66		21	94	4	119		13	4	10	27		224	93	317
4:45 PM - 5:00 PM	4	64	26	94		58	6	15	79		17	86	3	106		13	4	9	26		200	105	305
5:00 PM - 5:15 PM	7	93	43	143		68	5	22	95		24	101	2	127		16	4	3	23		270	118	388
5:15 PM - 5:30 PM	2	95	33	130		58	1	21	80		17	97	2	116		12	1	4	17		246	97	343
5:30 PM - 5:45 PM	1	90	32	123		57	0	36	93		17	89	2	108		7	1	2	10		231	103	334
5:45 PM - 6:00 PM	2	90	29	121		57	2	43	102		16	81	1	98		8	3	2	13		219	115	334
6:00 PM - 6:15 PM	0	98	42	140		75	1	30	106		15	89	0	104		8	1	1	10		244	116	360
6:15 PM - 6:30 PM	0	103	33	136		56	0	32	88		13	85	1	99		11	8	1	20		235	108	343
6:30 PM - 6:45 PM	0	78	20	98		61	0	50	111		19	70	3	92		7	3	2	12		190	123	313
6:45 PM - 7:00 PM	0	86	26	112		52	0	23	75		24	86	0	110		9	4	4	17		222	92	314
Total	20	1011	402	1433		708	30	326	1064		224	1017	25	1266		138	38	46	222		2699	1286	3985
PM One Hour Volumes																							
4:00 PM - 5:00 PM	8	278	144	430	0.85	224	21	69	314	0.82	79	319	14	412	0.87	60	13	27	100	0.93	842	414	1256
4:15 PM - 5:15 PM	14	292	141	447	0.78	245	21	70	336	0.88	85	354	15	454	0.89	57	14	26	97	0.90	901	433	1334
4:30 PM - 5:30 PM	15	322	135	472	0.83	236	17	67	320	0.84	79	378	11	468	0.92	54	13	26	93	0.86	940	413	1353
4:45 PM - 5:45 PM	14	342	134	490	0.86	241	12	94	347	0.91	75	373	9	457	0.90	48	10	18	76	0.73	947	423	1370
5:00 PM - 6:00 PM	12	368	137	517	0.90	240	8	122	370	0.91	74	368	7	449	0.88	43	9	11	63	0.68	966	433	1399
5:15 PM - 6:15 PM	5	373	136	514	0.92	247	4	130	381	0.90	65	356	5	426	0.92	35	6	9	50	0.74	940	431	1371
5:30 PM - 6:30 PM	3	381	136	520	0.93	245	3	141	389	0.92	61	344	4	409	0.95	34	13	6	53	0.66	929	442	1371
5:45 PM - 6:45 PM	2	369	124	495	0.88	249	3	155	407	0.92	63	325	5	393	0.94	34	15	6	55	0.69	888	462	1350
6:00 PM - 7:00 PM	0	365	121	486	0.87	244	1	135	380	0.86	71	330	4	405	0.92	35	16	8	59	0.74	891	439	1330

Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - Bicycles

PROJECT: Maple Avenue Consolidation					DATE: 2/17/2016					SOUTHBOUND ROAD: Lawyers Road									
W+A JOB NO: 6740					DAY: Wednesday					NORTHBOUND ROAD: Lawyers Road									
INTERSECTION: Lawyers Road & Maple Avenue					WEATHER: Cloudy					WESTBOUND ROAD: Church Street									
LOCATION: Vienna, VA					COUNTED BY: Salih					EASTBOUND ROAD: Church Street									
INPUTED BY: JAS																			
Time Period	Southbound Lawyers Road				Westbound Church Street				Northbound Lawyers Road				Eastbound Church Street				North & South	East & West	Total
	Right	Thru	Left	Total	Right	Thru	Left	Total	Right	Thru	Left	Total	Right	Thru	Left	Total			
AM 15 Minute Volumes																			
6:00 AM - 6:15 AM				0				0				0				0	0	0	0
6:15 AM - 6:30 AM				0				0				0				0	0	0	0
6:30 AM - 6:45 AM				0				0				0				0	0	0	0
6:45 AM - 7:00 AM				0				0				0				0	0	0	0
7:00 AM - 7:15 AM				0				0	1			1				0	1	0	1
7:15 AM - 7:30 AM				0		1	1	2	2			2				0	2	2	4
7:30 AM - 7:45 AM				0				0				0				0	0	0	0
7:45 AM - 8:00 AM				0				0				0				0	0	0	0
8:00 AM - 8:15 AM				0			1	1				0				0	0	1	1
8:15 AM - 8:30 AM				0				0				0				0	0	0	0
8:30 AM - 8:45 AM				0				0				0				0	0	0	0
8:45 AM - 9:00 AM				0				0				0				0	0	0	0
Total	0	0	0	0	0	1	2	3	3	0	0	3	0	0	0	0	3	3	6
AM One Hour Volumes																			
6:00 AM - 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM - 7:15 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	1
6:30 AM - 7:30 AM	0	0	0	0	0	1	1	2	3	0	0	3	0	0	0	0	3	2	5
6:45 AM - 7:45 AM	0	0	0	0	0	1	1	2	3	0	0	3	0	0	0	0	3	2	5
7:00 AM - 8:00 AM	0	0	0	0	0	1	1	2	3	0	0	3	0	0	0	0	3	2	5
7:15 AM - 8:15 AM	0	0	0	0	0	1	2	3	2	0	0	2	0	0	0	0	2	3	5
7:30 AM - 8:30 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1
7:45 AM - 8:45 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1
8:00 AM - 9:00 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1
PM 15 Minute Volumes																			
4:00 PM - 4:15 PM				0	1			1				0		1		1	0	2	2
4:15 PM - 4:30 PM	1			1		1		1				0				0	1	1	2
4:30 PM - 4:45 PM	1			1				0				0				0	1	0	1
4:45 PM - 5:00 PM				0				0				0				0	0	0	0
5:00 PM - 5:15 PM				0				0				0				0	0	0	0
5:15 PM - 5:30 PM				0				0				0				0	0	0	0
5:30 PM - 5:45 PM				0				0				0		1		1	0	1	1
5:45 PM - 6:00 PM				0				0				0				0	0	0	0
6:00 PM - 6:15 PM				0				0	1			1				0	1	0	1
6:15 PM - 6:30 PM				0				0				0				0	0	0	0
6:30 PM - 6:45 PM				0				0	1			1				0	1	0	1
6:45 PM - 7:00 PM				0				0				0				0	0	0	0
Total	0	2	0	2	1	1	0	2	2	0	0	2	0	2	0	2	4	4	8
PM One Hour Volumes																			
4:00 PM - 5:00 PM	0	2	0	2	1	1	0	2	0	0	0	0	0	1	0	1	2	3	5
4:15 PM - 5:15 PM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	2	1	3
4:30 PM - 5:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
4:45 PM - 5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1
5:00 PM - 6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1
5:15 PM - 6:15 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	1	2
5:30 PM - 6:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	1	2
5:45 PM - 6:45 PM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	2	0	2
6:00 PM - 7:00 PM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	2	0	2

Wells + Associates, Inc.

McLean, Virginia

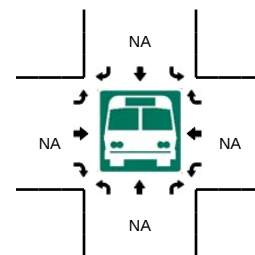
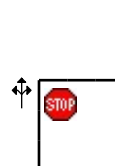
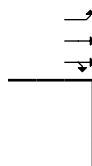
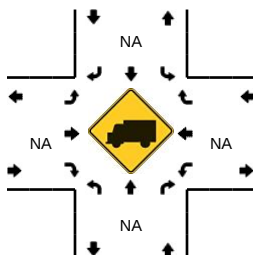
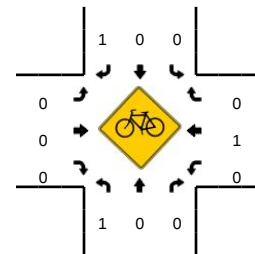
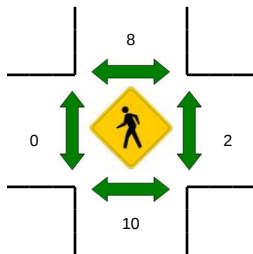
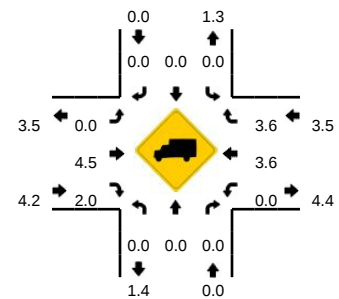
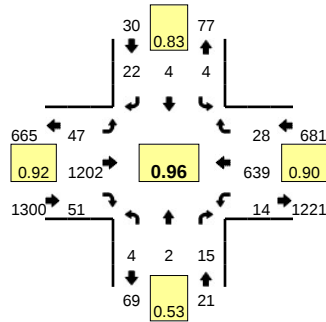
Pedestrian Volume Survey

PROJECT: Maple Avenue Consolidation W+A JOB NO: 6740 INTERSECTION: Lawyers Road & Maple Avenue LOCATION: Vienna, VA DATE: 2/17/2016 DAY: Wednesday WEATHER: Cloudy COUNTED BY: Salih INPUTED BY: JAS														
Time Period	Movement													
	1	2	3	4	5	6	7	8	1 + 2	3 + 4	5 + 6	7 + 8	Total	
AM 15 Minute Volumes														
6:00 AM - 6:15 AM														
6:15 AM - 6:30 AM														
6:30 AM - 6:45 AM														
6:45 AM - 7:00 AM														
7:00 AM - 7:15 AM														
7:15 AM - 7:30 AM														
7:30 AM - 7:45 AM														
7:45 AM - 8:00 AM														
8:00 AM - 8:15 AM							1							
8:15 AM - 8:30 AM														
8:30 AM - 8:45 AM	1													
8:45 AM - 9:00 AM														
Total	1	0	0	0	0	0	1	0	1	0	0	0	0	
AM One Hour Volumes														
6:00 AM - 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM - 7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM - 7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM - 7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM - 8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM - 8:15 AM	0	0	0	0	0	1	0	0	0	0	1	0	1	1
7:30 AM - 8:30 AM	0	0	0	0	0	1	0	0	0	0	1	0	1	1
7:45 AM - 8:45 AM	1	0	0	0	0	1	0	0	1	0	1	0	2	2
8:00 AM - 9:00 AM	1	0	0	0	0	1	0	0	1	0	1	0	2	2
PM 15 Minute Volumes														
4:00 PM - 4:15 PM	1	3		1	4									
4:15 PM - 4:30 PM	2	1												
4:30 PM - 4:45 PM														
4:45 PM - 5:00 PM														
5:00 PM - 5:15 PM	1	1												
5:15 PM - 5:30 PM		2	1											
5:30 PM - 5:45 PM		2	1											
5:45 PM - 6:00 PM														
6:00 PM - 6:15 PM				2										
6:15 PM - 6:30 PM		2												
6:30 PM - 6:45 PM														
6:45 PM - 7:00 PM														
Total	4	11	2	3	4	0	0	0	4	11	2	3	4	
PM One Hour Volumes														
4:00 PM - 5:00 PM	3	4	0	1	4	0	0	0	7	1	4	0	12	12
4:15 PM - 5:15 PM	3	2	0	0	0	0	0	0	5	0	0	0	5	5
4:30 PM - 5:30 PM	1	3	1	0	0	0	0	0	4	1	0	0	5	5
4:45 PM - 5:45 PM	1	5	2	0	0	0	0	0	6	2	0	0	8	8
5:00 PM - 6:00 PM	1	5	2	0	0	0	0	0	6	2	0	0	8	8
5:15 PM - 6:15 PM	0	4	2	2	0	0	0	0	4	4	0	0	8	8
5:30 PM - 6:30 PM	0	4	1	2	0	0	0	0	4	3	0	0	7	7
5:45 PM - 6:45 PM	0	2	0	2	0	0	0	0	2	2	0	0	4	4
6:00 PM - 7:00 PM	0	2	0	2	0	0	0	0	2	2	0	0	4	4

LOCATION: Pleasant St NW -- Route 123
CITY/STATE: Vienna, VA

QC JOB #: 12465707
DATE: Thu, May 08 2014

Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM



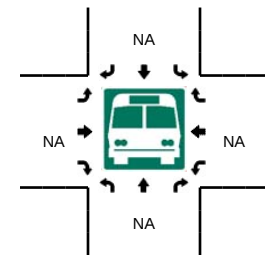
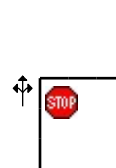
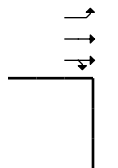
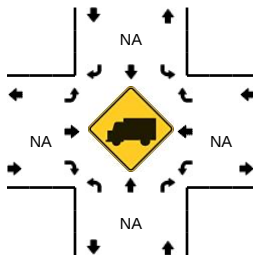
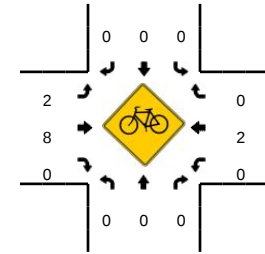
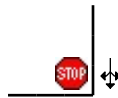
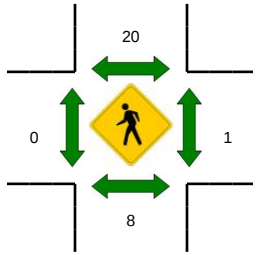
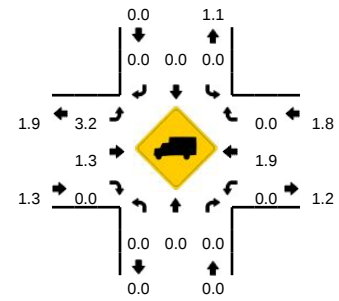
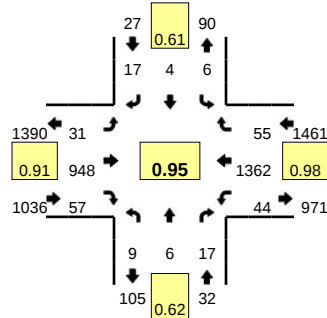
15-Min Count Period Beginning At	Pleasant St NW (Northbound)				Pleasant St NW (Southbound)				Route 123 (Eastbound)				Route 123 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
8:00 AM	3	0	7	0	3	2	4	0	3	286	9	0	2	150	6	0	475	
8:15 AM	0	1	4	0	0	1	5	0	13	323	16	0	5	155	6	0	529	
8:30 AM	0	0	2	0	1	1	5	0	15	290	16	0	3	156	9	0	498	
8:45 AM	1	1	2	0	0	0	8	0	16	303	10	0	4	178	7	0	530	2032
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1557
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1028
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	530
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	4	4	8	0	0	0	32	0	64	1212	40	0	16	712	28	0	2120	
Heavy Trucks	0	0	0		0	0	0		0	64	0		0	40	0		104	
Pedestrians	0				8				0				0				8	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Pleasant St NW -- Route 123
CITY/STATE: Vienna, VA

QC JOB #: 12465708
DATE: Thu, May 08 2014

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:00 PM -- 5:15 PM



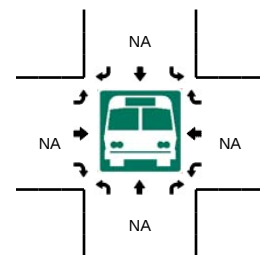
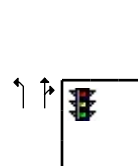
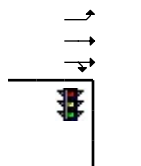
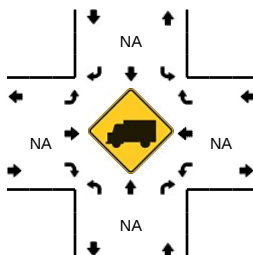
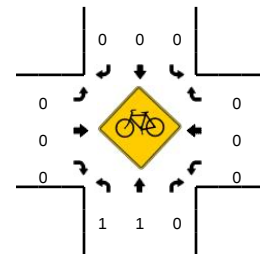
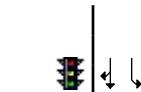
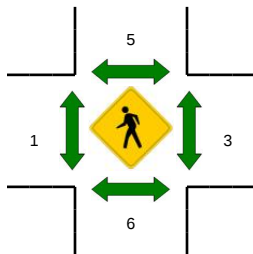
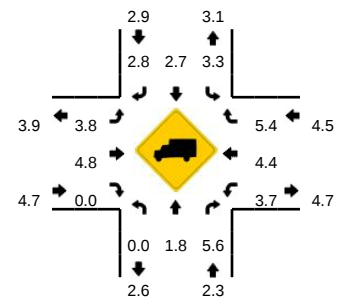
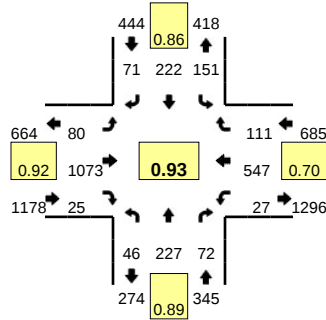
15-Min Count Period Beginning At	Pleasant St NW (Northbound)				Pleasant St NW (Southbound)				Route 123 (Eastbound)				Route 123 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
5:00 PM	1	2	3	0	4	2	5	0	3	272	9	1	10	355	7	0	674	
5:15 PM	2	1	3	0	2	1	4	0	9	211	14	1	11	346	12	0	617	
5:30 PM	3	1	3	0	0	1	7	0	7	218	14	0	12	316	18	0	600	
5:45 PM	3	2	8	0	0	0	1	0	10	247	20	0	11	345	18	0	665	2556
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1882
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1265
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	665
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	4	8	12	0	16	8	20	0	12	1088	36	4	40	1420	28	0	2696	
Heavy Trucks	0	0	0	0	0	0	0	0	0	24	0	0	0	40	0	0	64	
Pedestrians		12				8				0				0			20	
Bicycles	0	0	0	0	0	0	0	0	1	6	0	0	0	0	0	0	7	
Railroad																		
Stopped Buses																		

Comments:

LOCATION: Lawyers Rd NW -- Route 123
CITY/STATE: Vienna, VA

QC JOB #: 12465528
DATE: Thu, May 08 2014

Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:15 AM -- 8:30 AM



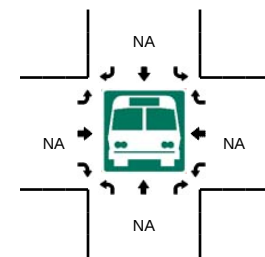
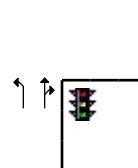
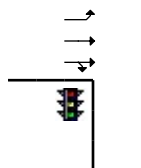
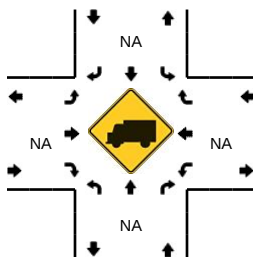
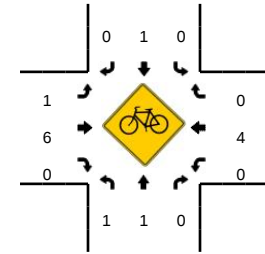
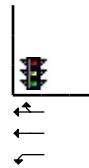
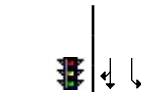
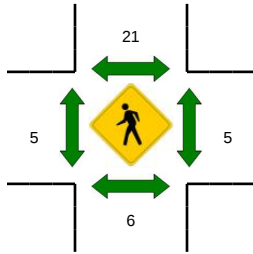
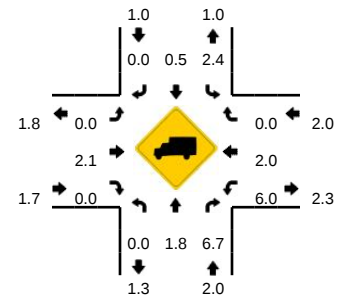
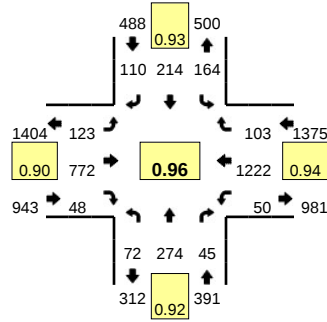
15-Min Count Period Beginning At	Lawyers Rd NW (Northbound)				Lawyers Rd NW (Southbound)				Route 123 (Eastbound)				Route 123 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	3	4	5	0	16	17	5	0	2	153	4	0	2	52	4	0	267	1572 2001 2321 2578 2556 2495 2553 2553 2652
6:15 AM	1	9	7	0	17	19	8	0	2	211	2	0	1	52	4	0	333	
6:30 AM	4	20	10	0	28	24	18	0	7	209	2	0	0	72	10	0	404	
6:45 AM	11	32	8	0	28	43	17	0	10	270	2	0	3	137	7	0	568	
7:00 AM	16	28	16	0	36	57	9	0	8	275	2	0	3	226	20	0	696	
7:15 AM	5	38	20	0	33	56	17	0	9	316	6	0	6	133	14	0	653	
7:30 AM	8	53	19	0	45	59	15	0	17	293	5	0	7	120	20	0	661	
7:45 AM	5	42	23	0	19	69	15	0	19	203	3	0	10	118	20	0	546	
8:00 AM	11	52	11	0	36	43	12	0	19	273	7	0	5	132	34	0	635	2495
8:15 AM	6	56	22	0	32	61	23	0	19	298	8	0	11	142	33	0	711	2553
8:30 AM	15	69	13	0	48	65	16	0	24	242	5	0	5	134	25	0	661	2553
8:45 AM	14	50	26	0	35	53	20	0	18	260	5	0	6	139	19	0	645	2652
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	24	224	88	0	128	244	92	0	76	1192	32	0	44	568	132	0	2844	
Heavy Trucks	0	12	0	0	4	8	0	0	4	60	0	0	4	20	4	0	116	
Pedestrians	0	4	0	0	0	8	0	0	0	4	0	0	0	0	0	0	16	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Comments:

LOCATION: Lawyers Rd NW -- Route 123
CITY/STATE: Vienna, VA

QC JOB #: 12465529
DATE: Thu, May 08 2014

Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:00 PM -- 5:15 PM



15-Min Count Period Beginning At	Lawyers Rd NW (Northbound)				Lawyers Rd NW (Southbound)				Route 123 (Eastbound)				Route 123 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	17	50	8	0	34	35	34	0	25	190	13	0	7	324	33	0	770	
4:15 PM	15	60	9	0	38	49	29	0	32	202	5	0	10	296	29	0	774	
4:30 PM	24	69	11	0	34	48	33	0	26	196	5	0	9	276	22	0	753	
4:45 PM	15	63	14	0	39	59	33	0	31	183	5	0	15	288	26	0	771	3068
5:00 PM	26	61	8	0	41	51	22	0	31	218	13	0	12	323	29	0	835	3133
5:15 PM	10	67	14	0	29	49	40	0	32	188	17	0	12	309	31	0	798	3157
5:30 PM	15	76	8	0	49	60	25	0	34	177	9	0	13	283	21	0	770	3174
5:45 PM	21	70	15	0	45	54	23	0	26	189	9	0	13	307	22	0	794	3197
6:00 PM	14	49	18	0	33	62	26	0	31	191	13	0	16	300	38	0	791	3153
6:15 PM	19	64	15	0	39	61	22	0	33	195	9	0	11	295	32	0	795	3150
6:30 PM	24	64	18	0	33	54	24	0	29	158	5	0	9	277	22	0	717	3097
6:45 PM	18	58	17	0	34	31	36	0	27	186	7	0	10	295	33	0	752	3055
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	104	244	32	0	164	204	88	0	124	872	52	0	48	1292	116	0	3340	
Heavy Trucks	0	4	4	0	0	4	0	0	0	28	0	0	4	36	0	0	80	
Pedestrians		4				28				0				4			36	
Bicycles	1	0	0		0	0	0		0	5	0		0	0	0		6	
Railroad																		
Stopped Buses																		

Comments:

Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - All Vehicles

PROJECT: Maple Avenue Consolidation					DATE: 2/17/2016					SOUTHBOUND ROAD: Site Driveway													
W+A JOB NO: 6740					DAY: Wednesday					NORTHBOUND ROAD: 0													
INTERSECTION: Lawyers Road & Maple Avenue					WEATHER: Cloudy					WESTBOUND ROAD: Maple Avenue													
LOCATION: Vienna, VA					COUNTED BY: Jose & Salih					EASTBOUND ROAD: Maple Avenue													
INPUTED BY: JAS																							
Time Period	Southbound Site Driveway				Westbound Maple Avenue				Northbound 0				Eastbound Maple Avenue				North & South	East & West	Total				
	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF								
AM 15 Minute Volumes																							
6:00 AM - 6:15 AM	0	1	0	1		0	0	0	0		0	0	0	0		1	0	0	1		1	1	2
6:15 AM - 6:30 AM	0	0	0	0		0	0	0	0		0	1	0	1		0	0	0	0		1	0	1
6:30 AM - 6:45 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:45 AM - 7:00 AM	0	0	1	1		0	0	0	0		0	0	0	0		0	0	1	1		1	1	2
7:00 AM - 7:15 AM	0	1	0	1		1	0	0	1		0	0	0	0		1	0	0	1		1	2	3
7:15 AM - 7:30 AM	0	2	0	2		0	0	1	1		0	1	0	1		0	0	0	0		3	1	4
7:30 AM - 7:45 AM	0	0	0	0		1	0	0	1		0	1	0	1		0	0	0	0		1	1	2
7:45 AM - 8:00 AM	1	2	0	3		0	0	0	0		0	3	1	4		0	0	0	0		7	0	7
8:00 AM - 8:15 AM	0	2	0	2		0	0	0	0		1	2	0	3		0	0	1	1		5	1	6
8:15 AM - 8:30 AM	0	0	1	1		1	0	0	1		0	1	0	1		0	0	0	0		2	1	3
8:30 AM - 8:45 AM	0	1	3	4		1	0	1	2		0	2	0	2		1	1	1	3		6	5	11
8:45 AM - 9:00 AM	0	2	0	2		1	0	0	1		0	0	0	0		0	0	0	0		2	1	3
Total	1	11	5	17		5	0	2	7		1	11	1	13		3	1	3	7		30	14	44
AM One Hour Volumes																							
6:00 AM - 7:00 AM	0	1	1	2	0.50	0	0	0	0	0.00	0	1	0	1	0.25	1	0	1	2	0.50	3	2	5
6:15 AM - 7:15 AM	0	1	1	2	0.50	1	0	0	1	0.25	0	1	0	1	0.25	1	0	1	2	0.50	3	3	6
6:30 AM - 7:30 AM	0	3	1	4	0.50	1	0	1	2	0.50	0	1	0	1	0.25	1	0	1	2	0.50	5	4	9
6:45 AM - 7:45 AM	0	3	1	4	0.50	2	0	1	3	0.75	0	2	0	2	0.50	1	0	1	2	0.50	6	5	11
7:00 AM - 8:00 AM	1	5	0	6	0.50	2	0	1	3	0.75	0	5	1	6	0.38	1	0	0	1	0.25	12	4	16
7:15 AM - 8:15 AM	1	6	0	7	0.58	1	0	1	2	0.50	1	7	1	9	0.56	0	0	1	1	0.25	16	3	19
7:30 AM - 8:30 AM	1	4	1	6	0.50	2	0	0	2	0.50	1	7	1	9	0.56	0	0	1	1	0.25	15	3	18
7:45 AM - 8:45 AM	1	5	4	10	0.63	2	0	1	3	0.38	1	8	1	10	0.63	1	1	2	4	0.33	20	7	27
8:00 AM - 9:00 AM	0	5	4	9	0.56	3	0	1	4	0.50	1	5	0	6	0.50	1	1	2	4	0.33	15	8	23
PM 15 Minute Volumes																							
4:00 PM - 4:15 PM	1	0	0	1		3	0	0	3		0	0	0	0		0	0	1	1		1	4	5
4:15 PM - 4:30 PM	0	0	0	0		1	0	0	1		0	0	0	0		0	0	0	0		0	1	1
4:30 PM - 4:45 PM	1	0	0	1		1	0	0	1		0	0	0	0		0	0	1	1		1	2	3
4:45 PM - 5:00 PM	0	0	0	0		1	0	0	1		0	0	0	0		0	0	1	1		0	2	2
5:00 PM - 5:15 PM	1	0	0	1		0	0	0	0		0	0	0	0		0	0	1	1		1	1	2
5:15 PM - 5:30 PM	1	0	0	1		0	0	0	0		0	0	0	0		0	0	0	0		1	0	1
5:30 PM - 5:45 PM	2	0	0	2		0	0	0	0		0	0	0	0		0	0	0	0		2	0	2
5:45 PM - 6:00 PM	1	0	0	1		1	0	0	1		0	0	0	0		0	0	0	0		1	1	2
6:00 PM - 6:15 PM	0	0	0	0		3	0	0	3		0	0	0	0		0	0	0	0		0	3	3
6:15 PM - 6:30 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:30 PM - 6:45 PM	2	0	0	2		1	0	0	1		0	0	0	0		0	0	0	0		2	1	3
6:45 PM - 7:00 PM	1	0	0	1		0	0	0	0		0	0	0	0		0	0	0	0		1	0	1
Total	10	0	0	10		11	0	0	11		0	0	0	0		0	0	4	4		10	15	25
PM One Hour Volumes																							
4:00 PM - 5:00 PM	2	0	0	2	0.50	6	0	0	6	0.50	0	0	0	0	0.00	0	0	3	3	0.75	2	9	11
4:15 PM - 5:15 PM	2	0	0	2	0.50	3	0	0	3	0.75	0	0	0	0	0.00	0	0	3	3	0.75	2	6	8
4:30 PM - 5:30 PM	3	0	0	3	0.75	2	0	0	2	0.50	0	0	0	0	0.00	0	0	3	3	0.75	3	5	8
4:45 PM - 5:45 PM	4	0	0	4	0.50	1	0	0	1	0.25	0	0	0	0	0.00	0	0	2	2	0.50	4	3	7
5:00 PM - 6:00 PM	5	0	0	5	0.63	1	0	0	1	0.25	0	0	0	0	0.00	0	0	1	1	0.25	5	2	7
5:15 PM - 6:15 PM	4	0	0	4	0.50	4	0	0	4	0.33	0	0	0	0	0.00	0	0	0	0	0.00	4	4	8
5:30 PM - 6:30 PM	3	0	0	3	0.38	4	0	0	4	0.33	0	0	0	0	0.00	0	0	0	0	0.00	3	4	7
5:45 PM - 6:45 PM	3	0	0	3	0.38	5	0	0	5	0.42	0	0	0	0	0.00	0	0	0	0	0.00	3	5	8
6:00 PM - 7:00 PM	3	0	0	3	0.38	4	0	0	4	0.33	0	0	0	0	0.00	0	0	0	0	0.00	3	4	7

Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - All Vehicles

PROJECT: Maple Avenue Consolidation W+A JOB NO: 6740 INTERSECTION: Lawyers Road & Maple Avenue LOCATION: Vienna, VA					DATE: 2/17/2016 DAY: Wednesday WEATHER: Cloudy COUNTED BY: Laura INPUT BY: JAS					SOUTHBOUND ROAD: Pleasant Street NORTHBOUND ROAD: Pleasant Street WESTBOUND ROAD: Driveway South EASTBOUND ROAD: 0													
Time Period	Southbound Pleasant Street					Westbound Driveway South					Northbound Pleasant Street					Eastbound 0					North & South	East & West	Total
	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF			
AM 15 Minute Volumes																							
6:00 AM - 6:15 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:15 AM - 6:30 AM	0	0	2	2		0	0	0	0		0	0	0	0		0	0	0	0		2	0	2
6:30 AM - 6:45 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:45 AM - 7:00 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
7:00 AM - 7:15 AM	0	0	2	2		1	0	0	1		2	0	0	2		0	0	0	0		4	1	5
7:15 AM - 7:30 AM	0	0	1	1		0	0	0	0		0	0	0	0		0	0	0	0		1	0	1
7:30 AM - 7:45 AM	0	0	2	2		1	0	0	1		0	0	0	0		0	0	0	0		2	1	3
7:45 AM - 8:00 AM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
8:00 AM - 8:15 AM	0	0	2	2		0	0	0	0		1	0	0	1		0	0	0	0		3	0	3
8:15 AM - 8:30 AM	0	0	1	1		1	0	0	1		0	0	0	0		0	0	0	0		1	1	2
8:30 AM - 8:45 AM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
8:45 AM - 9:00 AM	0	0	2	2		0	0	0	0		0	0	0	0		0	0	0	0		2	0	2
Total	0	0	12	12		3	0	0	3		5	0	0	5		0	0	0	0		17	3	20
AM One Hour Volumes																							
6:00 AM - 7:00 AM	0	0	2	2	0.25	0	0	0	0	0.00	0	0	0	0	0.00	0	0	0	0	0.00	2	0	2
6:15 AM - 7:15 AM	0	0	4	4	0.50	1	0	0	1	0.25	2	0	0	2	0.25	0	0	0	0	0.00	6	1	7
6:30 AM - 7:30 AM	0	0	3	3	0.38	1	0	0	1	0.25	2	0	0	2	0.25	0	0	0	0	0.00	5	1	6
6:45 AM - 7:45 AM	0	0	5	5	0.63	2	0	0	2	0.50	2	0	0	2	0.25	0	0	0	0	0.00	7	2	9
7:00 AM - 8:00 AM	0	0	5	5	0.63	2	0	0	2	0.50	3	0	0	3	0.38	0	0	0	0	0.00	8	2	10
7:15 AM - 8:15 AM	0	0	5	5	0.63	1	0	0	1	0.25	2	0	0	2	0.50	0	0	0	0	0.00	7	1	8
7:30 AM - 8:30 AM	0	0	5	5	0.63	2	0	0	2	0.50	2	0	0	2	0.50	0	0	0	0	0.00	7	2	9
7:45 AM - 8:45 AM	0	0	3	3	0.38	1	0	0	1	0.25	3	0	0	3	0.75	0	0	0	0	0.00	6	1	7
8:00 AM - 9:00 AM	0	0	5	5	0.63	1	0	0	1	0.25	2	0	0	2	0.50	0	0	0	0	0.00	7	1	8
PM 15 Minute Volumes																							
4:00 PM - 4:15 PM	0	0	0	0		2	0	0	2		0	0	0	0		0	0	0	0		0	2	2
4:15 PM - 4:30 PM	0	0	1	1		0	0	1	1		0	0	0	0		0	0	0	0		1	1	2
4:30 PM - 4:45 PM	0	0	1	1		0	0	1	1		0	0	0	0		0	0	0	0		1	1	2
4:45 PM - 5:00 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
5:00 PM - 5:15 PM	0	0	0	0		0	0	1	1		0	0	0	0		0	0	0	0		0	1	1
5:15 PM - 5:30 PM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
5:30 PM - 5:45 PM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
5:45 PM - 6:00 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:00 PM - 6:15 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:15 PM - 6:30 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:30 PM - 6:45 PM	0	0	1	1		0	0	0	0		0	0	0	0		0	0	0	0		1	0	1
6:45 PM - 7:00 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
Total	0	0	3	3		2	0	3	5		2	0	0	2		0	0	0	0		5	5	10
PM One Hour Volumes																							
4:00 PM - 5:00 PM	0	0	2	2	0.50	2	0	2	4	0.50	0	0	0	0	0.00	0	0	0	0	0.00	2	4	6
4:15 PM - 5:15 PM	0	0	2	2	0.50	0	0	3	3	0.75	0	0	0	0	0.00	0	0	0	0	0.00	2	3	5
4:30 PM - 5:30 PM	0	0	1	1	0.25	0	0	2	2	0.50	1	0	0	1	0.25	0	0	0	0	0.00	2	2	4
4:45 PM - 5:45 PM	0	0	0	0	0.00	0	0	1	1	0.25	2	0	0	2	0.50	0	0	0	0	0.00	2	1	3
5:00 PM - 6:00 PM	0	0	0	0	0.00	0	0	1	1	0.25	2	0	0	2	0.50	0	0	0	0	0.00	2	1	3
5:15 PM - 6:15 PM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.50	0	0	0	0	0.00	2	0	2
5:30 PM - 6:30 PM	0	0	0	0	0.00	0	0	0	0	0.00	1	0	0	1	0.25	0	0	0	0	0.00	1	0	1
5:45 PM - 6:45 PM	0	0	1	1	0.25	0	0	0	0	0.00	0	0	0	0	0.00	0	0	0	0	0.00	1	0	1
6:00 PM - 7:00 PM	0	0	1	1	0.25	0	0	0	0	0.00	0	0	0	0	0.00	0	0	0	0	0.00	1	0	1

Wells + Associates, Inc.

McLean, Virginia

Turning Movement Count - All Vehicles

PROJECT: Maple Avenue Consolidation					DATE: 2/17/2016					SOUTHBOUND ROAD: Pleasant Street													
W+A JOB NO: 6740					DAY: Wednesday					NORTHBOUND ROAD: Pleasant Street													
INTERSECTION: Lawyers Road & Maple Avenue					WEATHER: Cloudy					WESTBOUND ROAD: North Driveway													
LOCATION: Vienna, VA					COUNTED BY: Geraldine					EASTBOUND ROAD: N/A													
INPUT BY: JAS																							
Time Period	Southbound Pleasant Street				Westbound North Driveway				Northbound Pleasant Street				Eastbound N/A				North & South	East & West	Total				
	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right	Thru	Left	Total	PHF	Right				Thru	Left	Total	PHF
AM 15 Minute Volumes																							
6:00 AM - 6:15 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:15 AM - 6:30 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:30 AM - 6:45 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:45 AM - 7:00 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
7:00 AM - 7:15 AM	0	0	0	0		0	0	0	0		2	0	0	2		0	0	0	0		2	0	2
7:15 AM - 7:30 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
7:30 AM - 7:45 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
7:45 AM - 8:00 AM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
8:00 AM - 8:15 AM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
8:15 AM - 8:30 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
8:30 AM - 8:45 AM	0	0	0	0		0	0	0	0		1	0	0	1		0	0	0	0		1	0	1
8:45 AM - 9:00 AM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
Total	0	0	0	0		0	0	0	0		5	0	0	5		0	0	0	0		5	0	5
AM One Hour Volumes																							
6:00 AM - 7:00 AM	0	0	0	0	0.00	0	0	0	0	0.00	0	0	0	0	0.00	0	0	0	0	0.00	0	0	0
6:15 AM - 7:15 AM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.25	0	0	0	0	0.00	2	0	2
6:30 AM - 7:30 AM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.25	0	0	0	0	0.00	2	0	2
6:45 AM - 7:45 AM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.25	0	0	0	0	0.00	2	0	2
7:00 AM - 8:00 AM	0	0	0	0	0.00	0	0	0	0	0.00	3	0	0	3	0.38	0	0	0	0	0.00	3	0	3
7:15 AM - 8:15 AM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.50	0	0	0	0	0.00	2	0	2
7:30 AM - 8:30 AM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.50	0	0	0	0	0.00	2	0	2
7:45 AM - 8:45 AM	0	0	0	0	0.00	0	0	0	0	0.00	3	0	0	3	0.75	0	0	0	0	0.00	3	0	3
8:00 AM - 9:00 AM	0	0	0	0	0.00	0	0	0	0	0.00	2	0	0	2	0.50	0	0	0	0	0.00	2	0	2
PM 15 Minute Volumes																							
4:00 PM - 4:15 PM	0	0	0	0		1	0	0	1		0	0	0	0		0	0	0	0		0	1	1
4:15 PM - 4:30 PM	0	0	1	1		1	0	2	3		0	0	0	0		0	0	0	0		1	3	4
4:30 PM - 4:45 PM	0	0	0	0		1	0	1	2		0	0	0	0		0	0	0	0		0	2	2
4:45 PM - 5:00 PM	0	0	0	0		0	0	2	2		1	0	0	1		0	0	0	0		1	2	3
5:00 PM - 5:15 PM	0	0	0	0		1	0	0	1		0	0	0	0		0	0	0	0		0	1	1
5:15 PM - 5:30 PM	0	0	0	0		0	0	1	1		0	0	0	0		0	0	0	0		0	1	1
5:30 PM - 5:45 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
5:45 PM - 6:00 PM	0	0	0	0		0	0	1	1		0	0	0	0		0	0	0	0		0	1	1
6:00 PM - 6:15 PM	0	0	0	0		2	0	0	2		0	0	0	0		0	0	0	0		0	2	2
6:15 PM - 6:30 PM	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0
6:30 PM - 6:45 PM	0	0	0	0		0	0	1	1		0	0	0	0		0	0	0	0		0	1	1
6:45 PM - 7:00 PM	0	0	0	0		0	0	2	2		0	0	0	0		0	0	0	0		0	2	2
Total	0	0	1	1		6	0	10	16		1	0	0	1		0	0	0	0		2	16	18
PM One Hour Volumes																							
4:00 PM - 5:00 PM	0	0	1	1	0.25	3	0	5	8	0.67	1	0	0	1	0.25	0	0	0	0	0.00	2	8	10
4:15 PM - 5:15 PM	0	0	1	1	0.25	3	0	5	8	0.67	1	0	0	1	0.25	0	0	0	0	0.00	2	8	10
4:30 PM - 5:30 PM	0	0	0	0	0.00	2	0	4	6	0.75	1	0	0	1	0.25	0	0	0	0	0.00	1	6	7
4:45 PM - 5:45 PM	0	0	0	0	0.00	1	0	3	4	0.50	1	0	0	1	0.25	0	0	0	0	0.00	1	4	5
5:00 PM - 6:00 PM	0	0	0	0	0.00	1	0	2	3	0.75	0	0	0	0	0.00	0	0	0	0	0.00	0	3	3
5:15 PM - 6:15 PM	0	0	0	0	0.00	2	0	2	4	0.50	0	0	0	0	0.00	0	0	0	0	0.00	0	4	4
5:30 PM - 6:30 PM	0	0	0	0	0.00	2	0	1	3	0.38	0	0	0	0	0.00	0	0	0	0	0.00	0	3	3
5:45 PM - 6:45 PM	0	0	0	0	0.00	2	0	2	4	0.50	0	0	0	0	0.00	0	0	0	0	0.00	0	4	4
6:00 PM - 7:00 PM	0	0	0	0	0.00	2	0	3	5	0.63	0	0	0	0	0.00	0	0	0	0	0.00	0	5	5

APPENDIX C

Appendix C - Existing Capacity Analysis



HCM Unsignalized Intersection Capacity Analysis

1. Pleasant St & Parking Lot/Church Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	→	→	→	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	1	0	1	0	0	0	4	26	47	8	47	1
Future Volume (Veh/h)	1	0	1	0	0	0	4	26	47	8	47	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	1.00	0.92
Hourly flow rate (vph)	1	0	1	0	0	0	5	31	55	9	47	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked												
VC, conflicting volume	134	162	48	135	134	58	48					86
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	134	162	48	135	134	58	48					86
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	100	100	100	100	100	100	100					99
CM capacity (veh/h)	832	724	1022	830	749	1007	1559					1510
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	2	91	57									
Volume Left	1	5	9									
Volume Right	1	55	1									
cSH	917	1559	1510									
Volume to Capacity	0.00	0.00	0.01									
Queue Length 95th (ft)	0	0	0									
Control Delay (s)	8.9	0.4	1.2									
Lane LOS	A	A	A									
Approach Delay (s)	8.9	0.4	1.2									
Approach LOS	A											
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			15.4%									A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2. Lawyers Rd & Church Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	→	→	→	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	11	21	21	24	1	73	8	335	75	295	398	7
Future Volume (Veh/h)	11	21	21	24	1	73	8	335	75	295	398	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	25	25	28	1	86	9	364	82	321	433	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked	0.84	0.84	0.84	0.84	0.84	0.84						0.84
VC, conflicting volume	1546	1543	438	1512	1506	406	441					446
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1555	1551	438	1514	1507	200	441					247
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	75	62	96	36	99	88	99					71
CM capacity (veh/h)	52	66	612	44	72	705	1119					1109
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	63	115	455	321	441							
Volume Left	13	28	9	321	0							
Volume Right	25	86	82	0	8							
cSH	102	176	1119	1109	1700							
Volume to Capacity	0.62	0.65	0.01	0.29	0.26							
Queue Length 95th (ft)	75	94	1	30	0							
Control Delay (s)	84.0	53.6	0.3	9.6	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	84.0	53.6	0.3	4.0								
Approach LOS	F	F										
Intersection Summary												
Average Delay			10.5									
Intersection Capacity Utilization			62.5%									B
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3. Pleasant St & Rt 123/Maple Avenue

Existing AM Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (veh/h)	47	1202	51	14	639	28	4	2	15	7	7	34
Future Volume (Veh/h)	47	1202	51	14	639	28	4	2	15	7	7	34
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	-2%	-2%	-2%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Peak Hour Factor	0.92	0.92	0.92	0.90	0.90	0.90	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	51	1307	55	16	710	31	5	2	18	8	8	40
Pedestrians							2	10	18	8	8	40
Lane Width (ft)							9.7	16.0	16.0	15.0	15.0	15.0
Walking Speed (ft/s)							4.0	4.0	4.0	4.0	4.0	4.0
Percent Blockage							0	1	1	1	1	1
Right turn flare (veh)												
Median type	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT
Median storage (veh)	2	2	2	2	2	2	2	2	2	2	2	2
Upstream signal (ft)	254	747	747	747	747	747	747	747	747	747	747	747
pX platoon unblocked	0.86						0.86	0.86	0.86	0.86	0.86	0.86
VC, conflicting volume	749						1372	2228	693	1542	2240	378
VC1, stage 1 conf vol							1446	1446	766	766	766	766
VC2, stage 2 conf vol							431	781	776	776	1474	1474
VCu, unblocked vol	387						1697	2103	693	1307	2117	0
IC, single (s)	4.1						7.5	6.5	6.9	7.5	6.5	6.9
IC, 2 stage (s)							6.5	5.5	3.3	3.5	4.0	3.3
IF (s)	2.2						3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95						96	99	95	97	95	96
CM capacity (veh/h)	988						491	125	166	381	262	151
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 1	NB 1	NB 1	NB 1	NB 1
Volume Total	51	871	491	16	473	268	25	56				
Volume Left	51	0	0	16	0	0	5	8				
Volume Right	0	0	55	0	0	31	18	40				
cSH	988	1700	1700	491	1700	1700	252	442				
Volume to Capacity	0.05	0.51	0.29	0.03	0.28	0.16	0.10	0.13				
Queue Length 95th (ft)	4	0	0	3	0	0	8	11				
Control Delay (s)	8.8	0.0	0.0	12.6	0.0	0.0	20.9	14.3				
Lane LOS	A	A	B	B	C	C	C	B				
Approach Delay (s)	0.3			0.3			20.9	14.3				
Approach LOS	C			C			C	B				
Intersection Summary												
Average Delay							0.9					
Intersection Capacity Utilization							49.7%					
Analysis Period (min)							15					

Queues

4. Courthouse Rd/Lawyers Rd & Maple Avenue

Existing AM Conditions

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	1193	32	775	52	336	176	341
v/c Ratio	0.61	0.78	0.29	0.60	0.49	0.91	0.85	0.66
Control Delay	77.9	36.7	68.9	34.4	78.3	81.5	91.8	49.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.9	36.7	68.9	34.4	78.3	81.5	91.8	49.2
Queue Length 50th (ft)	77	527	28	290	46	289	157	265
Queue Length 95th (ft)	136	#640	60	341	91	#447	#257	355
Internal Link Dist (ft)		667		792		621		287
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	167	1530	110	1298	122	390	222	522
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.78	0.29	0.60	0.43	0.86	0.79	0.65
Intersection Summary								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Existing AM Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↶	↷	↰	↶	↷	↰	↶	↷	↰	↶	↷
Traffic Volume (vph)	80	1073	25	27	547	111	46	227	72	151	222	71
Future Volume (vph)	80	1073	25	27	547	111	46	227	72	151	222	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)	0%	0%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	5.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	1.00	1.00	1.00	1.00	0.97	1.00	1.00	0.96	1.00	0.96	1.00	0.96
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95
Satd. Flow (prot)	1562	3197	1546	3101	1711	1728	1636	1771	1636	1771	1636	1771
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95
Satd. Flow (perm)	1562	3197	1546	3101	1711	1728	1636	1771	1636	1771	1636	1771
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.89	0.89	0.89	0.86	0.86	0.86
Adj. Flow (vph)	87	1166	27	32	644	131	52	255	81	176	258	83
RTOR Reduction (vph)	0	1	0	0	12	0	0	8	0	0	9	0
Lane Group Flow (vph)	87	1192	0	32	763	0	52	328	0	176	332	0
Conf. Peds. (#/hr)	6	6	6	5	5	5	3	3	3	3	3	1
Heavy Vehicles (%)	4%	5%	2%	4%	4%	5%	2%	2%	2%	3%	3%	3%
Turn Type	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	1	6	3	8	7	4	7	4	7	4
Permitted Phases	12.8	63.9	6.0	57.1	7.6	30.3	17.8	30.3	17.8	40.5	17.8	40.5
Actuated Green, G (s)	12.8	63.9	6.0	57.1	7.6	30.3	17.8	30.3	17.8	40.5	17.8	40.5
Effective Green, g (s)	0.09	0.46	0.04	0.41	0.05	0.22	0.13	0.22	0.13	0.29	0.13	0.29
Actuated g/C Ratio	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	142	1459	66	1264	92	373	208	512	208	512	208	512
Lane Grp Cap (vph)	c0.06	c0.37	0.02	0.25	0.03	c0.19	c0.11	0.19	c0.11	0.19	c0.11	0.19
v/s Ratio Prot	0.61	0.82	0.48	0.60	0.57	0.88	0.85	0.65	0.85	0.65	0.85	0.65
v/s Ratio Perm	61.2	33.0	65.5	32.6	64.6	53.1	59.8	43.5	59.8	43.5	59.8	43.5
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	7.1	4.9	5.5	2.1	7.7	20.3	25.8	2.8	25.8	2.8	25.8	2.8
Incremental Delay, d2	68.4	37.8	71.0	34.7	72.3	73.4	85.6	46.4	85.6	46.4	85.6	46.4
Delay (s)	E	D	E	C	E	E	F	D	F	D	F	D
Level of Service	E	D	E	C	E	E	F	D	F	D	F	D
Approach Delay (s)	39.9	39.9	36.1	73.3	73.3	73.3	59.7	59.7	59.7	59.7	59.7	59.7
Approach LOS	D	D	D	D	D	D	E	E	E	E	E	E
Intersection Summary												
HCM 2000 Control Delay	46.6	HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.84	D										
Actuated Cycle Length (s)	140.0	Sum of lost time (s)										
Intersection Capacity Utilization	82.0%	ICU Level of Service										
Analysis Period (min)	15	E										
Critical Lane Group												

Queues

9: Nuttle Street & Maple Avenue

Existing AM Conditions

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	14	1374	191	553	177	183	319	78	326
v/c Ratio	0.03	0.88	0.87	0.30	0.73	0.73	0.56	0.22	0.89
Control Delay	21.1	55.2	90.3	26.9	94.5	93.6	16.7	64.8	99.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	55.2	90.3	26.9	94.5	93.6	16.7	64.8	99.0
Queue Length 50th (ft)	8	836	188	212	226	234	72	82	395
Queue Length 95th (ft)	21	#971	#346	287	289	297	138	137	#556
Internal Link Dist (ft)	206	206	285	1528	575	575	583	583	583
Turn Bay Length (ft)	60	285	285	215	327	340	372	389	389
Base Capacity (vph)	556	1568	225	1869	327	340	575	372	389
Survation 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	0.03	0.88	0.85	0.30	0.54	0.54	0.55	0.21	0.84
Intersection Summary									
# 95th percentile volume exceeds capacity, queue may be longer.									
Queue shown is maximum after two cycles.									

HCM Signalized Intersection Capacity Analysis 9. Nutley Street & Maple Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	1059	109	176	472	37	188	118	271	72	283	17
Future Volume (vph)	12	1059	109	176	472	37	188	118	271	72	283	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	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	0.95	1.00	0.95	0.95	0.95	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	0.99	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	1.00	1.00	1.00
Flt	1.00	0.99	1.00	0.99	1.00	0.99	1.00	1.00	0.85	1.00	0.99	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	0.95
Satd. Flow (prot)	1762	3479	1770	3490	1681	1749	1568	1770	1846			
Flt Permitted	0.45	1.00	0.04	1.00	0.95	0.99	1.00	0.95	1.00	0.95	1.00	0.95
Satd. Flow (perm)	825	3479	82	3490	1681	1749	1568	1770	1846			
Peak-hour factor, PHF	0.85	0.85	0.85	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	14	1246	128	191	513	40	221	139	319	78	308	18
RTOR Reduction (vph)	0	4	0	0	2	0	0	0	185	0	1	0
Lane Group Flow (vph)	14	1370	0	191	551	0	177	183	134	78	325	0
Confl. Peds. (#/hr)	6		3	3	3	6	1	1	2	2	2	1
Turn Type	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA	Split	NA	NA
Protected Phases	5	2	1	6	8	8	1	4	4			
Permitted Phases	2		6						8			
Actuated Green, G (s)	87.5	83.5	107.9	96.9	25.4	25.4	42.8	35.7	35.7			
Effective Green, g (s)	91.5	85.5	109.9	98.9	27.4	27.4	46.8	37.7	37.7			
Actuated g/C Ratio	0.48	0.45	0.58	0.52	0.14	0.14	0.25	0.20	0.20			
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	426	1565	219	1816	242	252	427	351	366			
v/s Ratio Prot	0.00	0.39	c0.09	0.16	c0.11	0.10	0.03	0.04	c0.18			
v/s Ratio Perm	0.01		c0.41				0.05					
v/c Ratio	0.03	0.88	0.87	0.30	0.73	0.73	0.31	0.22	0.89			
Uniform Delay, d1	25.7	47.4	63.6	25.9	77.8	77.7	58.5	63.9	74.1			
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	0.0	7.2	29.4	0.4	10.8	10.0	0.4	0.3	22.0			
Delay (s)	25.8	54.6	92.9	26.4	88.6	87.7	58.9	64.2	96.1			
Level of Service	C	D	F	C	F	F	E	E	F			
Approach Delay (s)	54.3		43.5		74.4				90.0			
Approach LOS	D		D		E				F			
Intersection Summary												
HCM 2000 Control Delay	60.5						HCM 2000 Level of Service					
HCM 2000 Volume to Capacity ratio	0.86						E					
Actuated Cycle Length (s)	190.0						Sum of lost time (s)					
Intersection Capacity Utilization	84.2%						20.0					
Analysis Period (min)	15						E					
Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 1. Pleasant St & Parking Lot/Church Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	2	1	4	0	0	0	5	69	16	11	16	1
Traffic Volume (veh/h)	2	1	4	0	0	0	5	69	16	11	16	1
Future Volume (Veh/h)	2	1	4	0	0	0	5	69	16	11	16	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%	2%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	1	4	0	0	0	5	75	17	12	17	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pK, platoon unblocked												
VC, conflicting volume	135	144	18	140	136	84	18					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
IC, unblocked vol	135	144	18	140	136	84	18					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	100	100	100	100	100	100	100					
CM capacity (veh/h)	829	739	1061	820	747	976	1599					
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	7	97	30									
Volume Left	2	5	12									
Volume Right	4	17	1									
CSH	929	1599	1503									
Volume to Capacity	0.01	0.00	0.01									
Queue Length 95th (ft)	1	0	1									
Control Delay (s)	8.9	0.4	3.0									
Lane LOS	A	A	A									
Approach Delay (s)	8.9	0.4	3.0									
Approach LOS	A											
Intersection Summary												
Average Delay	1.4						ICU Level of Service					
Intersection Capacity Utilization	15.4%						A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

2: Lawlors Rd & Church Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	42	15	50	124	8	245	7	375	75	140	392	12
Traffic Volume (veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Future Volume (Veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Sign Control	Stop	0%	0%	Stop	0%	0%	Free	0%	0%	Free	0%	0%
Grade	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	46	16	54	135	9	266	8	408	82	152	426	13
Hourly flow rate (vph)	46	16	54	135	9	266	8	408	82	152	426	13
Pedestrians				2							6	
Lane Width (ft)				12.0							12.0	
Walking Speed (ft/s)				4.0							4.0	
Percent Blockage				0							1	
Right turn flare (veh)		3				2						
Median type							None				None	
Median storage (veh)								367				
Upstream signal (ft)				0.82	0.82	0.82				0.82		
pX platoon unblocked	0.82	0.82	1244	432	1205	1210	457	439		482		
VC, conflicting volume	1345											
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1311	1189	432	1141	1147	229	439			272		
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	17	88	91	0	94	60	99			86		
CM capacity (veh/h)	56	131	623	107	139	660	1121			1058		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	116	410	498	152	439							
Volume Left	46	135	8	152	0							
Volume Right	54	266	82	0	13							
cSH	133	249	1121	1058	1700							
Volume to Capacity	0.87	1.65	0.01	0.14	0.26							
Queue Length 95th (ft)	140	650	1	13	0							
Control Delay (s)	109.5	343.0	0.2	9.0	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	109.5	343.0	0.2	2.3								
Approach LOS	F	F										
Intersection Summary												
Average Delay			95.9									
Intersection Capacity Utilization			70.0%							C		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3: Pleasant St & Rt 123/Maple Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	43	1002	58	45	1408	56	9	6	17	6	14	37
Traffic Volume (veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Future Volume (Veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Sign Control	Free	-2%	Free	Free	4%	4%	4%	4%	4%	4%	4%	4%
Grade	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	47	1089	63	49	1530	61	10	7	18	7	15	40
Hourly flow rate (vph)	47	1089	63	49	1530	61	10	7	18	7	15	40
Pedestrians				2							8	
Lane Width (ft)				9.7							15.0	
Walking Speed (ft/s)				4.0							4.0	
Percent Blockage				0							1	
Right turn flare (veh)												
Median type												
Median storage (veh)		2										
Upstream signal (ft)		254				747						
pX platoon unblocked	0.59											
VC, conflicting volume	1599			1162								
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	617			1162								
IC, single (s)	4.1			4.1								
IC, 2 stage (s)												
IF (s)	2.2			2.2								
p0 queue free %	92			92								
CM capacity (veh/h)	567			602								
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	47	726	426	49	1020	571	35	62				
Volume Left	47	0	0	49	0	0	10	7				
Volume Right	0	0	63	0	0	61	18	40				
cSH	567	1700	1700	602	1700	1700	223	282				
Volume to Capacity	0.08	0.43	0.25	0.08	0.08	0.34	0.16	0.22				
Queue Length 95th (ft)	7	0	0	7	0	0	14	21				
Control Delay (s)	11.9	0.0	0.0	11.5	0.0	0.0	24.1	21.4				
Lane LOS	B			B			C	C				
Approach Delay (s)	0.5			0.3			24.1	21.4				
Approach LOS							C	C				
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			51.9%							A		
Analysis Period (min)			15									

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Existing PM Conditions

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	136	942	55	1513	92	354	188	377
v/c Ratio	0.93	0.62	0.52	1.10	0.75	0.94	0.93	0.80
Control Delay	137.2	21.3	103.0	96.5	106.8	94.2	115.6	66.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.2	21.3	103.0	96.5	106.8	94.2	115.6	66.1
Queue Length 50th (ft)	148	222	56	~951	96	361	198	353
Queue Length 95th (ft)	#300	283	111	#1088	#186	#554	#355	486
Internal Link Dist (ft)	667		792		621		287	
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	146	1517	115	1371	128	388	204	478
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.62	0.48	1.10	0.72	0.91	0.92	0.79
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.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Existing PM Conditions

Movement	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↗	↖	↗		↖	↗	↖
Traffic Volume (vph)	125	808	59	51	1287	105	85	280	46	173
Future Volume (vph)	125	808	59	51	1287	105	85	280	46	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	12	10	12
Grade (%)	0%	0%		2%			0%			0%
Total Lost time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0		6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	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	0.99	1.00	0.99	1.00	0.99	1.00	0.98	1.00	0.94
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1562	3177	1546	3159	1711	1758	1636	1733		
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1562	3177	1546	3159	1711	1758	1636	1733		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	878	64	55	1399	114	92	304	50	188
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	13
Lane Group Flow (vph)	136	939	0	55	1509	0	92	350	0	188
Confl. Peds. (#/hr)		6			5			3		1
Heavy Vehicles (%)	4%	5%	0%	4%	4%	5%	2%	2%	3%	3%
Turn Type	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2		1	6		3	8	7	4
Permitted Phases										
Actuated Green, G (s)	15.1	75.3	9.0	69.2	11.4	33.9	19.8	33.9	19.8	42.3
Effective Green, g (s)	15.1	75.3	9.0	69.2	11.4	33.9	19.8	33.9	19.8	42.3
Actuated g/C Ratio	0.09	0.47	0.06	0.43	0.07	0.21	0.12	0.21	0.12	0.26
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
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)	147	1495	86	1366	121	372	202	458		
v/s Ratio Prot	c0.09	0.30	0.04	c0.48	0.05	c0.20	c0.11	0.21		
v/s Ratio Perm										
v/c Ratio	0.93	0.63	0.64	1.10	0.76	0.94	0.93	0.79		
Uniform Delay, d1	71.9	31.8	73.9	45.4	73.0	62.1	69.4	54.8		
Progression Factor	1.20	0.60	1.19	0.91	1.00	1.00	1.00	1.00		
Incremental Delay, d2	49.8	1.9	14.5	58.3	24.1	31.8	44.0	9.2		
Delay (s)	135.8	21.0	102.5	99.4	97.0	93.8	113.5	64.0		
Level of Service	F	C	F	F	F	F	F	F	E	
Approach Delay (s)		35.5		99.5		94.5		80.5		
Approach LOS		D		F		F		F		
Intersection Summary										
HCM 2000 Control Delay	77.1						HCM 2000 Level of Service		E	
HCM 2000 Volume to Capacity ratio	1.02									
Actuated Cycle Length (s)	160.0						Sum of lost time (s)		22.0	
Intersection Capacity Utilization	92.8%						ICU Level of Service		F	
Analysis Period (min)	15									
Critical Lane Group										

Queues

9. Nutley Street & Maple Avenue

Existing PM Conditions

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group									
Lane Group Flow (vph)	45	830	272	1230	286	298	403	76	336
v/c Ratio	0.38	0.76	0.87	0.83	0.91	0.91	0.54	0.22	0.94
Control Delay	33.6	53.7	63.8	36.7	94.3	93.8	13.1	56.2	97.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	53.7	63.8	36.7	94.3	93.8	13.1	56.2	97.1
Queue Length 50th (ft)	25	409	168	593	309	323	82	68	348
Queue Length 95th (ft)	49	493	#335	737	#486	#503	187	120	#546
Internal Link Dist (ft)	206			1528		575			583
Turn Bay Length (ft)	60	285			215				
Base Capacity (vph)	120	1094	320	1492	325	338	757	347	361
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	0.38	0.76	0.85	0.82	0.88	0.88	0.53	0.22	0.93
Intersection Summary									
# 95th percentile volume exceeds capacity, queue may be longer.									
Queue shown is maximum after two cycles.									

HCM Signalized Intersection Capacity Analysis

9. Nutley Street & Maple Avenue

Existing PM Conditions

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Future Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	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	1.00	1.00	1.00
Fr	1.00	0.97	1.00	0.99	1.00	0.99	1.00	1.00	0.85	1.00	0.98	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	0.98
Satd. Flow (prot)	1770	3374	1770	3512	1770	3512	1681	1747	1583	1770	1822	1822
Flt Permitted	0.09	1.00	0.13	1.00	0.13	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	170	3374	250	3512	1681	1747	1583	1770	1822	1770	1822	1822
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)	45	645	185	272	1187	43	362	222	403	76	295	41
RTOR Reduction (vph)	0	16	0	0	2	0	0	0	188	0	3	0
Lane Group Flow (vph)	45	814	0	272	1228	0	286	298	215	76	333	0
Confl. Peds. (#/hr)	17	11	11	17	8	17	8	4	4	4	8	8
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	Split	NA	ph+ov	Split	NA	NA
Protected Phases	5	2	1	6	6	8	8	8	1	4	4	4
Permitted Phases	2											
Actuated Green, G (s)	55.7	50.9	77.9	66.1	30.1	30.1	30.1	30.1	57.1	31.0	31.0	31.0
Effective Green, g (s)	55.7	50.9	77.9	66.1	30.1	30.1	30.1	30.1	57.1	31.0	31.0	31.0
Actuated g/C Ratio	0.35	0.32	0.49	0.41	0.19	0.19	0.19	0.19	0.36	0.19	0.19	0.19
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	1073	311	1450	c0.11	c0.35	0.17	c0.17	0.14	0.04	c0.18	c0.18
v/s Ratio Prot	0.01	0.24										
v/s Ratio Perm	0.13		c0.32									
v/c Ratio	0.42	0.76	0.87	0.85	0.91	0.91	0.91	0.91	0.38	0.22	0.94	0.94
Uniform Delay, d1	38.1	49.0	34.4	42.4	63.6	63.6	63.6	63.6	38.3	54.3	63.6	63.6
Progression Factor	1.00	1.00	1.17	0.73	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	5.0	22.7	6.3	27.7	27.5	27.7	27.5	0.4	0.3	33.2	33.2
Delay (s)	40.8	54.1	63.0	37.3	91.2	91.1	91.2	91.1	38.7	54.7	96.8	96.8
Level of Service	D	D	E	D	F	F	F	F	D	D	F	F
Approach Delay (s)	53.4		41.9						69.7		89.0	
Approach LOS	D		D						E		F	
Intersection Summary												
HCM 2000 Control Delay			57.0									E
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			160.0									28.0
Intersection Capacity Utilization			92.2%									F
Analysis Period (min)			15									
c Critical Lane Group												

APPENDIX D

Appendix D - Background Capacity Analysis



HCM Unsignalized Intersection Capacity Analysis

1. Pleasant St & Parking Lot/Church Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	→	→	→	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	1	0	1	0	0	0	4	27	48	8	48	1
Future Volume (Veh/h)	1	0	1	0	0	0	4	27	48	8	48	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	1	0	0	0	4	29	52	9	52	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked												
VC, conflicting volume	134	160	52	134	134	55	53					81
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol	134	160	52	134	134	55	53					81
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	100	100	100	100	100	100	100					99
CM capacity (veh/h)	833	726	1015	831	750	1012	1553					1517
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	2	85	62									
Volume Left	1	4	9									
Volume Right	1	52	1									
cSH	915	1553	1517									
Volume to Capacity	0.00	0.00	0.01									
Queue Length 95th (ft)	0	0	0									
Control Delay (s)	8.9	0.4	1.1									
Lane LOS	A	A	A									
Approach Delay (s)	8.9	0.4	1.1									
Approach LOS	A											
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			15.5%									A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2. Lawyers Rd & Church Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	→	→	→	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	17	22	22	24	1	74	8	342	77	301	411	7
Future Volume (Veh/h)	17	22	22	24	1	74	8	342	77	301	411	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	24	24	26	1	80	9	372	84	327	447	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked	0.84	0.84	0.84	0.84	0.84	0.84						0.84
VC, conflicting volume	1578	1579	452	1546	1541	415	455					456
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol	1594	1594	452	1555	1549	207	455					256
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	63	61	96	35	98	89	99					70
CM capacity (veh/h)	49	62	601	40	67	696	1106					1098
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	66	107	465	327	455							
Volume Left	18	26	9	327	0							
Volume Right	24	80	84	0	8							
cSH	88	162	1106	1098	1700							
Volume to Capacity	0.75	0.66	0.01	0.30	0.27							
Queue Length 95th (ft)	95	95	1	31	0							
Control Delay (s)	112.9	57.7	0.3	9.7	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	112.9	57.7	0.3	4.0								
Approach LOS	F	F										
Intersection Summary												
Average Delay			11.9									
Intersection Capacity Utilization			64.1%									C
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

3. Pleasant St & Rt 123/Maple Avenue

Background AM Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	1236	52	14	656	29	4	2	15	7	9	39
Future Volume (Veh/h)	51	1236	52	14	656	29	4	2	15	7	9	39
Sign Control	Free	Free		Free	Free		Stop	Stop		Stop	Stop	
Grade	-2%	-2%		4%	4%		4%	4%		-2%	-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	1343	57	15	713	32	4	2	16	8	10	42
Pedestrians				2	2		10	10		8	8	
Lane Width (ft)				9.7	9.7		16.0	16.0		15.0	15.0	
Walking Speed (ft/s)				4.0	4.0		4.0	4.0		4.0	4.0	
Percent Blockage				0	0							
Right turn flare (veh)								1			1	
Median type	TWLTL											
Median storage (veh)	2	2		2	2							
Upstream signal (ft)	254	254		747	747							
pX platoon unblocked	0.87						0.87	0.87		0.87	0.87	0.87
VC, conflicting volume	753	1410					1925	2274	712	1568	2287	380
VC1, stage 1 conf vol							1492	1492		767	767	
VC2, stage 2 conf vol							434	783		800	1520	
VCu, unblocked vol	407	1410					1759	2163	712	1347	2177	0
IC, single (s)	4.1	4.1					7.5	6.5	6.9	7.5	6.5	6.9
IC, 2 stage (s)							6.5	5.5		6.5	5.5	
IF (s)	2.2	2.2					3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94	97					97	99	96	97	93	95
CM capacity (veh/h)	987	474					116	157	370	254	143	932
Direction, Lane #	EB.1	EB.2	EB.3	WB.1	WB.2	WB.3	NB.1	SB.1				
Volume Total	55	895	505	15	475	270	22	60				
Volume Left	55	0	0	15	0	0	4	8				
Volume Right	0	0	57	0	0	32	16	42				
cSH	987	1700	1700	474	1700	1700	244	410				
Volume to Capacity	0.06	0.53	0.30	0.03	0.28	0.16	0.09	0.15				
Queue Length 95th (ft)	4	0	0	2	0	0	7	13				
Control Delay (s)	8.9	0.0	0.0	12.8	0.0	0.0	21.2	15.3				
Lane LOS	A			B			C	C				
Approach Delay (s)	0.3			0.3			21.2	15.3				
Approach LOS				C			C	C				
Intersection Summary												
Average Delay	0.9											
Intersection Capacity Utilization	53.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

Queues

4. Courthouse Rd/Lawyers Rd & Maple Avenue

Background AM Conditions

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	89	1225	30	741	55	331	168	330
v/c Ratio	0.62	0.79	0.27	0.57	0.51	0.91	0.82	0.65
Control Delay	102.7	18.3	68.3	33.4	79.4	80.7	89.2	49.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	102.7	18.3	68.3	33.4	79.4	80.7	89.2	49.1
Queue Length 50th (ft)	85	293	26	274	49	284	150	255
Queue Length 95th (ft)	145	#696	61	350	96	#447	#259	365
Internal Link Dist (ft)	667							
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	167	1541	110	1309	122	390	222	517
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.79	0.27	0.57	0.45	0.85	0.76	0.64
Intersection Summary								
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis 4: Courthouse Rd/Lawyers Rd & Maple Avenue

Background AM Conditions													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT	SBT
Lane Configurations	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗	↖↗
Traffic Volume (vph)	82	1099	28	28	569	113	51	232	73	155	226	77	77
Future Volume (vph)	82	1099	28	28	569	113	51	232	73	155	226	77	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12	12
Grade (%)	0%	0%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	5.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.96	1.00	0.96	1.00	0.96	1.00
Frbp. Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	0.95
Satd. Flow (prot)	1562	3196	1546	3103	1711	1729	1711	1729	1636	1768	1768	1768	1768
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95
Satd. Flow (perm)	1562	3196	1546	3103	1711	1729	1711	1729	1636	1768	1768	1768	1768
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	0.92
Adj. Flow (vph)	89	1195	30	30	618	123	55	252	79	168	246	84	84
RTOR Reduction (vph)	0	1	0	0	11	0	0	8	0	0	9	0	0
Lane Group Flow (vph)	89	1224	0	30	730	0	55	323	0	168	321	0	0
Confl. Peds. (#/hr)	6	6	6	6	6	6	6	6	6	6	6	6	6
Heavy Vehicles (%)	4%	5%	2%	4%	4%	5%	2%	2%	2%	3%	3%	3%	3%
Turn Type	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA	NA
Protected Phases	5	2	1	6	3	8	7	4	7	4	7	4	4
Permitted Phases	12.9	64.5	6.0	57.6	7.7	30.0	17.5	39.8	17.5	39.8	17.5	39.8	39.8
Actuated Green, G (s)	12.9	64.5	6.0	57.6	7.7	30.0	17.5	39.8	17.5	39.8	17.5	39.8	39.8
Effective Green, g (s)	0.09	0.46	0.04	0.41	0.06	0.21	0.12	0.28	0.12	0.28	0.12	0.28	0.28
Actuated g/C Ratio	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	6.0
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	143	1472	66	1276	94	370	204	502	204	502	204	502	502
Lane Grp Cap (vph)	c0.06	c0.38	0.02	0.24	0.03	c0.19	c0.10	0.18	c0.10	0.18	c0.10	0.18	0.18
v/s Ratio Prot	0.62	0.83	0.45	0.57	0.59	0.87	0.82	0.64	0.82	0.64	0.82	0.64	0.64
v/s Ratio Perm	61.2	33.0	65.4	31.7	64.6	53.2	59.7	43.8	59.7	43.8	59.7	43.8	43.8
Uniform Delay, d1	1.39	0.41	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	7.7	5.3	4.9	1.9	9.0	19.7	22.8	2.8	22.8	2.8	22.8	2.8	2.8
Incremental Delay, d2	93.1	18.8	70.3	33.6	73.6	72.9	82.5	46.6	82.5	46.6	82.5	46.6	46.6
Delay (s)	F	B	E	C	E	E	F	D	F	D	F	D	D
Level of Service	23.8	35.0	73.0	73.0	73.0	73.0	58.7	58.7	58.7	58.7	58.7	58.7	58.7
Approach Delay (s)	C	D	E	E	E	E	E	E	E	E	E	E	E
Approach LOS	C	D	E	E	E	E	E	E	E	E	E	E	E
Intersection Summary													
HCM 2000 Control Delay	39.0 HCM 2000 Level of Service												
HCM 2000 Volume to Capacity ratio	0.84												
Actuated Cycle Length (s)	140.0 Sum of lost time (s)												
Intersection Capacity Utilization	83.3% ICU Level of Service												
Analysis Period (min)	15												
Critical Lane Group													

Queues 9: Nutley Street & Maple Avenue

Background AM Conditions									
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	13	1309	196	573	167	172	300	79	332
v/c Ratio	0.03	0.95	0.88	0.33	0.74	0.73	0.58	0.25	1.02
Control Delay	16.9	56.8	90.7	11.6	77.1	75.9	18.7	52.8	111.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	56.8	90.7	11.6	77.1	75.9	18.7	52.8	111.0
Queue Length 50th (ft)	5	608	147	72	153	157	72	63	~326
Queue Length 95th (ft)	17	#770	#299	92	237	242	164	114	#525
Internal Link Dist (ft)		206		1528		575		583	
Turn Bay Length (ft)	60		285		215				
Base Capacity (vph)	392	1372	224	1758	264	274	539	310	325
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	0.03	0.95	0.88	0.33	0.63	0.63	0.56	0.25	1.02
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.									

HCM Signalized Intersection Capacity Analysis 9. Nutley Street & Maple Avenue

Movement	Background AM Conditions										
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	1	4	4	1	4	4	1	4	4	1	4
Traffic Volume (veh/h)	12	1093	111	180	489	38	192	120	276	73	289
Future Volume (vph)	12	1093	111	180	489	38	192	120	276	73	289
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	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	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.99
Satd. Flow (prot)	1764	3481	1770	3492	1681	1748	1569	1770	1846		
Flt Permitted	0.44	1.00	0.06	1.00	0.95	0.99	1.00	0.95	1.00		
Satd. Flow (perm)	811	3481	120	3492	1681	1748	1569	1770	1846		
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
Adj. Flow (vph)	13	1188	121	196	532	41	209	130	300	79	314
RTOR Reduction (vph)	0	5	0	0	4	0	0	0	151	0	2
Lane Group Flow (vph)	13	1304	0	196	569	0	167	172	149	79	330
Confl. Peds. (#/hr)	6	3	3	3	6	1	2	2	2	2	1
Turn Type	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA		
Permitted Phases	5	2	1	6	8	8	1	4	4		
Prohibited Phases	2		6				8				
Actuated Green, G (s)	57.3	54.9	75.5	66.1	18.9	18.9	32.5	24.6	24.6		
Effective Green, g (s)	57.3	54.9	75.5	66.1	18.9	18.9	32.5	24.6	24.6		
Actuated g/C Ratio	0.41	0.39	0.54	0.47	0.13	0.13	0.23	0.18	0.18		
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	348	1365	225	1648	226	235	442	311	324		
v/s Ratio Prot	0.00	c0.37	c0.08	0.16	c0.10	0.10	0.03	0.04	c0.18		
v/s Ratio Perm	0.01	0.38	0.07	0.35	0.74	0.73	0.34	0.25	1.02		
v/c Ratio	0.04	0.95	0.87	0.35	0.74	0.73	0.34	0.25	1.02		
Uniform Delay, d1	24.6	41.3	41.8	23.3	58.2	58.1	44.8	49.8	57.7		
Progression Factor	1.00	1.00	1.75	0.50	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.0	15.7	28.4	0.6	11.9	11.1	0.5	0.4	55.1		
Delay (s)	24.7	57.1	101.4	12.3	70.1	69.3	45.2	50.2	112.8		
Level of Service	C	E	F	B	E	E	D	D	F		
Approach Delay (s)		56.8		35.0		58.2			100.8		
Approach LOS		E		D		E			F		
Intersection Summary											
HCM 2000 Control Delay	57.5										
HCM 2000 Volume to Capacity ratio	0.92										
Actuated Cycle Length (s)	140.0										
Intersection Capacity Utilization	92.5%										
Analysis Period (min)	15										
c Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis 1. Pleasant St & Parking Lot/Church Street

Movement	Background PM Conditions										
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	2	1	4	0	0	0	5	69	16	11	16
Traffic Volume (veh/h)	2	1	4	0	0	0	5	69	16	11	16
Future Volume (Veh/h)	2	1	4	0	0	0	5	69	16	11	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	1	4	0	0	0	5	75	17	12	17
Pedestrians											
Lane Width (ft)											
Walking Speed (ft/s)											
Percent Blockage											
Right turn flare (veh)											
Median type											
Median storage (veh)											
Upstream signal (ft)											
pK platoon unblocked											
VC, conflicting volume	135	144	18	140	136	84	18			92	
VC1, stage 1 conf vol											
VC2, stage 2 conf vol											
IC, unblocked vol	135	144	18	140	136	84	18			92	
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1	
IC, 2 stage (s)											
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2	
p0 queue free %	100	100	100	100	100	100	100			99	
CM capacity (veh/h)	829	739	1061	820	747	976	1599			1503	
Direction, Lane #	EB 1	NB 1	SB 1								
Volume Total	7	97	30								
Volume Left	2	5	12								
Volume Right	4	17	1								
CSH	929	1599	1503								
Volume to Capacity	0.01	0.00	0.01								
Queue Length 95th (ft)	1	0	1								
Control Delay (s)	8.9	0.4	3.0								
Lane LOS	A	A	A								
Approach Delay (s)	8.9	0.4	3.0								
Approach LOS	A										
Intersection Summary											
Average Delay	1.4										
Intersection Capacity Utilization	15.4%										
ICU Level of Service	A										
Analysis Period (min)	15										

HCM Unsignalized Intersection Capacity Analysis

2: Lawyers Rd & Church Street

Background PM Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	42	15	50	124	8	245	7	375	75	140	392	12
Traffic Volume (veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Future Volume (Veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Sign Control	Stop	0%	0%	Stop	0%	0%	Free	0%	0%	Free	0%	0%
Grade	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	46	16	54	135	9	266	8	408	82	152	426	13
Hourly flow rate (vph)	46	16	54	135	9	266	8	408	82	152	426	13
Pedestrians				2							6	
Lane Width (ft)				12.0							12.0	
Walking Speed (ft/s)				4.0							4.0	
Percent Blockage				0							1	
Right turn flare (veh)		3				2						
Median type							None				None	
Median storage (veh)								367				
Upstream signal (ft)												
pX platoon unblocked	0.82	0.82	0.82	0.82	0.82	0.82				0.82		
VC, conflicting volume	1345	1244	432	1205	1210	457	439			482		
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1311	1189	432	1141	1147	229	439			272		
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
IC, 2 stage (s)												
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
IF (s)	17	88	91	0	94	60	99			86		
p0 capacity (veh/h)	56	131	623	107	139	660	1121			1058		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	116	410	498	152	439							
Volume Left	46	135	8	152	0							
Volume Right	54	266	82	0	13							
cSH	133	249	1121	1058	1700							
Volume to Capacity	0.87	1.65	0.01	0.14	0.26							
Queue Length 95th (ft)	140	650	1	13	0							
Control Delay (s)	109.5	343.0	0.2	9.0	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	109.5	343.0	0.2	2.3								
Approach LOS	F	F										
Intersection Summary												
Average Delay				95.9								
Intersection Capacity Utilization				70.0%								
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis

3: Pleasant St & Rt 123/Maple Avenue

Background PM Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	43	1002	58	45	1408	56	9	6	17	6	14	37
Traffic Volume (veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Future Volume (Veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Sign Control	Free	-2%	Free	Free	4%	4%	4%	4%	4%	4%	4%	4%
Grade	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	47	1089	63	49	1530	61	10	7	18	7	15	40
Hourly flow rate (vph)	47	1089	63	49	1530	61	10	7	18	7	15	40
Pedestrians				2							8	
Lane Width (ft)				9.7							15.0	
Walking Speed (ft/s)				4.0							4.0	
Percent Blockage				0							1	
Right turn flare (veh)												
Median type												
Median storage (veh)		2										
Upstream signal (ft)		254										
pX platoon unblocked	0.59											
VC, conflicting volume	1599			1162								
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	617			1162								
IC, single (s)	4.1			4.1								
IC, 2 stage (s)												
p0 queue free %	2.2			2.2								
IF (s)	92			92								
p0 capacity (veh/h)	567			602								
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	47	726	426	49	1020	571	35	62				
Volume Left	47	0	0	49	0	0	10	7				
Volume Right	0	63	0	0	0	61	18	40				
cSH	567	1700	1700	602	1700	1700	223	282				
Volume to Capacity	0.08	0.43	0.25	0.08	0.08	0.34	0.16	0.22				
Queue Length 95th (ft)	7	0	0	7	0	0	14	21				
Control Delay (s)	11.9	0.0	0.0	11.5	0.0	0.0	24.1	21.4				
Lane LOS	B			B			C	C				
Approach Delay (s)	0.5			0.3			24.1	21.4				
Approach LOS							C	C				
Intersection Summary												
Average Delay				1.1								
Intersection Capacity Utilization				51.9%								
Analysis Period (min)				15								

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Background PM Conditions

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	136	942	55	1513	92	354	188	377
v/c Ratio	0.93	0.62	0.52	1.10	0.75	0.94	0.93	0.80
Control Delay	137.2	21.3	103.0	96.5	106.8	94.2	115.6	66.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.2	21.3	103.0	96.5	106.8	94.2	115.6	66.1
Queue Length 50th (ft)	148	222	56	~951	96	361	198	353
Queue Length 95th (ft)	#300	283	111	#1088	#186	#554	#355	486
Internal Link Dist (ft)	667			792		621		287
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	146	1517	115	1371	128	388	204	478
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.62	0.48	1.10	0.72	0.91	0.92	0.79
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.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Background PM Conditions

Movement	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↗	↖	↗		↖	↗	↖
Traffic Volume (vph)	125	808	59	51	1287	105	85	280	46	173
Future Volume (vph)	125	808	59	51	1287	105	85	280	46	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	12	10	12
Grade (%)	0%	0%		2%			0%			0%
Total Lost time (s)	5.0	6.0	5.0	6.0	5.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.99	1.00	0.99	1.00	0.98		1.00	0.94	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1562	3177	1546	3159	1711	1758		1636	1733	
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1562	3177	1546	3159	1711	1758		1636	1733	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		0.92	0.92	
Adj. Flow (vph)	136	878	64	55	1399	114		92	304	
RTOR Reduction (vph)	0	3	0	0	4	0		0	0	
Lane Group Flow (vph)	136	939	0	55	1509	0		92	350	
Confl. Peds. (#/hr)		6			5			3		
Heavy Vehicles (%)	4%	5%	0%	4%	5%	2%		2%	3%	3%
Turn Type	Prot	NA	Prot	NA	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6	3		8	7	4
Permitted Phases										
Actuated Green, G (s)	15.1	75.3	9.0	69.2	11.4	33.9		19.8	42.3	
Effective Green, g (s)	15.1	75.3	9.0	69.2	11.4	33.9		19.8	42.3	
Actuated g/C Ratio	0.09	0.47	0.06	0.43	0.07	0.21		0.12	0.26	
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	147	1495	86	1366	121	372		202	458	
v/s Ratio Prot	c0.09	0.30	0.04	c0.48	0.05	c0.20		c0.11	0.21	
v/s Ratio Perm										
v/c Ratio	0.93	0.63	0.64	1.10	0.76	0.94		0.93	0.79	
Uniform Delay, d1	71.9	31.8	73.9	45.4	73.0	62.1		69.4	54.8	
Progression Factor	1.20	0.60	1.19	0.91	1.00	1.00		1.00	1.00	
Incremental Delay, d2	49.8	1.9	14.5	58.3	24.1	31.8		44.0	9.2	
Delay (s)	135.8	21.0	102.5	99.4	97.0	93.8		113.5	64.0	
Level of Service	F	C	F	F	F	F		F	E	
Approach Delay (s)		35.5		99.5		94.5			80.5	
Approach LOS		D		F		F			F	
Intersection Summary										
HCM 2000 Control Delay	77.1 HCM 2000 Level of Service									
HCM 2000 Volume to Capacity ratio	1.02									
Actuated Cycle Length (s)	160.0									
Intersection Capacity Utilization	92.8%									
Analysis Period (min)	15									
Critical Lane Group										

Queues

9. Nutley Street & Maple Avenue

Background PM Conditions

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group									
Lane Group Flow (vph)	45	830	272	1230	286	298	403	76	336
v/c Ratio	0.38	0.76	0.87	0.83	0.91	0.91	0.54	0.22	0.94
Control Delay	33.6	53.7	63.8	36.7	94.3	93.8	13.1	56.2	97.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	53.7	63.8	36.7	94.3	93.8	13.1	56.2	97.1
Queue Length 50th (ft)	25	409	168	593	309	323	82	68	348
Queue Length 95th (ft)	49	493	#335	737	#486	#503	187	120	#546
Internal Link Dist (ft)	206			1528		575			583
Turn Bay Length (ft)	60	285			215				
Base Capacity (vph)	120	1094	320	1492	325	338	757	347	361
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	0.38	0.76	0.85	0.82	0.88	0.88	0.53	0.22	0.93
Intersection Summary									
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.									

HCM Signalized Intersection Capacity Analysis

9. Nutley Street & Maple Avenue

Background PM Conditions

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT
Traffic Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Future Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	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	1.00	1.00	1.00
Fr	1.00	0.97	1.00	0.99	1.00	0.99	1.00	1.00	0.85	1.00	0.98	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3374	1770	3512	1770	3512	1681	1747	1583	1770	1822	1822
Flt Permitted	0.09	1.00	0.13	1.00	0.13	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	170	3374	250	3512	250	3512	1681	1747	1583	1770	1822	1822
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)	45	645	185	272	1187	43	362	222	403	76	295	41
RTOR Reduction (vph)	0	16	0	0	2	0	0	0	188	0	3	0
Lane Group Flow (vph)	45	814	0	272	1228	0	286	298	215	76	333	0
Confl. Peds. (#/hr)	17	11	11	17	17	17	8	8	4	4	8	8
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	Split	NA	ph+ov	Split	NA	NA
Protected Phases	5	2	1	6	6	6	8	8	8	1	4	4
Permitted Phases	2											
Actuated Green, G (s)	55.7	50.9	77.9	66.1	77.9	66.1	30.1	30.1	57.1	31.0	31.0	31.0
Effective Green, g (s)	55.7	50.9	77.9	66.1	77.9	66.1	30.1	30.1	57.1	31.0	31.0	31.0
Actuated g/C Ratio	0.35	0.32	0.49	0.41	0.49	0.41	0.19	0.19	0.36	0.19	0.19	0.19
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	1073	311	1450	311	1450	316	328	564	342	353	353
v/s Ratio Prot	0.01	0.24	c0.11	c0.35	c0.11	c0.35	0.17	c0.17	0.14	0.04	c0.18	c0.18
v/s Ratio Perm	0.13		c0.32		c0.32							
v/c Ratio	0.42	0.76	0.87	0.85	0.87	0.85	0.91	0.91	0.38	0.22	0.94	0.94
Uniform Delay, d1	38.1	49.0	34.4	42.4	34.4	42.4	63.6	63.6	38.3	54.3	63.6	63.6
Progression Factor	1.00	1.00	1.17	0.73	1.17	0.73	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	5.0	22.7	6.3	22.7	6.3	27.7	27.5	0.4	0.3	33.2	33.2
Delay (s)	40.8	54.1	63.0	37.3	63.0	37.3	91.2	91.1	38.7	54.7	96.8	96.8
Level of Service	D	D	E	D	E	D	F	F	D	D	F	F
Approach Delay (s)	53.4		41.9		41.9		69.7		89.0			
Approach LOS	D		D		D		E		F			
Intersection Summary												
HCM 2000 Control Delay			57.0				HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			160.0				Sum of lost time (s)		28.0			
Intersection Capacity Utilization			92.2%				ICU Level of Service		F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

1: Pleasant St & Parking Lot/Church Street

Traffic Signal Timing Diagram												
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↔	↔						↔	↔	↔	↔	↔
Traffic Volume (veh/h)	1	0	1	0	0	0	4	27	48	8	48	1
Future Volume (veh/h)	1	0	1	0	0	0	4	27	48	8	48	1
ISign Control	Stop			Stop			Free	Free		Free		
Grade	0%			0%			2%	2%		-2%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	1	0	0	0	4	29	52	9	52	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)								None			None	
Median type												
Median storage (veh)												
Upstream signal (ft)												
Box, platoon unblocked												
Box, conflicting volume												
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VC, unblocked vol	134	160	52	134	134	55	53			81		
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
po queue free %	100	100	100	100	100	100	100			99		
gW capacity (veh/h)	833	726	1015	831	750	1012	1553			1517		
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	2	85	62									
Volume Left	1	4	9									
Volume Right	1	52	1									
ESH	915	1553	1517									
Volume to Capacity	0.00	0.00	0.01									
Queue Length 95th (ft)	0	0	0									
Control Delay (s)	8.9	0.4	1.1									
Lane LOS	A	A	A									
Approach Delay (s)	8.9	0.4	1.1									
Approach LOS	A											
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			15.5%									
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Lawyers Rd & Church Street

									SBL	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	NBR	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (veh/h)	17	22	22	24	1	74	8	342	77	301	411	7	7
Future Volume (Vel/h)	17	22	22	24	1	74	8	342	77	301	411	7	7
Sign Control	Stop	Stop	Stop	Stop	0%	0%	0%	Free	Free	Free	Free	0%	0%
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	24	24	26	1	80	9	372	84	327	447	8	8
Pedestrians								1				1	
Lane Width (ft)								12.0				12.0	
Lane Length (ft)								4.0				4.0	
Percent Blockage								0				0	
Right turn flare (veh)			3			2		None				None	
Median type								None				None	
Median storage (vet)								367					
Upstream signal (ft)													
pX platoon unblocked	0.83	0.83		0.83	0.83	0.83			0.83				
CVC, conflicting volume	1578	1579	452	1546	1541	415	455		456				
VCI, stage 1 conf vol													
VCI, stage 2 conf vol													
VCU, unblocked vol	1595	1596	452	1556	1550	188	455		238				
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1		4.1				
IC, 2 stage (s)													
JF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2		2.2				
pQ queue free %	62	60	96	33	98	89	99		70				
cM capacity (veh/h)	48	61	601	39	66	703	1106		1099				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2								
Volume Total	66	107	465	327	455								
Volume Left	18	26	9	327	0								
Volume Right	24	80	84	0	8								
cSH	87	150	1106	1099	1700								
Volume to Capacity	0.76	0.71	0.01	0.30	0.27								
Queue Length 95th (ft)	96	105	1	31	0								
Control Delay (s)	116.1	73.4	0.3	9.7	0.0								
Lane LOS	F	F	A	A									
Approach Delay (s)	116.1	73.4	0.3	4.0									
Approach LOS	F	F											
Intersection Summary													
Average Delay				13.2									
Intersection Capacity Utilization				64.1%									
Analysis Period (min)				15									

HCM Unsignalized Intersection Capacity Analysis

3. Pleasant St & Rt 123/Maple Avenue

Background AM Conditions Improvement #1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (veh/h)	51	1236	52	14	656	29	4	2	15	7	9	39
Future Volume (Veh/h)	51	1236	52	14	656	29	4	2	15	7	9	39
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	-2%	-2%	-2%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	1343	57	15	713	32	4	2	16	8	10	42
Pedestrians							2	10	10	8	8	8
Lane Width (ft)							9.7	16.0	16.0	15.0	15.0	15.0
Walking Speed (ft/s)							4.0	4.0	4.0	4.0	4.0	4.0
Percent Blockage							0	1	1	1	1	1
Right turn flare (veh)												
Median type	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT	TWLT
Median storage (veh)	2	2	2	2	2	2	2	2	2	2	2	2
Upstream signal (ft)	254	254	254	747	747	747	747	747	747	747	747	747
pX platoon unblocked	0.88						0.88	0.88	0.88	0.88	0.88	0.88
VC, conflicting volume	753			1410			1925	2274	712	1568	2287	380
VC1, stage 1 conf vol							1492	1492		767	767	
VC2, stage 2 conf vol							434	783		800	1520	
VCu, unblocked vol	432			1410			1771	2171	712	1363	2185	6
IC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
IC, 2 stage (s)							6.5	5.5	3.3	3.5	4.0	3.3
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			97			97	99	96	97	93	95
CM capacity (veh/h)	975			474			116	157	370	252	143	932
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	55	895	505	15	475	270	22	60				
Volume Left	55	0	0	15	0	0	4	8				
Volume Right	0	0	57	0	0	32	16	42				
cSH	975	1700	1700	474	1700	1700	243	409				
Volume to Capacity	0.06	0.53	0.30	0.03	0.28	0.16	0.09	0.15				
Queue Length 95th (ft)	4	0	0	2	0	0	7	13				
Control Delay (s)	8.9	0.0	0.0	12.8	0.0	0.0	21.3	15.3				
Lane LOS	A	A	B	B	C	C	C	C				
Approach Delay (s)	0.3			0.3			21.3	15.3				
Approach LOS	C			C			C	C				
Intersection Summary												
Average Delay	0.9											
Intersection Capacity Utilization	53.0%											
Analysis Period (min)	15											

Queues

4. Courthouse Rd/Lawyers Rd & Maple Avenue

Background AM Conditions Improvement #1

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	88	1225	30	741	55	331	168	330
v/c Ratio	0.29	0.79	0.16	0.53	0.51	0.92	0.84	0.66
Control Delay	8.8	19.2	16.9	29.6	79.4	83.0	93.3	50.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.8	19.2	16.9	29.6	79.4	83.0	93.3	50.6
Queue Length 50th (ft)	13	454	12	255	49	286	151	260
Queue Length 95th (ft)	27	687	29	318	96	#459	#270	372
Internal Link Dist (ft)		667		792		621		287
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	309	1560	192	1392	122	378	210	501
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.79	0.16	0.53	0.45	0.88	0.80	0.66
Intersection Summary								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Background AM Conditions Improvement #1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	82	1099	28	28	569	113	51	232	73	155	226	77
Future Volume (vph)	82	1099	28	28	569	113	51	232	73	155	226	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)	0%	0%	2%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.96	1.00	0.96	1.00	0.96
Frbp. ped/bikes	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Frbp. ped/bikes	1562	3196	1546	3103	1711	1729	1636	1768	1636	1768	1636	1768
Satd. Flow (prot)	0.26	1.00	0.11	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Flt Permitted	424	3196	180	3103	1711	1729	1636	1768	1636	1768	1636	1768
Satd. Flow (perm)	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak-hour factor, PHF	89	1195	30	618	123	55	252	79	168	246	84	84
Adj. Flow (vph)	0	1	0	0	12	0	0	8	0	0	9	0
RTOR Reduction (vph)	89	1224	0	30	729	0	55	323	0	168	321	0
Lane Group Flow (vph)	6	6	6	6	6	5	3	3	3	3	3	3
Confl. Peds. (#/hr)	4%	5%	2%	4%	4%	5%	2%	2%	2%	3%	3%	3%
Heavy Vehicles (%)	pm+pt	NA	pm+pt	NA	NA	Prot	NA	NA	Prot	NA	NA	NA
Turn Type	5	2	1	6	3	8	7	4	7	4	7	4
Protected Phases	2	6	6	6	6	6	6	6	6	6	6	6
Permitted Phases	75.3	65.3	67.3	61.3	7.7	29.6	17.1	39.0	17.1	39.0	17.1	39.0
Actuated Green, G (s)	75.3	65.3	67.3	61.3	7.7	29.6	17.1	39.0	17.1	39.0	17.1	39.0
Effective Green, g (s)	0.54	0.47	0.48	0.44	0.06	0.21	0.12	0.28	0.12	0.28	0.12	0.28
Actuated g/C Ratio	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	309	1490	145	1358	94	365	199	492	199	492	199	492
Lane Grp Cap (vph)	c0.02	c0.38	0.01	0.24	0.03	c0.19	c0.10	0.18	c0.10	0.18	c0.10	0.18
v/s Ratio Prot	0.13	0.09	0.09	0.09	0.59	0.89	0.84	0.65	0.84	0.65	0.84	0.65
v/s Ratio Perm	0.29	0.82	0.21	0.54	0.59	0.89	0.84	0.65	0.84	0.65	0.84	0.65
w/c Ratio	17.5	32.3	23.1	28.9	64.6	53.6	60.1	44.5	60.1	44.5	60.1	44.5
Uniform Delay, d1	0.43	0.47	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	0.5	4.9	0.7	1.5	9.0	21.7	26.5	3.1	26.5	3.1	26.5	3.1
Incremental Delay, d2	8.0	20.0	23.9	30.4	73.6	75.2	86.6	47.6	86.6	47.6	86.6	47.6
Delay (s)	A	B	C	C	E	E	F	D	F	D	F	D
Level of Service	19.2	30.2	30.2	75.0	75.0	75.0	60.8	60.8	75.0	60.8	60.8	60.8
Approach Delay (s)	B	B	C	C	E	E	E	E	E	E	E	E
Approach LOS												
Intersection Summary												
HCM 2000 Control Delay	36.3											
HCM 2000 Volume to Capacity ratio	0.82											
Actuated Cycle Length (s)	140.0											
Intersection Capacity Utilization	83.3%											
Analysis Period (min)	15											
Critical Lane Group												

9: Nuttle Street & Maple Avenue

Background AM Conditions Improvement #1

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	
Lane Group Flow (vph)	13	1309	196	573	167	172	300	79	332	→
v/c Ratio	0.03	0.95	0.88	0.33	0.74	0.73	0.58	0.25	1.02	↖
Control Delay	16.9	56.8	90.9	12.5	77.1	75.9	18.7	52.8	111.0	↗
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	↖
Total Delay	16.9	56.8	90.9	12.5	77.1	75.9	18.7	52.8	111.0	↗
Queue Length 50th (ft)	5	608	148	82	153	157	72	63	~336	↖
Queue Length 95th (ft)	17	#770	#299	106	237	242	164	114	#525	↗
Internal Link Dist (ft)		206		1528		575			583	
Turn Bay Length (ft)	60		285		215					
Base Capacity (vph)	392	1372	224	1758	264	274	539	310	325	
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	0.03	0.95	0.88	0.33	0.63	0.63	0.56	0.25	1.02	
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.										

HCM Signalized Intersection Capacity Analysis 9. Nutley Street & Maple Avenue

Background AM Conditions Improvement #1													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1	
Traffic Volume (veh/h)	12	1093	111	180	489	38	192	120	276	73	289	17	
Future Volume (vph)	12	1093	111	180	489	38	192	120	276	73	289	17	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	1.00	0.95	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	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1764	3481	1770	3492	1681	1748	1569	1770	1846				
Flt Permitted	0.44	1.00	0.06	1.00	0.95	0.99	1.00	0.95	1.00				
Satd. Flow (perm)	811	3481	120	3492	1681	1748	1569	1770	1846				
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)	13	1188	121	196	532	41	209	130	300	79	314	18	
RTOR Reduction (vph)	0	5	0	0	4	0	0	0	151	0	2	0	
Lane Group Flow (vph)	13	1304	0	196	569	0	167	172	149	79	330	0	
Confl. Peds. (#/hr)	6	3	3	3	6	1	2	2	2	2	1	1	
Turn Type	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA				
Permitted Phases	5	2	1	6	8	8	1	4	4				
Prohibited Phases	2		6										
Actuated Green, G (s)	57.3	54.9	75.5	66.1	18.9	18.9	32.5	24.6	24.6				
Effective Green, g (s)	57.3	54.9	75.5	66.1	18.9	18.9	32.5	24.6	24.6				
Actuated g/C Ratio	0.41	0.39	0.54	0.47	0.13	0.13	0.23	0.18	0.18				
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0				
Lane Grp Cap (vph)	348	1365	225	1648	226	235	442	311	324				
v/s Ratio Prot	0.00	c0.37	c0.08	0.16	c0.10	0.10	0.03	0.04	c0.18				
v/s Ratio Perm	0.01	0.38	0.07	0.35	0.74	0.73	0.34	0.25	1.02				
v/c Ratio	0.04	0.95	0.87	0.35	0.74	0.73	0.34	0.25	1.02				
Uniform Delay, d1	24.6	41.3	41.8	23.3	58.2	58.1	44.8	49.8	57.7				
Progression Factor	1.00	1.00	1.76	0.55	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.0	15.7	28.4	0.6	11.9	11.1	0.5	0.4	55.1				
Delay (s)	24.7	57.1	101.8	13.3	70.1	69.3	45.2	50.2	112.8				
Level of Service	C	E	F	B	E	E	D	D	F				
Approach Delay (s)	56.8		35.8		58.2				100.8				
Approach LOS	E		D		E				F				
Intersection Summary													
HCM 2000 Control Delay	57.7												
HCM 2000 Volume to Capacity ratio	0.92												
Actuated Cycle Length (s)	140.0												
Intersection Capacity Utilization	92.5%												
Analysis Period (min)	15												
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis 1. Pleasant St & Parking Lot/Church Street

Background PM Conditions Improvement #1													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	2	1	4	0	0	0	5	69	16	11	16	1	
Traffic Volume (veh/h)	2	1	4	0	0	0	5	69	16	11	16	1	
Future Volume (Veh/h)	2	1	4	0	0	0	5	69	16	11	16	1	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
Grade	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%	2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	2	1	4	0	0	0	5	75	17	12	17	1	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type													
Median storage (veh)													
Upstream signal (ft)													
pK platoon unblocked													
VC, conflicting volume	135	144	18	140	136	84	18					92	
VC1, stage 1 conf vol													
VC2, stage 2 conf vol													
VCU, unblocked vol	135	144	18	140	136	84	18					92	
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1	
IC, 2 stage (s)													
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2	
p0 queue free %	100	100	100	100	100	100	100					99	
CM capacity (veh/h)	829	739	1061	820	747	976	1599					1503	
Direction, Lane #	EB 1	NB 1	SB 1										
Volume Total	7	97	30										
Volume Left	2	5	12										
Volume Right	4	17	1										
CSH	929	1599	1503										
Volume to Capacity	0.01	0.00	0.01										
Queue Length 95th (ft)	1	0	1										
Control Delay (s)	8.9	0.4	3.0										
Lane LOS	A	A	A										
Approach Delay (s)	8.9	0.4	3.0										
Approach LOS	A												
Intersection Summary													
Average Delay	1.4												
Intersection Capacity Utilization	15.4%												
Analysis Period (min)	15												
ICU Level of Service	A												

HCM Unsignalized Intersection Capacity Analysis

2: Lawyers Rd & Church Street

Movement	Background PM Conditions Improvement #1											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	42	15	50	124	8	245	7	375	75	140	392	12
Traffic Volume (veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Future Volume (Veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	16	54	135	9	266	8	408	82	152	426	13
Pedestrians				2								6
Lane Width (ft)				12.0								12.0
Walking Speed (ft/s)				4.0								4.0
Percent Blockage				0								1
Right turn flare (veh)		3				2						
Median type								None				None
Median storage (veh)								367				
Upstream signal (ft)												
pX platoon unblocked	0.80	0.80		0.80	0.80	0.80						0.80
VC, conflicting volume	1345	1244	432	1205	1210	457	439					482
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1306	1180	432	1130	1136	192	439					236
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (s)												
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	17	88	91	0	93	60	99					86
CM capacity (veh/h)	55	129	623	105	137	673	1121					1060
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	116	410	498	152	439							
Volume Left	46	135	8	152	0							
Volume Right	54	266	82	0	13							
cSH	132	247	1121	1060	1700							
Volume to Capacity	0.88	1.66	0.01	0.14	0.26							
Queue Length 95th (ft)	142	655	1	13	0							
Control Delay (s)	112.4	348.8	0.2	9.0	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	112.4	348.8	0.2	2.3								
Approach LOS	F	F										
Intersection Summary												
Average Delay	97.5											
Intersection Capacity Utilization	70.0%											
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

3: Pleasant St & Rt 123/Maple Avenue

Movement	Background PM Conditions Improvement #1											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	43	1002	58	45	1408	56	9	6	17	6	14	37
Traffic Volume (veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Future Volume (Veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
Grade	-2%	-2%	-2%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	1089	63	49	1530	61	10	7	18	7	15	40
Pedestrians				2								8
Lane Width (ft)				9.7								15.0
Walking Speed (ft/s)				4.0								4.0
Percent Blockage				0								1
Right turn flare (veh)												
Median type												
Median storage (veh)		2										
Upstream signal (ft)		254										
pX platoon unblocked	0.55											
VC, conflicting volume	1599			1162								
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	465			1162								0
IC, single (s)	4.1			4.1								6.9
IC, 2 stage (s)												
p0 queue free %	2.2			2.2								5.5
p0 queue free %	92			92								3.3
CM capacity (veh/h)	607			602								598
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 1	NB 1	SB 1	SB 1	SB 1
Volume Total	47	726	426	49	1020	571	35	62				
Volume Left	47	0	0	49	0	0	10	7				
Volume Right	0	0	63	0	0	61	18	40				
cSH	607	1700	1700	602	1700	1700	228	286				
Volume to Capacity	0.08	0.43	0.25	0.08	0.60	0.34	0.15	0.22				
Queue Length 95th (ft)	6	0	0	7	0	0	13	20				
Control Delay (s)	11.4	0.0	0.0	11.5	0.0	0.0	23.6	21.0				
Lane LOS	B			B			C	C				
Approach Delay (s)	0.4			0.3			23.6	21.0				
Approach LOS							C	C				
Intersection Summary												
Average Delay	1.1											
Intersection Capacity Utilization	51.9%											
Analysis Period (min)	15											

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue Background PM Conditions Improvement #1

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Group									
Lane Group Flow (vph)	136	942	55	1513	92	354	188	377	
v/c Ratio	0.93	0.58	0.20	0.99	0.87	1.03	0.97	0.85	
Control Delay	105.3	16.5	12.5	59.5	129.5	116.6	125.5	72.1	
Queue Delay	0.0	0.0	0.0	10.6	0.0	0.0	0.0	0.0	
Total Delay	105.3	16.5	12.5	70.1	129.5	116.6	125.5	72.1	
Queue Length 50th (ft)	103	183	15	831	97	~390	199	362	
Queue Length 95th (ft)	#242	233	32	#996	#209	#602	#366	#534	
Internal Link Dist (ft)		667		792		621		287	
Turn Bay Length (ft)	160		145		230		245		
Base Capacity (vph)	147	1611	270	1524	106	344	194	446	
Starvation Cap Reductn	0	0	0	56	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.93	0.58	0.20	1.03	0.87	1.03	0.97	0.85	
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.									

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue Background PM Conditions Improvement #1

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Movement									
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBT
Traffic Volume (vph)	125	808	59	51	1287	105	85	280	46
Future Volume (vph)	125	808	59	51	1287	105	85	280	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	12	11	12	10	12
Grade (%)		0%		2%		0%		0%	
Total Lost time (s)		5.0		6.0		5.0		6.0	
Lane Util. Factor		1.00		0.95		1.00		1.00	
Flpb. ped/bikes		1.00		1.00		1.00		1.00	
Flpb. ped/bikes		1.00		1.00		1.00		1.00	
Flt		1.00		0.99		1.00		0.98	
Flt Protected		0.95		1.00		0.95		1.00	
Satd. Flow (prot)		1562		3177		1711		1758	
Flt Permitted		0.05		1.00		0.95		1.00	
Satd. Flow (perm)		82		3177		1711		1758	
Peak-hour factor, PHF		0.92		0.92		0.92		0.92	
Adj. Flow (vph)		136		878		114		92	
RTOR Reduction (vph)		0		4		0		4	
Lane Group Flow (vph)		136		939		0		92	
Confl. Peds. (#/hr)				6		5		3	
Heavy Vehicles (%)		4%		5%		2%		2%	
Turn Type		pm+pt		NA		Prot		NA	
Protected Phases		5		2		3		8	
Permitted Phases		2		6		3		7	
Actuated Green, G (s)		91.0		80.0		77.0		10.0	
Effective Green, g (s)		91.0		80.0		77.0		10.0	
Actuated g/C Ratio		0.57		0.50		0.53		0.06	
Clearance Time (s)		5.0		6.0		5.0		6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0	
Lane Grp Cap (vph)		148		1588		249		1520	
v/s Ratio Prot		c0.06		0.30		c0.48		0.05	
v/s Ratio Perm		0.46		0.11		0.11		c0.20	
v/c Ratio		0.92		0.59		0.22		0.99	
Uniform Delay, d1		49.0		28.4		19.8		41.2	
Progression Factor		1.34		0.53		0.75		0.94	
Incremental Delay, d2		47.8		1.5		0.4		21.4	
Delay (s)		113.3		16.5		15.4		60.1	
Level of Service		F		B		E		F	
Approach Delay (s)		28.7		58.5		121.3		88.6	
Approach LOS		C		E		F		F	
Intersection Summary									
HCM 2000 Control Delay		62.0		HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio		0.99							
Actuated Cycle Length (s)		160.0		Sum of lost time (s)		22.0			
Intersection Capacity Utilization		92.8%		ICU Level of Service		F			
Analysis Period (min)		15							
c Critical Lane Group									

Queues

9. Nuttle Street & Maple Avenue

Background PM Conditions Improvement #1

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	45	830	272	1230	286	298	403	76	336
v/c Ratio	0.38	0.76	0.87	0.83	0.91	0.91	0.54	0.22	0.94
Control Delay	33.6	53.7	63.8	36.3	94.3	93.8	13.1	56.2	97.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	53.7	63.8	36.3	94.3	93.8	13.1	56.2	97.1
Queue Length 50th (ft)	25	409	171	564	309	323	82	68	348
Queue Length 95th (ft)	49	493	#336	682	#486	#503	187	120	#546
Internal Link Dist (ft)		206		1528		575			583
Turn Bay Length (ft)	60		285		215				
Base Capacity (vph)	120	1094	320	1492	325	338	757	347	361
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	0.38	0.76	0.85	0.82	0.88	0.88	0.53	0.22	0.93
Intersection Summary									
#	95th percentile volume exceeds capacity, queue may be longer.								
	Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

9. Nuttle Street & Maple Avenue

Background PM Conditions Improvement #1

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT
Traffic Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Future Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	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	1.00	1.00	1.00
Fr	1.00	0.97	1.00	0.99	1.00	0.99	1.00	1.00	0.85	1.00	0.98	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3374	1770	3512	1770	3512	1681	1747	1583	1770	1822	1822
Flt Permitted	0.09	1.00	0.13	1.00	0.13	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	170	3374	250	3512	1681	1747	1583	1770	1822	1770	1822	1822
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)	45	645	185	272	1187	43	362	222	403	76	295	41
RTOR Reduction (vph)	0	16	0	0	2	0	0	0	188	0	3	0
Lane Group Flow (vph)	45	814	0	272	1228	0	286	298	215	76	333	0
Confl. Peds. (#/hr)	17	11	11	11	11	17	8	4	4	4	8	8
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	Split	NA	ph+ov	Split	NA	NA
Permitted Phases	5	2	1	6	6	8	8	8	1	4	4	4
Prohibited Phases	2											
Actuated Green, G (s)	55.7	50.9	77.9	66.1	30.1	30.1	30.1	30.1	57.1	31.0	31.0	31.0
Effective Green, g (s)	55.7	50.9	77.9	66.1	30.1	30.1	30.1	30.1	57.1	31.0	31.0	31.0
Actuated g/C Ratio	0.35	0.32	0.49	0.41	0.19	0.19	0.19	0.19	0.36	0.19	0.19	0.19
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	1073	311	1450	c0.11	c0.35	0.17	c0.17	0.14	0.04	c0.18	c0.18
v/s Ratio Prot	0.01	0.24	c0.11	c0.35	c0.32							
v/s Ratio Perm	0.13											
v/c Ratio	0.42	0.76	0.87	0.85	0.91	0.91	0.91	0.91	0.38	0.22	0.94	0.94
Uniform Delay, d1	38.1	49.0	34.4	42.4	63.6	63.6	63.6	63.6	38.3	54.3	63.6	63.6
Progression Factor	1.00	1.00	1.17	0.72	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	5.0	22.7	6.3	27.7	27.5	27.7	27.5	0.4	0.3	33.2	33.2
Delay (s)	40.8	54.1	63.0	36.9	91.2	91.1	91.2	91.1	38.7	54.7	96.8	96.8
Level of Service	D	D	E	D	F	F	F	F	D	D	F	F
Approach Delay (s)	53.4		41.6				69.7				89.0	
Approach LOS	D		D				E				F	
Intersection Summary												
HCM 2000 Control Delay	56.9											
HCM 2000 Volume to Capacity ratio	0.92											
Actuated Cycle Length (s)	160.0											
Intersection Capacity Utilization	92.2%											
Analysis Period (min)	15											
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis

1. Pleasant St & Parking Lot/Church Street

Background AM Conditions Improvement #2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	1	0	0	0	4	27	48	8	48	1
Future Volume (Veh/h)	1	0	1	0	0	0	4	27	48	8	48	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	1	0	0	0	4	29	52	9	52	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked												
VC, conflicting volume	134	160	52	134	134	55	53					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	134	160	52	134	134	55	53					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	100	100	100	100	100	100	100					
CM capacity (veh/h)	833	726	1015	831	750	1012	1553					
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	2	85	62									
Volume Left	1	4	9									
Volume Right	1	52	1									
cSH	915	1553	1517									
Volume to Capacity	0.00	0.00	0.01									
Queue Length 95th (ft)	0	0	0									
Control Delay (s)	8.9	0.4	1.1									
Lane LOS	A	A	A									
Approach Delay (s)	8.9	0.4	1.1									
Approach LOS	A											
Intersection Summary												
Average Delay			0.8									
Intersection Capacity Utilization			15.5%									
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2. Lawyers Rd & Church Street

Background AM Conditions Improvement #2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	22	22	24	1	74	8	342	77	301	411	7
Future Volume (Veh/h)	17	22	22	24	1	74	8	342	77	301	411	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	24	24	26	1	80	9	372	84	327	447	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked	0.83	0.83	0.83	0.83	0.83	0.83						
VC, conflicting volume	1578	1579	452	1546	1541	415	455					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1595	1595	452	1555	1549	193	455					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	62	61	96	33	98	89	99					
CM capacity (veh/h)	48	61	601	39	66	702	1106					
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	66	107	465	327	455							
Volume Left	18	26	9	327	0							
Volume Right	24	80	84	0	8							
cSH	87	151	1106	1099	1700							
Volume to Capacity	0.76	0.71	0.01	0.30	0.27							
Queue Length 95th (ft)	96	104	1	31	0							
Control Delay (s)	115.3	72.6	0.3	9.7	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	115.3	72.6	0.3	4.0								
Approach LOS	F	F										
Intersection Summary												
Average Delay			13.1									
Intersection Capacity Utilization			64.1%									
Analysis Period (min)			15									

3. Pleasant St & Rt 123/Maple Avenue

Background AM Conditions Improvement #2													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Traffic Volume (veh/h)	51	1236	52	14	656	29	4	2	15	7	9	39	
Future Volume (Veh/h)	51	1236	52	14	656	29	4	2	15	7	9	39	
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	
Grade	-2%	-2%	-2%	4%	4%	4%	4%	4%	4%	4%	4%	4%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	55	1343	57	15	713	32	4	2	16	8	10	42	
Pedestrians							2		10			8	
Lane Width (ft)						9.7			16.0			15.0	
Walking Speed (ft/s)						4.0			4.0			4.0	
Percent Blockage						0			1			1	
Right turn flare (veh)													
Median type	TWLT	TL											
Median storage (veh)	2												
Upstream signal (ft)	254												
pX platoon unblocked	0.88												
VC, conflicting volume	753												
VC1, stage 1 conf vol													
VC2, stage 2 conf vol													
VCU, unblocked vol	450												
IC, single (s)	4.1												
IC, 2 stage (s)													
IF (s)	2.2												
p0 queue free %	94												
CM capacity (veh/h)	967												
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3	
Volume Total	55	895	505	15	475	270	22	60					
Volume Left	55	0	0	15	0	0	4	8					
Volume Right	0	0	57	0	0	32	16	42					
cSH	967	1700	1700	474	1700	1700	243	405					
Volume to Capacity	0.06	0.53	0.30	0.03	0.28	0.16	0.09	0.15					
Queue Length 95th (ft)	5	0	0	2	0	0	7	13					
Control Delay (s)	8.9	0.0	0.0	12.8	0.0	0.0	21.3	15.4					
Lane LOS	A	A	B	B	C	C	C	C					
Approach Delay (s)	0.3			0.3			21.3	15.4					
Approach LOS	C			C			C	C					
Intersection Summary													
Average Delay													
Intersection Capacity Utilization													
Analysis Period (min)													

4. Courthouse Rd/Lawyers Rd & Maple Avenue

Background AM Conditions Improvement #2													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Group Flow (vph)	88	1225	30	741	55	331	168	330					
v/c Ratio	0.27	0.76	0.15	0.51	0.23	0.89	0.70	0.66					
Control Delay	7.8	17.3	15.5	27.6	33.0	77.9	49.3	49.9					
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Total Delay	7.8	17.3	15.5	27.6	33.0	77.9	49.3	49.9					
Queue Length 50th (ft)	13	432	12	252	32	281	105	255					
Queue Length 95th (ft)	25	675	27	305	65	#435	#179	365					
Internal Link Dist (ft)		667		792		621		287					
Turn Bay Length (ft)	160		145		230		245						
Base Capacity (vph)	324	1630	203	1461	237	402	241	513					
Starvation Cap Reductn	0	0	0	0	0	0	0	0					
Spillback Cap Reductn	0	0	0	0	0	0	0	0					
Storage Cap Reductn	0	0	0	0	0	0	0	0					
Reduced v/c Ratio	0.27	0.75	0.15	0.51	0.23	0.82	0.70	0.64					
Intersection Summary													
#													
95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.													

HCM Signalized Intersection Capacity Analysis 4: Courthouse Rd/Lawyers Rd & Maple Avenue

Background AM Conditions Improvement #2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	1099	28	28	569	113	51	232	73	155	226	77
Future Volume (vph)	82	1099	28	28	569	113	51	232	73	155	226	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)	0%	0%	2%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	5.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	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	1.00	1.00	0.98	1.00	1.00	0.96	1.00	0.96	1.00	0.96
Frt	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.96	1.00	0.96	1.00	0.96
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1562	3196	1546	3103	1711	1729	1636	1768	1636	1768	1768	1768
Flt Permitted	0.27	1.00	0.12	1.00	0.41	1.00	0.19	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	438	3196	197	3103	746	1729	319	1768	319	1768	1768	1768
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)	89	1195	30	30	618	123	55	252	79	168	246	84
RTOR Reduction (vph)	0	1	0	0	12	0	0	8	0	0	9	0
Lane Group Flow (vph)	89	1224	0	30	729	0	55	323	0	168	321	0
Confl. Peds. (#/hr)	6	6	6	5	5	5	3	3	3	3	3	3
Heavy Vehicles (%)	4%	5%	2%	4%	4%	5%	2%	2%	2%	3%	3%	3%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	5	2	1	6	3	8	7	4	7	4	7	4
Permitted Phases	2	6	6	8	8	8	4	4	4	4	4	4
Actuated Green, G (s)	78.0	68.0	70.0	64.0	35.3	30.4	49.0	39.1	49.0	39.1	49.0	39.1
Effective Green, g (s)	78.0	68.0	70.0	64.0	35.3	30.4	49.0	39.1	49.0	39.1	49.0	39.1
Actuated g/C Ratio	0.56	0.49	0.50	0.46	0.25	0.22	0.35	0.28	0.35	0.28	0.35	0.28
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	324	1552	156	1418	221	375	239	493	239	493	493	493
v/s Ratio Prot	c0.02	c0.38	0.01	0.23	0.01	c0.19	c0.07	0.18	c0.07	0.18	0.18	0.18
v/s Ratio Perm	0.13	0.09	0.09	0.05	0.05	0.18	0.18	0.18	0.18	0.18	0.18	0.18
v/c Ratio	0.27	0.79	0.19	0.51	0.25	0.86	0.70	0.65	0.70	0.65	0.70	0.65
Uniform Delay, d1	16.1	30.0	21.4	27.0	40.7	52.8	35.4	44.5	35.4	44.5	44.5	44.5
Progression Factor	0.41	0.47	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.9	0.6	1.3	0.6	1.80	0.9	3.1	0.9	3.1	3.1	3.1
Delay (s)	7.0	17.9	22.0	28.3	41.3	70.8	44.4	47.5	44.4	47.5	47.5	47.5
Level of Service	A	B	C	C	D	E	D	D	D	D	D	D
Approach Delay (s)	17.2	28.1	66.6	66.6	66.6	66.6	46.5	46.5	46.5	46.5	46.5	46.5
Approach LOS	B	B	C	C	E	E	D	D	D	D	D	D
Intersection Summary												
HCM 2000 Control Delay	31.3											
HCM 2000 Level of Service	C											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	140.0											
Intersection Capacity Utilization	83.3%											
Analysis Period (min)	15											
Critical Lane Group												

Queues 9: Nutley Street & Maple Avenue

Background AM Conditions Improvement #2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	13	1309	196	573	167	172	300	79	332
v/c Ratio	0.03	0.95	0.88	0.33	0.74	0.73	0.58	0.25	1.02
Control Delay	16.9	56.8	86.5	13.0	77.1	75.9	18.7	52.8	111.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	56.8	86.5	13.0	77.1	75.9	18.7	52.8	111.0
Queue Length 50th (ft)	5	608	148	82	153	157	72	63	~326
Queue Length 95th (ft)	17	#770	#299	112	237	242	164	114	#525
Internal Link Dist (ft)	206	206	285	215	575	575	583	583	583
Turn Bay Length (ft)	60	285	285	215	575	575	583	583	583
Base Capacity (vph)	392	1372	224	1758	264	274	539	310	325
Survation 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	0.03	0.95	0.88	0.33	0.63	0.63	0.56	0.25	1.02
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.									

HCM Signalized Intersection Capacity Analysis 9. Nutley Street & Maple Avenue

Background AM Conditions Improvement #2													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1	
Traffic Volume (veh/h)	12	1093	111	180	489	38	192	120	276	73	289	17	
Future Volume (vph)	12	1093	111	180	489	38	192	120	276	73	289	17	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	1.00	0.95	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	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1764	3481	1770	3492	1681	1748	1569	1770	1846				
Flt Permitted	0.44	1.00	0.06	1.00	0.95	0.99	1.00	0.95	1.00				
Satd. Flow (perm)	811	3481	120	3492	1681	1748	1569	1770	1846				
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)	13	1188	121	196	532	41	209	130	300	79	314	18	
RTOR Reduction (vph)	0	5	0	0	4	0	0	0	151	0	2	0	
Lane Group Flow (vph)	13	1304	0	196	569	0	167	172	149	79	330	0	
Confl. Peds. (#/hr)	6	3	3	3	6	1	2	2	2	2	1	1	
Turn Type	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA				
Permitted Phases	5	2	1	6	8	8	1	4	4				
Prohibited Phases	2		6										
Actuated Green, G (s)	57.3	54.9	75.5	66.1	18.9	18.9	32.5	24.6	24.6				
Effective Green, g (s)	57.3	54.9	75.5	66.1	18.9	18.9	32.5	24.6	24.6				
Actuated g/C Ratio	0.41	0.39	0.54	0.47	0.13	0.13	0.23	0.18	0.18				
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	348	1365	225	1648	226	235	442	311	324				
v/s Ratio Prot	0.00	c0.37	c0.08	0.16	c0.10	0.10	0.03	0.04	c0.18				
v/s Ratio Perm	0.01	0.38	0.38	0.35	0.74	0.73	0.34	0.25	1.02				
v/c Ratio	0.04	0.95	0.87	0.35	0.74	0.73	0.34	0.25	1.02				
Uniform Delay, d1	24.6	41.3	41.8	23.3	58.2	58.1	44.8	49.8	57.7				
Progression Factor	1.00	1.00	1.60	0.57	1.00	1.00	1.00	1.00	1.00				
Incremental Delay, d2	0.0	15.7	28.4	0.6	11.9	11.1	0.5	0.4	55.1				
Delay (s)	24.7	57.1	95.3	13.8	70.1	69.3	45.2	50.2	112.8				
Level of Service	C	E	F	B	E	E	D	D	F				
Approach Delay (s)	56.8		34.6		58.2				100.8				
Approach LOS	E		C		E				F				
Intersection Summary													
HCM 2000 Control Delay	57.4												
HCM 2000 Volume to Capacity ratio	0.92												
Actuated Cycle Length (s)	140.0												
Intersection Capacity Utilization	92.5%												
Analysis Period (min)	15												
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis 1. Pleasant St & Parking Lot/Church Street

Background PM Conditions Improvement #2													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	2	1	4	0	0	0	5	69	16	11	16	1	
Traffic Volume (veh/h)	2	1	4	0	0	0	5	69	16	11	16	1	
Future Volume (Veh/h)	2	1	4	0	0	0	5	69	16	11	16	1	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
Grade	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	2%	2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	2	1	4	0	0	0	5	75	17	12	17	1	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type													
Median storage (veh)													
Upstream signal (ft)													
pK platoon unblocked													
VC, conflicting volume	135	144	18	140	136	84	18	92					
VC1, stage 1 conf vol													
VC2, stage 2 conf vol													
VCU, unblocked vol	135	144	18	140	136	84	18	92					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1					
IC, 2 stage (s)													
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2					
p0 queue free %	100	100	100	100	100	100	100	100					
CM capacity (veh/h)	829	739	1061	820	747	976	1599	1503					
Direction, Lane #	EB 1	NB 1	SB 1										
Volume Total	7	97	30										
Volume Left	2	5	12										
Volume Right	4	17	1										
CSH	929	1599	1503										
Volume to Capacity	0.01	0.00	0.01										
Queue Length 95th (ft)	1	0	1										
Control Delay (s)	8.9	0.4	3.0										
Lane LOS	A	A	A										
Approach Delay (s)	8.9	0.4	3.0										
Approach LOS	A												
Intersection Summary													
Average Delay	1.4												
Intersection Capacity Utilization	15.4%												
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis

2: Lawyers Rd & Church Street

Background PM Conditions Improvement #2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	42	15	50	124	8	245	7	375	75	140	392	12
Traffic Volume (veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Future Volume (Veh/h)	42	15	50	124	8	245	7	375	75	140	392	12
Sign Control	Stop	0%	0%	Stop	0%	0%	Free	Free	Free	Free	Free	Free
Grade	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	46	16	54	135	9	266	8	408	82	152	426	13
Hourly flow rate (vph)	46	16	54	135	9	266	8	408	82	152	426	13
Pedestrians					2							6
Lane Width (ft)					12.0							12.0
Walking Speed (ft/s)					4.0							4.0
Percent Blockage					0							1
Right turn flare (veh)			3				2					
Median type								None				None
Median storage (veh)												
Upstream signal (ft)								367				
pX platoon unblocked	0.79	0.79		0.79	0.79	0.79						0.79
VC, conflicting volume	1345	1244	432	1205	1210	457	439					482
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1305	1178	432	1128	1135	186	439					230
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (s)												
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2					2.2
IF (s)	17	88	91	0	93	61	99					86
p0 capacity (veh/h)	55	129	623	105	136	675	1121					1060
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	116	410	498	152	439							
Volume Left	46	135	8	152	0							
Volume Right	54	266	82	0	13							
cSH	132	247	1121	1060	1700							
Volume to Capacity	0.88	1.66	0.01	0.14	0.26							
Queue Length 95th (ft)	142	656	1	12	0							
Control Delay (s)	112.9	349.8	0.2	9.0	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	112.9	349.8	0.2	2.3								
Approach LOS	F	F										
Intersection Summary												
Average Delay	97.8											
Intersection Capacity Utilization	70.0%											
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

3: Pleasant St & Rt 123/Maple Avenue

Background PM Conditions Improvement #2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	43	1002	58	45	1408	56	9	6	17	6	14	37
Traffic Volume (veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Future Volume (Veh/h)	43	1002	58	45	1408	56	9	6	17	6	14	37
Sign Control	Free	-2%	Free	Free	4%	4%	4%	4%	4%	4%	4%	4%
Grade	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	47	1089	63	49	1530	61	10	7	18	7	15	40
Hourly flow rate (vph)	47	1089	63	49	1530	61	10	7	18	7	15	40
Pedestrians					2							8
Lane Width (ft)					9.7							15.0
Walking Speed (ft/s)					4.0							4.0
Percent Blockage					0							1
Right turn flare (veh)												
Median type					TWLT							
Median storage (veh)					2							
Upstream signal (ft)					254							
pX platoon unblocked	0.55											0.55
VC, conflicting volume	1599				1162							804
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	459				1162							2859
IC, single (s)	4.1				4.1							6.9
IC, 2 stage (s)												
p0 queue free %	2.2				2.2							5.5
IF (s)	92				92							3.3
p0 capacity (veh/h)	608				602							93
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	47	726	426	49	1020	571	35	62				
Volume Left	47	0	0	49	0	0	10	7				
Volume Right	0	0	63	0	0	61	18	40				
cSH	608	1700	1700	602	1700	1700	228	287				
Volume to Capacity	0.08	0.43	0.25	0.08	0.60	0.34	0.15	0.22				
Queue Length 95th (ft)	6	0	0	7	0	0	13	20				
Control Delay (s)	11.4	0.0	0.0	11.5	0.0	0.0	23.6	21.0				
Lane LOS	B			B			C	C				
Approach Delay (s)	0.4			0.3			23.6	21.0				
Approach LOS							C	C				
Intersection Summary												
Average Delay	1.1											
Intersection Capacity Utilization	51.9%											
Analysis Period (min)	15											

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue Background PM Conditions Improvement #2

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Group Flow (vph)	136	942	55	1513	92	354	188	377	
v/c Ratio	0.91	0.57	0.20	0.98	0.53	0.97	0.91	0.80	
Control Delay	101.9	15.5	11.8	55.1	52.5	101.1	85.0	66.5	
Queue Delay	0.0	0.0	0.0	9.2	0.0	0.0	0.0	0.0	
Total Delay	101.9	15.5	11.8	64.3	52.5	101.1	85.0	66.5	
Queue Length 50th (ft)	102	179	15	812	68	367	148	356	
Queue Length 95th (ft)	#241	223	31	#974	114	#578	#308	#510	
Internal Link Dist (ft)	667			792		621		287	
Turn Bay Length (ft)	160		145		230		245		
Base Capacity (vph)	150	1641	277	1563	173	366	206	469	
Starvation Cap Reductn	0	0	0	70	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.91	0.57	0.20	1.01	0.53	0.97	0.91	0.80	
Intersection Summary									
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue Background PM Conditions Improvement #2

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBT
Lane Configurations	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBT
Traffic Volume (vph)	125	808	59	51	1287	105	85	280	218
Future Volume (vph)	125	808	59	51	1287	105	85	280	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	12	12
Grade (%)	0%	0%	2%	2%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00
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	0.99	1.00	0.99	1.00	0.98	1.00	0.94	0.94
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1562	3177	1546	3159	1711	1758	1636	1733	1733
Flt Permitted	0.05	1.00	0.22	1.00	0.28	1.00	0.11	1.00	1.00
Satd. Flow (perm)	81	3177	364	3159	500	1758	194	1733	1733
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	878	64	55	1399	114	92	304	237
RTOR Reduction (vph)	0	3	0	0	4	0	0	0	13
Lane Group Flow (vph)	136	939	0	55	1509	0	92	350	0
Confl. Peds. (#/hr)	6	6	5	5	5	3	3	1	1
Heavy Vehicles (%)	4%	5%	0%	4%	5%	2%	2%	3%	3%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	NA
Protected Phases	5	2	1	6	3	8	7	4	4
Permitted Phases	2	6	6	8	8	8	4	4	4
Actuated Green, G (s)	92.7	81.5	86.3	78.3	39.2	32.9	53.5	42.2	42.2
Effective Green, g (s)	92.7	81.5	86.3	78.3	39.2	32.9	53.5	42.2	42.2
Actuated g/C Ratio	0.58	0.51	0.54	0.49	0.25	0.21	0.33	0.26	0.26
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	1618	255	1545	170	361	205	457	457
v/s Ratio Prot	c0.06	0.30	0.01	c0.48	0.02	0.20	c0.09	0.21	0.21
v/s Ratio Perm	0.46		0.11		0.11		c0.22		
v/c Ratio	0.91	0.58	0.22	0.98	0.54	0.97	0.92	0.80	0.80
Uniform Delay, d1	48.9	27.3	19.1	40.0	50.2	63.1	43.6	54.9	54.9
Progression Factor	1.34	0.52	0.75	0.94	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	44.5	1.4	0.4	18.0	3.5	38.8	40.1	9.3	9.3
Delay (s)	110.1	15.6	14.8	55.6	53.7	101.9	83.7	64.2	64.2
Level of Service	F	B	B	E	D	F	F	E	E
Approach Delay (s)		27.5		54.2		91.9		70.7	70.7
Approach LOS		C		D		F		E	E
Intersection Summary									
HCM 2000 Control Delay	53.5 HCM 2000 Level of Service D								
HCM 2000 Volume to Capacity ratio	0.97								
Actuated Cycle Length (s)	160.0 Sum of lost time (s) 22.0								
Intersection Capacity Utilization	92.8% ICU Level of Service F								
Analysis Period (min)	15								
c Critical Lane Group									

Queues

9. Nuttle Street & Maple Avenue Background PM Conditions Improvement #2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	45	830	272	1230	286	298	403	76	336
v/c Ratio	0.38	0.76	0.87	0.83	0.91	0.91	0.54	0.22	0.94
Control Delay	33.6	53.7	63.6	36.2	94.3	93.8	13.1	56.2	97.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	53.7	63.6	36.2	94.3	93.8	13.1	56.2	97.1
Queue Length 50th (ft)	25	409	171	564	309	323	82	68	348
Queue Length 95th (ft)	49	493	#336	675	#486	#503	187	120	#546
Internal Link Dist (ft)		206		1528		575			583
Turn Bay Length (ft)	60		285		215				
Base Capacity (vph)	120	1094	320	1492	325	338	757	347	361
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	0.38	0.76	0.85	0.82	0.88	0.88	0.53	0.22	0.93
Intersection Summary									
#	95th percentile volume exceeds capacity, queue may be longer.								
	Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

9. Nuttle Street & Maple Avenue Background PM Conditions Improvement #2

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBT
Traffic Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Future Volume (vph)	41	593	170	250	1092	40	333	204	371	70	271	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	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	1.00	1.00	1.00
Prt	1.00	0.97	1.00	0.99	1.00	0.99	1.00	1.00	0.85	1.00	0.98	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3374	1770	3512	1770	3512	1681	1747	1583	1770	1822	1822
Flt Permitted	0.09	1.00	0.13	1.00	0.13	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	170	3374	250	3512	1681	1747	1583	1770	1822	1770	1822	1822
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)	45	645	185	272	1187	43	362	222	403	76	295	41
RTOR Reduction (vph)	0	16	0	0	2	0	0	0	188	0	3	0
Lane Group Flow (vph)	45	814	0	272	1228	0	286	298	215	76	333	0
Confl. Peds. (#/hr)	17	11	11	11	11	17	8	4	4	4	4	8
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	Split	NA	ph+ov	Split	NA	NA
Protected Phases	5	2	1	6	6	8	8	8	1	4	4	4
Permitted Phases	2											
Actuated Green, G (s)	55.7	50.9	77.9	66.1	30.1	30.1	30.1	30.1	57.1	31.0	31.0	31.0
Effective Green, g (s)	55.7	50.9	77.9	66.1	30.1	30.1	30.1	30.1	57.1	31.0	31.0	31.0
Actuated g/C Ratio	0.35	0.32	0.49	0.41	0.19	0.19	0.19	0.19	0.36	0.19	0.19	0.19
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	1073	311	1450	c0.11	c0.35	0.17	c0.17	0.14	0.04	c0.18	c0.18
v/s Ratio Prot	0.01	0.24	c0.11	c0.35	c0.32							
v/s Ratio Perm	0.13											
v/c Ratio	0.42	0.76	0.87	0.85	0.91	0.91	0.91	0.91	0.38	0.22	0.94	0.94
Uniform Delay, d1	38.1	49.0	34.4	42.4	63.6	63.6	63.6	63.6	38.3	54.3	63.6	63.6
Progression Factor	1.00	1.00	1.16	0.72	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	5.0	22.7	6.3	27.7	27.5	27.7	27.5	0.4	0.3	33.2	33.2
Delay (s)	40.8	54.1	62.7	36.7	91.2	91.1	91.2	91.1	38.7	54.7	96.8	96.8
Level of Service	D	D	E	D	F	F	F	F	D	D	F	F
Approach Delay (s)	53.4		41.4						69.7		89.0	
Approach LOS	D		D						E		F	
Intersection Summary												
HCM 2000 Control Delay	56.8											
HCM 2000 Volume to Capacity ratio	0.92											
Actuated Cycle Length (s)	160.0											
Intersection Capacity Utilization	92.2%											
Analysis Period (min)	15											
c	Critical Lane Group											

APPENDIX E

Appendix E - Total Future Capacity Analysis



HCM Unsignalized Intersection Capacity Analysis

1: Pleasant St & Parking Lot/Church Street

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	0	1	0	0	0	4	27	25	9	21	1
Future Volume (Veh/h)	1	0	1	0	0	0	4	27	25	9	21	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	1	0	0	0	4	29	27	10	23	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked												
VC, conflicting volume	94	108	24	95	94	42	24					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	94	108	24	95	94	42	24					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	100	100	100	100	100	100	100					
CM capacity (veh/h)	883	776	1053	881	788	1028	1591					
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	2	60	34									
Volume Left	1	4	10									
Volume Right	1	27	1									
cSH	961	1591	1549									
Volume to Capacity	0.00	0.00	0.01									
Queue Length 95th (ft)	0	0	0									
Control Delay (s)	8.8	0.5	2.2									
Lane LOS	A	A	A									
Approach Delay (s)	8.8	0.5	2.2									
Approach LOS	A											
Intersection Summary												
Average Delay			1.3									
Intersection Capacity Utilization			14.2%									
Analysis Period (min)			15									

Marco Polo Site Total Future AM Conditions
Wells + Associates

Synchro 9 Report
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HCM Unsignalized Intersection Capacity Analysis

2: Lawyers Rd & Church Street

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	23	35	24	1	74	8	343	77	301	407	7
Future Volume (Veh/h)	16	23	35	24	1	74	8	343	77	301	407	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	25	38	26	1	80	9	373	84	327	442	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked	0.84	0.84	0.84	0.84	0.84	0.84						
VC, conflicting volume	1574	1575	447	1542	1537	416	450					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1589	1589	447	1551	1544	209	450					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	65	60	94	32	99	88	99					
CM capacity (veh/h)	49	62	605	38	67	695	1110					
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	80	107	466	327	450							
Volume Left	17	26	9	327	0							
Volume Right	38	80	84	0	8							
cSH	108	149	1110	1097	1700							
Volume to Capacity	0.74	0.72	0.01	0.30	0.26							
Queue Length 95th (ft)	100	106	1	31	0							
Control Delay (s)	93.2	74.7	0.2	9.7	0.0							
Lane LOS	F	F	A	A	A							
Approach Delay (s)	93.2	74.7	0.2	4.1								
Approach LOS	F	F										
Intersection Summary												
Average Delay			13.1									
Intersection Capacity Utilization			63.9%									
Analysis Period (min)			15									

Marco Polo Site Total Future AM Conditions
Wells + Associates

Synchro 9 Report
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HCM Unsignalized Intersection Capacity Analysis

3. Pleasant St & Rt 123/Maple Avenue

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	22	1225	52	15	658	32	4	2	15	7	7	35
Future Volume (Veh/h)	22	1225	52	15	658	32	4	2	15	7	7	35
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	-2%	-2%	-2%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	1332	57	16	715	35	4	2	16	8	8	38
Pedestrians							2		10			8
Lane Width (ft)					9.7		16.0		16.0			15.0
Walking Speed (ft/s)					4.0		4.0		4.0			4.0
Percent Blockage					0		1		1			1
Right turn flare (veh)												
Median type	TWLT	TWLT										
Median storage (veh)	2	254										
Upstream signal (ft)					747							
pX platoon unblocked	0.89						0.89	0.89	0.89	0.89	0.89	0.89
VC, conflicting volume	758	1399					1850	2208	706	1506	2220	383
VC1, stage 1 conf vol							1418	1418		772	772	
VC2, stage 2 conf vol							432	790		733	1447	
VCu, unblocked vol	468	1399					1701	2106	706	1312	2119	45
IC, single (s)	4.1	4.1					7.5	6.5	6.9	7.5	6.5	6.9
IC, 2 stage (s)							6.5	5.5		6.5	5.5	
IF (s)	2.2	2.2					3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97	97					97	99	96	97	95	96
CM capacity (veh/h)	957	479					133	174	373	275	159	892
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 1	SB 1	SB 1	SB 1	SB 1
Volume Total	24	888	501	16	477	273	22	54				
Volume Left	24	0	0	16	0	0	4	8				
Volume Right	0	0	57	0	0	35	16	38				
cSH	957	1700	1700	479	1700	1700	261	443				
Volume to Capacity	0.03	0.52	0.29	0.03	0.28	0.16	0.08	0.12				
Queue Length 95th (ft)	2	0	0	3	0	0	7	10				
Control Delay (s)	8.9	0.0	0.0	12.8	0.0	0.0	20.1	14.3				
Lane LOS	A	A	B	B	C	C	C	B				
Approach Delay (s)	0.2		0.3				20.1	14.3				
Approach LOS							C	B				
Intersection Summary												
Average Delay	0.7											
Intersection Capacity Utilization	46.2%											
Analysis Period (min)	15											

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Lane Group	EBL	EBT	WBL	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	90	1220	30	702	52	331	334
v/c Ratio	0.62	0.79	0.27	0.54	0.49	0.91	0.84
Control Delay	102.2	17.4	69.7	32.8	78.3	80.7	90.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	102.2	17.4	69.7	32.8	78.3	80.7	90.9
Queue Length 50th (ft)	86	203	28	170	46	284	155
Queue Length 95th (ft)	146	#533	65	274	92	#447	#272
Internal Link Dist (ft)		387		792		621	287
Turn Bay Length (ft)	160		145	230		245	
Base Capacity (vph)	167	1537	110	1303	122	390	222
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.79	0.27	0.54	0.43	0.85	0.78
Intersection Summary							
# 95th percentile volume exceeds capacity, queue may be longer.							
Queue shown is maximum after two cycles.							

HCM Signalized Intersection Capacity Analysis 4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB	EB	EB	EB	EB	EB	EB	EB	EB	EB	EB	EB
Traffic Volume (veh/h)	83	1096	27	28	533	113	48	232	73	159	229	78
Future Volume (veh/h)	83	1096	27	28	533	113	48	232	73	159	229	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)	0%	0%	0%	2%	2%	0%	0%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	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	1.00	1.00	0.97	1.00	0.96	1.00	0.96	1.00	0.96	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1562	3196	1546	3097	1711	1729	1636	1768	1636	1768	1636	1768
Flt Permitted	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1562	3196	1546	3097	1711	1729	1636	1768	1636	1768	1636	1768
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)	90	1191	29	30	579	123	52	252	79	173	249	85
RTOR Reduction (vph)	0	1	0	0	12	0	0	8	0	0	9	0
Lane Group Flow (vph)	90	1219	0	30	690	0	52	323	0	173	325	0
Confl. Peds. (#/hr)	6	6	6	5	5	5	3	3	3	3	3	3
Heavy Vehicles (%)	4%	5%	2%	4%	4%	5%	2%	2%	2%	3%	3%	3%
Turn Type	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	1	6	3	8	7	4	7	4	7	4
Permitted Phases	12.9	64.3	6.0	57.4	7.6	30.0	17.7	40.1	17.7	40.1	17.7	40.1
Actuated Green, G (s)	12.9	64.3	6.0	57.4	7.6	30.0	17.7	40.1	17.7	40.1	17.7	40.1
Effective Green, g (s)	0.09	0.46	0.04	0.41	0.05	0.21	0.13	0.29	0.13	0.29	0.13	0.29
Actuated g/C Ratio	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	143	1467	66	1269	92	370	206	506	60.11	0.18	0.18	0.18
Lane Grp Cap (vph)	c0.06	c0.38	0.02	0.22	0.03	c0.19	c0.11	0.18	c0.11	0.18	c0.11	0.18
v/s Ratio Prot	0.63	0.83	0.45	0.54	0.57	0.87	0.84	0.64	0.84	0.64	0.84	0.64
v/s Ratio Perm	61.2	33.1	65.4	31.4	64.6	53.2	59.8	43.7	59.8	43.7	59.8	43.7
Uniform Delay, d1	1.38	0.38	1.03	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	7.9	5.3	4.6	1.6	7.7	19.7	24.8	2.8	24.8	2.8	24.8	2.8
Incremental Delay, d2	92.5	17.9	71.9	33.2	72.3	72.9	84.6	46.5	84.6	46.5	84.6	46.5
Delay (s)	F	B	E	C	E	E	F	D	F	D	F	D
Level of Service	23.0	34.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8	72.8
Approach Delay (s)	C	C	C	C	C	C	C	C	C	C	C	C
Approach LOS	38.8	0.64	140.0	83.4%	15	15	15	15	15	15	15	15
Intersection Summary	Intersection Summary											
HCM 2000 Control Delay	HCM 2000 Control Delay											
HCM 2000 Volume to Capacity ratio	HCM 2000 Volume to Capacity ratio											
Actuated Cycle Length (s)	Actuated Cycle Length (s)											
Intersection Capacity Utilization	Intersection Capacity Utilization											
Analysis Period (min)	Analysis Period (min)											
c Critical Lane Group	c Critical Lane Group											

Marco Polo Site Total Future AM Conditions
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HCM Unsignalized Intersection Capacity Analysis 5: Residential Site Driveway & Church Street

12/8/2017

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	EB	EB	EB	EB
Traffic Volume (veh/h)	58	3	0	0	0	8
Future Volume (veh/h)	58	3	0	0	0	8
Sign Control	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	63	3	0	0	0	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (ft)						
pK platoon unblocked						
VC, conflicting volume						
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol						
IC, single (s)						
IC, 2 stage (s)						
p0 queue free %						
IC capacity (veh/h)						
Direction, Lane #	EB 1	NB 1				
Volume Total	66	9				
Volume Left	0	0				
Volume Right	3	9				
CSH	1700	1000				
Volume to Capacity	0.04	0.01				
Queue Length 95th (ft)	0	1				
Control Delay (s)	0.0	8.6				
Lane LOS	A	A				
Approach Delay (s)	0.0	8.6				
Approach LOS	A	A				
Intersection Summary	Intersection Summary					
Average Delay	Average Delay					
Intersection Capacity Utilization	Intersection Capacity Utilization					
Analysis Period (min)	Analysis Period (min)					

Marco Polo Site Total Future AM Conditions
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HCM Unsignalized Intersection Capacity Analysis 6: Retail Site Driveway & Church Street

12/8/2017

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↰				↱		
Traffic Volume (veh/h)	64	2	0	0	0	13	
Future Volume (Veh/h)	64	2	0	0	0	13	
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	70	2	0	0	0	14	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None				None		
Median storage (veh)							
Upstream signal (ft)							
pX platoon unblocked							
VC, conflicting volume		72			71	71	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCu, unblocked vol		72			71	71	
IC, single (s)		4.1			6.4	6.2	
IC, 2 stage (s)							
IF (s)		2.2			3.5	3.3	
p0 queue free %		100			100	99	
CM capacity (veh/h)		1528			933	991	
Direction, Lane #	EB 1	NB 1					
Volume Total	72	14					
Volume Left	0	0					
Volume Right	2	14					
cSH	1700	991					
Volume to Capacity	0.04	0.01					
Queue Length 95th (ft)	0	1					
Control Delay (s)	0.0	8.7					
Lane LOS	A	A					
Approach Delay (s)	0.0	8.7					
Approach LOS	A	A					
Intersection Summary							
Average Delay		1.4					
Intersection Capacity Utilization		13.5%			ICU Level of Service	A	
Analysis Period (min)		15					

Marco Polo Site Total Future AM Conditions
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HCM Unsignalized Intersection Capacity Analysis 7: Maple Avenue & Retail Site Driveway

12/8/2017

Movement	EBL	EBT	WBT	WBL	SBL	SBR	
Lane Configurations	↰	↰	↰	↰	↱	↱	
Traffic Volume (veh/h)	8	1244	678	12	6	7	
Future Volume (Veh/h)	8	1244	678	12	6	7	
Sign Control	Free		Free		Stop		
Grade	0%		4%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	9	1352	737	13	7	8	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		TWLTL	TWLTL				
Median storage (veh)		2	2				
Upstream signal (ft)		534	467				
pX platoon unblocked	0.86				0.86	0.86	
VC, conflicting volume	750				1438	375	
VC1, stage 1 conf vol					744		
VC2, stage 2 conf vol					694		
VCu, unblocked vol	382				1182	0	
IC, single (s)	4.1				6.8	6.9	
IC, 2 stage (s)					5.8		
IF (s)	2.2				3.5	3.3	
p0 queue free %	99				98	99	
CM capacity (veh/h)	1008				376	932	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	
Volume Total	9	676	676	491	259	15	
Volume Left	9	0	0	0	0	7	
Volume Right	0	0	0	0	13	8	
cSH	1008	1700	1700	1700	1700	551	
Volume to Capacity	0.01	0.40	0.40	0.29	0.15	0.03	
Queue Length 95th (ft)	1	0	0	0	0	2	
Control Delay (s)	8.6	0.0	0.0	0.0	0.0	11.7	
Lane LOS	A				B	B	
Approach Delay (s)	0.1			0.0		11.7	
Approach LOS					B		
Intersection Summary							
Average Delay				0.1			
Intersection Capacity Utilization				44.4%		ICU Level of Service	A
Analysis Period (min)				15			

Marco Polo Site Total Future AM Conditions
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	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group									
Lane Group Flow (vph)	13	1298	196	282	167	172	300	79	332
v/c Ratio	0.03	0.95	0.88	0.16	0.74	0.73	0.51	0.25	1.01
Control Delay	16.8	56.1	87.0	16.6	77.1	75.9	16.9	52.6	107.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.8	56.1	87.0	16.6	77.1	75.9	16.9	52.6	107.8
Queue Length 50th (ft)	5	600	147	52	153	157	71	63	~325
Queue Length 95th (ft)	17	#757	#300	68	237	242	164	114	#525
Internal Link Dist (ft)	158		1576		459		619		
Turn Bay Length (ft)	60	285			215				
Base Capacity (vph)	497	1368	224	1740	264	274	572	314	329
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	0.03	0.95	0.88	0.16	0.63	0.63	0.52	0.25	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.									

HCM Signalized Intersection Capacity Analysis

8: Nutley Street & Maple Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	12	1083	111	180	222	38	192	120	276	73	289	17
Future Volume (vph)	12	1083	111	180	222	38	192	120	276	73	289	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Flt	1.00	0.99	1.00	1.00	0.98	1.00	1.00	1.00	0.85	1.00	0.99	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3490	1770	3462	1770	3462	1681	1748	1583	1770	1848	1748
Flt Permitted	0.58	1.00	0.06	1.00	0.06	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1078	3490	121	3462	121	3462	1681	1748	1583	1770	1848	1748
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)	13	1177	121	196	241	41	209	130	300	79	314	18
RTOR Reduction (vph)	0	5	0	0	9	0	0	0	152	0	2	0
Lane Group Flow (vph)	13	1293	0	196	273	0	167	172	148	79	330	0
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	Split	NA	pm+ov	Split	NA	NA
Protected Phases	5	2	1	6	1	6	8	8	1	4	4	4
Permitted Phases	2		6						8			
Actuated Green, G (s)	57.0	54.6	75.2	65.8	75.2	65.8	18.9	18.9	32.5	24.9	24.9	24.9
Effective Green, g (s)	57.0	54.6	75.2	65.8	75.2	65.8	18.9	18.9	32.5	24.9	24.9	24.9
Actuated g/c Ratio	0.41	0.39	0.54	0.47	0.54	0.47	0.13	0.13	0.23	0.18	0.18	0.18
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	450	1361	225	1627	225	1627	226	235	446	314	328	328
v/s Ratio Prot	0.00	c0.37	c0.08	0.08	0.38	0.08	c0.10	0.10	0.03	0.04	c0.18	c0.18
v/s Ratio Perm	0.01		0.38						0.06			
v/c Ratio	0.03	0.95	0.87	0.17	0.74	0.73	0.74	0.73	0.33	0.25	1.01	1.01
Uniform Delay, d1	24.8	41.4	41.7	21.3	58.2	58.1	58.2	58.1	44.7	49.5	57.5	57.5
Progression Factor	1.00	1.00	1.61	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	15.0	28.4	0.2	11.9	11.1	11.9	11.1	0.4	0.4	51.5	51.5
Delay (s)	24.8	56.4	95.6	18.4	70.1	69.3	70.1	69.3	45.2	50.0	109.1	109.1
Level of Service	C	E	F	B	E	D	E	D	D	D	F	F
Approach Delay (s)	56.1		50.0		58.2						97.7	
Approach LOS	E		D		E						F	
Intersection Summary												
HCM 2000 Control Delay	61.5											
HCM 2000 Volume to Capacity ratio	0.92											
Actuated Cycle Length (s)	140.0											
Intersection Capacity Utilization	91.5%											
Analysis Period (min)	15											
c Critical Lane Group												

Queues

12/8/2017

4: Courthouse Rd/Lawyers Rd & Maple Avenue

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group								
Lane Group Flow (vph)	90	1220	30	702	52	331	173	334
v/c Ratio	0.28	0.79	0.16	0.51	0.49	0.92	0.84	0.65
Control Delay	9.2	19.4	20.0	23.5	78.3	83.0	90.9	49.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	19.4	20.0	23.5	78.3	83.0	90.9	49.8
Queue Length 50th (ft)	15	434	9	137	46	286	155	261
Queue Length 95th (ft)	28	#699	33	211	92	#459	#272	372
Internal Link Dist (ft)		387		792		621		287
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	320	1545	190	1377	122	378	222	510
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.79	0.16	0.51	0.43	0.88	0.78	0.65
Intersection Summary								
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.							

HCM Signalized Intersection Capacity Analysis

12/8/2017

4: Courthouse Rd/Lawyers Rd & Maple Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	83	1096	27	28	533	113	48	232	73	159	229	78
Future Volume (vph)	83	1096	27	28	533	113	48	232	73	159	229	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)		0%			2%			0%				0%
Total Lost time (s)		5.0		5.0	6.0		5.0	6.0		5.0		6.0
Lane Util. Factor		1.00		0.95	1.00		0.95	1.00		1.00		1.00
Frpb, ped/bikes		1.00		1.00	1.00		0.99	1.00		1.00		1.00
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00		1.00		1.00
Frt		1.00		1.00	1.00		0.97	1.00		0.96		1.00
Flt Protected		0.95		1.00	0.95		1.00	0.95		1.00		0.95
Satd. Flow (prot)		1562		3196	1546		3097	1711		1729		1636
Flt Permitted		0.27		1.00	0.11		1.00	0.95		1.00		1.00
Satd. Flow (perm)		452		3196	179		3097	1711		1729		1636
Peak-hour factor, PHF		0.92		0.92	0.92		0.92	0.92		0.92		0.92
Adj. Flow (vph)		90		1191	29		30	579		123		52
RTOR Reduction (vph)		0		1	0		0	12		0		8
Lane Group Flow (vph)		90		1219	0		30	690		0		52
Confl. Peds. (#/hr)				6			5			3		3
Heavy Vehicles (%)		4%		5%	2%		4%	5%		2%		3%
Turn Type		pm+pt		NA	pm+pt		NA	Prot		NA		Prot
Protected Phases		5		2	1		6	3		8		7
Permitted Phases		2			6							4
Actuated Green, G (s)		74.7		64.7	66.7		60.7	7.6		29.6		17.7
Effective Green, g (s)		74.7		64.7	66.7		60.7	7.6		29.6		17.7
Actuated g/C Ratio		0.53		0.46	0.48		0.43	0.05		0.21		0.13
Clearance Time (s)		5.0		6.0	5.0		6.0	5.0		6.0		5.0
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)		320		1477	143		1342	92		365		206
v/s Ratio Prot		c0.02		c0.38	0.01		0.22	0.03		c0.19		c0.11
v/s Ratio Perm		0.13			0.09							
v/c Ratio		0.28		0.83	0.21		0.51	0.57		0.89		0.84
Uniform Delay, d1		17.6		32.7	23.5		28.9	64.6		53.6		59.8
Progression Factor		0.45		0.46	1.17		0.79	1.00		1.00		1.00
Incremental Delay, d2		0.5		5.1	0.7		1.3	7.7		21.7		24.8
Delay (s)		8.4		20.0	28.3		24.2	72.3		75.2		84.6
Level of Service		A		C	C		C	E		E		F
Approach Delay (s)				19.2			24.3			74.8		59.8
Approach LOS				B			C			E		E
Intersection Summary												
HCM 2000 Control Delay	34.8											
HCM 2000 Volume to Capacity ratio	0.82											
Actuated Cycle Length (s)	140.0											
Intersection Capacity Utilization	83.4%											
Analysis Period (min)	15											
Critical Lane Group												

Marco Polo Site 3/14/2016 Total Future AM Conditions Improvement #1

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Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	90	1220	30	702	52	331	173	334
v/c Ratio	0.27	0.76	0.15	0.49	0.22	0.89	0.71	0.66
Control Delay	8.0	17.3	14.9	19.6	32.6	77.9	50.2	50.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	17.3	14.9	19.6	32.6	77.9	50.2	50.0
Queue Length 50th (ft)	14	408	9	134	30	281	108	259
Queue Length 95th (ft)	25	642	24	170	62	#435	#192	368
Internal Link Dist (ft)		387		792		621		287
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	337	1626	203	1455	235	402	243	514
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.75	0.15	0.48	0.22	0.82	0.71	0.65
Intersection Summary								
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.							

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SR
Lane Configurations	↔	↔↔	↔	↔↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	83	1096	27	28	533	113	48	232	73
Future Volume (vph)	83	1096	27	28	533	113	48	232	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	12	12
Grade (%)		0%		2%		0%		0%	
Total Lost time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	0.99	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	
Flt	1.00	1.00	1.00	0.97	1.00	0.96	1.00	0.96	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1562	3196	1546	3097	1711	1729	1636	1768	
Flt Permitted	0.28	1.00	0.12	1.00	0.41	1.00	0.19	1.00	
Satd. Flow (perm)	468	3196	198	3097	741	1729	319	1768	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	90	1191	29	30	579	123	52	252	79
RTOR Reduction (vph)	0	1	0	0	13	0	8	0	9
Lane Group Flow (vph)	90	1219	0	30	669	0	52	323	0
Confl. Peds. (#/hr)		6			5		3		1
Heavy Vehicles (%)	4%	5%	2%	4%	5%	2%	2%	3%	3%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA	
Protected Phases	5	2	1	6	3	8	7	4	
Permitted Phases	2		6		8		4		
Actuated Green, G (s)	77.8	67.8	69.8	63.8	35.3	30.4	49.2	39.3	
Effective Green, g (s)	77.8	67.8	69.8	63.8	35.3	30.4	49.2	39.3	
Actuated g/C Ratio	0.56	0.48	0.50	0.46	0.25	0.22	0.35	0.28	
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	338	1547	156	1411	220	375	241	496	
v/s Ratio Prot	c0.02	c0.38	0.01	0.22	0.01	c0.19	c0.07	0.18	
v/s Ratio Perm	0.13		0.09		0.05		0.18		
v/c Ratio	0.27	0.79	0.19	0.49	0.24	0.86	0.72	0.66	
Uniform Delay, d1	16.0	30.1	21.5	26.7	40.6	52.8	35.4	44.4	
Progression Factor	0.43	0.47	0.96	0.71	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	3.9	0.6	1.1	0.6	1.80	9.8	3.1	
Delay (s)	7.3	17.9	21.3	20.2	41.2	70.8	45.1	47.5	
Level of Service	A	B	C	C	D	E	D	D	
Approach Delay (s)		17.2		20.2		66.8		46.7	
Approach LOS		B		C		E		D	
Intersection Summary									
HCM 2000 Control Delay	29.5								C
HCM 2000 Volume to Capacity ratio	0.78								
Actuated Cycle Length (s)	140.0								22.0
Intersection Capacity Utilization	83.4%								E
Analysis Period (min)	15								
Critical Lane Group									

Marco Polo Site 3/14/2016 Total Future AM Conditions Improvement #2

Wells + Associates

Synchro 9 Report

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HCM Unsignalized Intersection Capacity Analysis

1: Pleasant St & Parking Lot/Church Street

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	2	1	4	0	0	0	5	69	32	14	16	1
Traffic Volume (veh/h)	2	1	4	0	0	0	5	69	32	14	16	1
Future Volume (Veh/h)	2	1	4	0	0	0	5	69	32	14	16	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	1	4	0	0	0	5	75	35	15	17	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked												
VC, conflicting volume	150	168	18	154	150	92	18					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	150	168	18	154	150	92	18					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	100	100	100	100	100	100	100					
CM capacity (veh/h)	809	716	1061	800	731	965	1599					
Direction, Lane #	EB 1	NB 1	SB 1									
Volume Total	7	115	33									
Volume Left	2	5	15									
Volume Right	4	35	1									
cSH	917	1599	1480									
Volume to Capacity	0.01	0.00	0.01									
Queue Length 95th (ft)	1	0	1									
Control Delay (s)	9.0	0.3	3.4									
Lane LOS	A	A	A									
Approach Delay (s)	9.0	0.3	3.4									
Approach LOS	A											
Intersection Summary												
Average Delay			1.4									
Intersection Capacity Utilization			17.3%									
Analysis Period (min)			15									

Marco Polo Site Total Future PM Conditions
Wells + Associates

Synchro 9 Report
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HCM Unsignalized Intersection Capacity Analysis

2: Lawyers Rd & Church Street

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	13	10	50	124	8	245	7	377	75	140	379	12
Traffic Volume (veh/h)	13	10	50	124	8	245	7	377	75	140	379	12
Future Volume (Veh/h)	13	10	50	124	8	245	7	377	75	140	379	12
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	11	54	135	9	266	8	410	82	152	412	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX platoon unblocked	0.82	0.82	0.82	0.82	0.82	0.82						
VC, conflicting volume	1333	1232	418	1190	1198	459	425					
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	1297	1174	418	1123	1132	232	425					
IC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1					
IC, 2 stage (s)												
IF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2					
p0 queue free %	75	92	91	0	94	60	99					
CM capacity (veh/h)	57	134	635	114	141	658	1134					
Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2							
Volume Total	79	410	500	152	425							
Volume Left	14	135	8	152	0							
Volume Right	54	266	82	0	13							
cSH	286	264	1134	1056	1700							
Volume to Capacity	0.28	1.55	0.01	0.14	0.25							
Queue Length 95th (ft)	27	613	1	13	0							
Control Delay (s)	26.4	301.2	0.2	9.0	0.0							
Lane LOS	D	F	A	A	A							
Approach Delay (s)	26.4	301.2	0.2	2.4								
Approach LOS	D	F										
Intersection Summary												
Average Delay			81.1									
Intersection Capacity Utilization			69.5%									
Analysis Period (min)			15									

Marco Polo Site Total Future PM Conditions
Wells + Associates

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HCM Unsignalized Intersection Capacity Analysis

12/8/2017

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	37	971	58	47	1395	66	9	7	20	6	4	17
Future Volume (Veh/h)	37	971	58	47	1395	66	9	7	20	6	4	17
Sign Control		Free			Free			Stop			Stop	
Grade		-2%			4%			4%			-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	1055	63	51	1516	72	10	8	22	7	4	18
Pedestrians					2			10			8	
Lane Width (ft)					9.7			16.0			15.0	
Walking Speed (ft/s)					4.0			4.0			4.0	
Percent Blockage					0			1			1	
Right turn flare (veh)												
Median type		TWLT			TWLT							
Median storage (veh)		2			2							
Upstream signal (ft)		254			747							
pX platoon unblocked												
VC, conflicting volume	1596		1128				2056	2874	571	2298	2870	802
VC1, stage 1 conf vol							1176	1176		1662	1662	
VC2, stage 2 conf vol							880	1698		636	1208	
VCu, unblocked vol	632		1128				1408	2788	571	1815	2781	0
IC, single (s)	4.1		4.1				7.5	6.5	6.9	7.5	6.5	6.9
IC, 2 stage (s)							6.5	5.5		6.5	5.5	
IF (s)	2.2		2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93		92				94	94	95	96	97	97
CM capacity (veh/h)	565		620				175	134	463	167	136	641
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1				
Volume Total	40	703	415	51	1011	577	40	29				
Volume Left	40	0	0	51	0	0	10	7				
Volume Right	0	0	63	0	0	72	22	18				
cSH	565	1700	1700	620	1700	1700	244	292				
Volume to Capacity	0.07	0.41	0.24	0.08	0.59	0.34	0.16	0.10				
Queue Length 95th (ft)	6	0	0	7	0	0	14	8				
Control Delay (s)	11.9	0.0	0.0	11.3	0.0	0.0	22.7	18.7				
Lane LOS	B	B	B	B	C	C	C	C				
Approach Delay (s)	0.4		0.4				22.7	18.7				
Approach LOS				C			C	C				
Intersection Summary												
Average Delay	0.9											
Intersection Capacity Utilization	51.3%											
Analysis Period (min)	15											
	A											

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	138	917	55	1484	84	354	184	366
v/c Ratio	0.93	0.60	0.52	1.08	0.71	0.94	0.92	0.77
Control Delay	136.3	21.1	103.1	89.3	102.3	94.2	113.6	64.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	136.3	21.1	103.1	89.3	102.3	94.2	113.6	64.0
Queue Length 50th (ft)	~152	216	56	~918	87	361	193	340
Queue Length 95th (ft)	#305	262	109	#1056	#164	#554	#344	469
Internal Link Dist (ft)	387							
Turn Bay Length (ft)	160	145		230		245		
Base Capacity (vph)	149	1522	115	1369	128	388	204	481
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.60	0.48	1.08	0.66	0.91	0.90	0.76
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.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	127	794	50	51	1260	105	77	280	46	169	219	118
Future Volume (vph)	127	794	50	51	1260	105	77	280	46	169	219	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)	0%	0%	0%	2%	2%	0%	0%	0%	0%	0%	0%	0%
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	0.95	1.00	0.95	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1562	3181	1546	3158	1711	1758	1636	1739				
Flt Permitted	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1562	3181	1546	3158	1711	1758	1636	1739				
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)	138	863	54	55	1370	114	84	304	50	184	238	128
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	0	12	0
Lane Group Flow (vph)	138	914	0	55	1480	0	84	350	0	184	354	0
Confl. Peds. (#/hr)			6			5			3			1
Heavy Vehicles (%)	4%	5%	0%	4%	4%	5%	2%	2%	2%	3%	3%	3%
Turn Type	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA	Prot	NA
Protected Phases	5	2	1	6	3	8	7	4				
Permitted Phases												
Actuated Green, G (s)	15.3	75.4	9.0	69.1	11.2	34.0	19.6	42.4				
Effective Green, g (s)	15.3	75.4	9.0	69.1	11.2	34.0	19.6	42.4				
Actuated g/C Ratio	0.10	0.47	0.06	0.43	0.07	0.21	0.12	0.26				
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0				
Lane Grp Cap (vph)	149	1499	86	1363	119	373	200	460				
v/s Ratio Prot	c0.09	0.29	0.04	c0.47	0.05	c0.20	c0.11	0.20				
v/s Ratio Perm												
v/c Ratio	0.93	0.61	0.64	1.09	0.71	0.94	0.92	0.77				
Uniform Delay, d1	71.8	31.4	73.9	45.5	72.8	62.0	69.4	54.3				
Progression Factor	1.19	0.61	1.19	0.90	1.00	1.00	1.00	1.00				
Incremental Delay, d2	49.8	1.8	14.5	51.2	17.3	30.9	41.8	7.6				
Delay (s)	135.2	20.8	102.5	92.2	90.1	92.9	111.2	61.8				
Level of Service	F	C	F	F	F	F	F	F				
Approach Delay (s)		35.8		92.6		92.3		78.3				
Approach LOS		D		F		F		E				
Intersection Summary												
HCM 2000 Control Delay			73.6			HCM 2000 Level of Service		E				
HCM 2000 Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			160.0			Sum of lost time (s)		22.0				
Intersection Capacity Utilization			91.8%			ICU Level of Service		F				
Analysis Period (min)			15									
c Critical Lane Group												

Marco Polo Site Total Future PM Conditions
Wells + Associates

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HCM Unsignalized Intersection Capacity Analysis

5: Residential Site Driveway & Church Street

12/8/2017

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	←	←	←	←	←	←
Traffic Volume (veh/h)	37	11	0	0	0	4
Future Volume (Veh/h)	37	11	0	0	0	4
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	12	0	0	0	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None				None	
Median storage (veh)						
Upstream signal (ft)						
pK platoon unblocked						
VC, conflicting volume		52			46	46
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol		52			46	46
IC, single (s)		4.1			6.4	6.2
IC, 2 stage (s)						
IF (s)		2.2			3.5	3.3
p0 queue free %		100			100	100
CM capacity (veh/h)		1554			964	1023
Direction, Lane #	EB 1	NB 1				
Volume Total	52	4				
Volume Left	0	0				
Volume Right	12	4				
cSH	1700	1023				
Volume to Capacity	0.03	0.00				
Queue Length 95th (ft)	0	0				
Control Delay (s)	0.0	8.5				
Lane LOS	A	A				
Approach Delay (s)	0.0	8.5				
Approach LOS	A	A				
Intersection Summary						
Average Delay		0.6				A
Intersection Capacity Utilization		13.3%				
Analysis Period (min)		15				

Marco Polo Site Total Future PM Conditions
Wells + Associates

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HCM Unsignalized Intersection Capacity Analysis 6: Retail Site Driveway & Church Street

12/8/2017

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↰				↱		
Traffic Volume (veh/h)	33	8	0	0	0	5	
Future Volume (Veh/h)	33	8	0	0	0	5	
Sign Control	Free		Free	Free	Stop		
Grade	0%		0%	0%	0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	36	9	0	0	0	5	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)	None						
Median type							None
Median storage (veh)							
Upstream signal (ft)							
pX platoon unblocked							
VC, conflicting volume			45		40	40	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCu, unblocked vol			45		40	40	
IC, single (s)			4.1		6.4	6.2	
IC, 2 stage (s)							
IF (s)			2.2		3.5	3.3	
p0 queue free %			100		100	100	
CM capacity (veh/h)			1563		971	1031	
Direction, Lane #	EB 1	NB 1					
Volume Total	45	5					
Volume Left	0	0					
Volume Right	9	5					
cSH	1700	1031					
Volume to Capacity	0.03	0.00					
Queue Length 95th (ft)	0	0					
Control Delay (s)	0.0	8.5					
Lane LOS	A	A					
Approach Delay (s)	0.0	8.5					
Approach LOS	A	A					
Intersection Summary							
Average Delay			0.9				
Intersection Capacity Utilization			13.3%				ICU Level of Service
Analysis Period (min)			15				A

HCM Unsignalized Intersection Capacity Analysis 7: Maple Avenue & Retail Site Driveway

12/8/2017

Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	↰	↱	↱	↱	↱	↱	
Traffic Volume (veh/h)	21	978	1425	32	26	30	
Future Volume (Veh/h)	21	978	1425	32	26	30	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	4%	0%	0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	23	1063	1549	35	28	33	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type			TWLT				None
Median storage (veh)			2				
Upstream signal (ft)			534		467		
pX platoon unblocked			0.58		0.58	0.58	
VC, conflicting volume			1584		2144	792	
VC1, stage 1 conf vol					1566		
VC2, stage 2 conf vol					578		
VCu, unblocked vol			563		1527	0	
IC, single (s)			4.1		6.8	6.9	
IC, 2 stage (s)					5.8		
IF (s)			2.2		3.5	3.3	
p0 queue free %			96		90	95	
CM capacity (veh/h)			584		268	630	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	
Volume Total	23	532	532	1033	551	61	
Volume Left	23	0	0	0	0	28	
Volume Right	0	0	0	0	35	33	
cSH	584	1700	1700	1700	1700	389	
Volume to Capacity	0.04	0.31	0.31	0.61	0.32	0.16	
Queue Length 95th (ft)	3	0	0	0	0	14	
Control Delay (s)	11.4	0.0	0.0	0.0	0.0	16.0	
Lane LOS	B				C	C	
Approach Delay (s)	0.2			0.0		16.0	
Approach LOS						C	
Intersection Summary							
Average Delay				0.5			
Intersection Capacity Utilization				50.4%			ICU Level of Service
Analysis Period (min)				15			A

12/8/2017

8: Nutley Street & Maple Avenue

	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group									
Lane Group Flow (vph)	45	840	272	1239	286	298	403	76	336
v/c Ratio	0.38	0.76	0.88	0.83	0.91	0.91	0.53	0.22	0.94
Control Delay	34.1	53.8	66.1	37.0	94.3	93.8	12.9	56.3	97.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.1	53.8	66.1	37.0	94.3	93.8	12.9	56.3	97.1
Queue Length 50th (ft)	25	415	174	598	309	323	80	68	347
Queue Length 95th (ft)	49	498	#343	738	#486	#503	185	120	#545
Internal Link Dist (ft)	165		1570		422			912	
Turn Bay Length (ft)	60	285			215				
Base Capacity (vph)	118	1107	317	1497	325	338	758	347	362
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	0.38	0.76	0.86	0.83	0.88	0.88	0.53	0.22	0.93
Intersection Summary									
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

12/8/2017

8: Nutley Street & Maple Avenue

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	41	603	170	250	1100	40	333	204	371	70	271	38
Future Volume (vph)	41	603	170	250	1100	40	333	204	371	70	271	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00
Flt	1.00	0.97	1.00	0.99	1.00	0.99	1.00	1.00	0.85	1.00	0.98	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3422	1770	3521	1770	3521	1681	1747	1583	1770	1829	1829
Flt Permitted	0.09	1.00	0.13	1.00	0.13	1.00	0.95	0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	165	3422	241	3521	165	3422	1681	1747	1583	1770	1829	1829
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)	45	655	185	272	1196	43	362	222	403	76	295	41
RTOR Reduction (vph)	0	16	0	0	2	0	0	0	189	0	3	0
Lane Group Flow (vph)	45	824	0	272	1237	0	286	298	214	76	333	0
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	Split	NA	ph+ov	Split	NA	NA
Protected Phases	5	2	1	6	1	6	8	8	81	4	4	4
Permitted Phases	2		6									
Actuated Green, G (s)	55.6	50.8	78.0	66.2	78.0	66.2	30.1	30.1	57.3	30.9	30.9	30.9
Effective Green, g (s)	55.6	50.8	78.0	66.2	78.0	66.2	30.1	30.1	57.3	30.9	30.9	30.9
Actuated g/c Ratio	0.35	0.32	0.49	0.41	0.49	0.41	0.19	0.19	0.36	0.19	0.19	0.19
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	105	1086	310	1456	310	1456	316	328	566	341	353	353
v/s Ratio Prot	0.01	0.24	c0.11	c0.35	0.17	c0.17	0.14	0.04	c0.18			
v/s Ratio Perm	0.14		c0.32									
v/c Ratio	0.43	0.76	0.88	0.85	0.91	0.91	0.38	0.22	0.94			
Uniform Delay, d1	38.3	49.1	35.8	42.4	35.8	42.4	63.6	63.6	38.1	54.4	63.7	63.7
Progression Factor	1.00	1.00	1.19	0.73	1.00	0.73	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	5.0	23.1	6.4	27.7	27.5	0.4	0.3	33.2			
Delay (s)	41.1	54.1	65.7	37.5	63.5	69.9	64.0	63.9	71.5	87.6	96.8	96.8
Level of Service	D	D	E	D	D	D	F	F	D	D	F	F
Approach Delay (s)	53.4		42.6				69.7				89.1	
Approach LOS	D		D				E				F	
Intersection Summary												
HCM 2000 Control Delay	57.2											
HCM 2000 Volume to Capacity ratio	0.93											
Actuated Cycle Length (s)	160.0											
Intersection Capacity Utilization	91.2%											
Analysis Period (min)	15											
c Critical Lane Group												

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group								
Lane Group Flow (vph)	138	917	55	1484	84	354	184	366
v/c Ratio	0.94	0.57	0.20	0.98	0.86	1.03	0.94	0.80
Control Delay	108.2	16.6	12.4	55.9	131.2	115.9	119.6	67.4
Queue Delay	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0
Total Delay	108.2	16.6	12.4	63.7	131.2	115.9	119.6	67.4
Queue Length 50th (ft)	105	180	15	804	89	~390	194	347
Queue Length 95th (ft)	#248	233	32	#964	#199	#602	#355	#488
Internal Link Dist (ft)		387		792		621		287
Turn Bay Length (ft)	160		145		230		245	
Base Capacity (vph)	147	1609	278	1522	98	345	195	457
Starvation Cap Reductn	0	0	0	55	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.57	0.20	1.01	0.86	1.03	0.94	0.80
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.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	127	794	50	51	1260	105	77	280	46	169	219	118
Future Volume (vph)	127	794	50	51	1260	105	77	280	46	169	219	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	11	12	10	12	12
Grade (%)		0%			2%			0%			0%	
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	1.00
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
Flt	1.00	0.99		1.00	0.99		1.00	0.98		1.00	0.95	1.00
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1562	3181		1546	3158		1711	1758		1636	1739	
Flt Permitted	0.05	1.00		0.23	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	82	3181		372	3158		1711	1758		1636	1739	
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)	138	863	54	55	1370	114	84	304	50	184	238	128
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	0	12	0
Lane Group Flow (vph)	138	914	0	55	1460	0	84	350	0	184	354	0
Confl. Peds. (#/hr)			6			5			3			1
Heavy Vehicles (%)	4%	5%	0%	4%	4%	5%	2%	2%	2%	3%	3%	3%
Turn Type	pm+pt	NA	NA	pm+pt	NA	NA	Prot	NA	Prot	NA	NA	NA
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6								
Actuated Green, G (s)	90.8	79.8		84.8	76.8		9.2	31.1		19.1	41.0	
Effective Green, g (s)	90.8	79.8		84.8	76.8		9.2	31.1		19.1	41.0	
Actuated g/C Ratio	0.57	0.50		0.53	0.48		0.06	0.19		0.12	0.26	
Clearance Time (s)	5.0	6.0		5.0	6.0		5.0	6.0		5.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	148	1586		255	1515		98	341		195	445	
v/s Ratio Prot	c0.06	0.29		0.01	c0.47		0.05	c0.20		c0.11	0.20	
v/s Ratio Perm	0.46			0.10								
v/c Ratio	0.93	0.58		0.22	0.98		0.86	1.03		0.94	0.80	
Uniform Delay, d1	49.0	28.2		19.8	40.7		74.7	64.5		69.9	55.6	
Progression Factor	1.32	0.54		0.75	0.93		1.00	1.00		1.00	1.00	
Incremental Delay, d2	51.9	1.4		0.4	18.2		48.0	55.6		48.2	9.5	
Delay (s)	116.8	16.7		15.3	56.2		122.7	120.1		118.1	65.1	
Level of Service	F	B		B	E		F	F		F	E	
Approach Delay (s)		29.8			54.8			120.6			82.8	
Approach LOS		C			D			F			F	
Intersection Summary												
HCM 2000 Control Delay	59.8											
HCM 2000 Volume to Capacity ratio	0.98											
Actuated Cycle Length (s)	160.0											
Intersection Capacity Utilization	91.8%											
Analysis Period (min)	15											
Critical Lane Group												

Queues

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Group									
Lane Group Flow (vph)	138	917	55	1484	84	354	184	366	
v/c Ratio	0.92	0.56	0.19	0.96	0.47	0.97	0.90	0.78	
Control Delay	104.7	15.3	11.6	50.8	49.0	101.1	82.2	65.1	
Queue Delay	0.0	0.0	0.0	6.4	0.0	0.0	0.0	0.0	
Total Delay	104.7	15.3	11.6	57.2	49.0	101.1	82.2	65.1	
Queue Length 50th (ft)	104	175	14	784	61	367	144	344	
Queue Length 95th (ft)	#247	223	30	#941	106	#578	#296	474	
Internal Link Dist (ft)		387		792		621		287	
Turn Bay Length (ft)	160	145			230		245		
Base Capacity (vph)	150	1646	286	1562	179	366	205	469	
Starvation Cap Reductn	0	0	0	71	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.92	0.56	0.19	1.00	0.47	0.97	0.90	0.78	
Intersection Summary									
#	95th percentile volume exceeds capacity, queue may be longer.								
	Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis

4: Courthouse Rd/Lawyers Rd & Maple Avenue

12/8/2017

Movement	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	127	794	50	51	1260	105	77	280	46	169
Future Volume (vph)	127	794	50	51	1260	105	77	280	46	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	9	10	10	9	10	12	11	12	10	12
Grade (%)	0%			2%		0%			0%	
Total Lost time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	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	1.00
Frt	1.00	0.99	1.00	0.99	1.00	0.98	1.00	0.98	1.00	0.95
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1562	3181	1546	3158	1711	1758	1636	1739		
Flt Permitted	0.05	1.00	0.23	1.00	0.30	1.00	0.11	1.00		
Satd. Flow (perm)	81	3181	380	3158	534	1758	197	1739		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	138	863	54	55	1370	114	84	304	50	184
RTOR Reduction (vph)	0	3	0	0	4	0	0	4	0	12
Lane Group Flow (vph)	138	914	0	55	1480	0	84	350	0	184
Confl. Peds. (#/hr)			6			5		3		1
Heavy Vehicles (%)	4%	5%	0%	4%	5%	2%	2%	3%	3%	3%
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	pm+pt	NA	NA
Protected Phases	5	2	1	6		3	8	7	4	
Permitted Phases	2		6			8		4		
Actuated Green, G (s)	92.8	81.6	86.4	78.4	39.3	33.0	53.4	42.1		
Effective Green, g (s)	92.8	81.6	86.4	78.4	39.3	33.0	53.4	42.1		
Actuated g/C Ratio	0.58	0.51	0.54	0.49	0.25	0.21	0.33	0.26		
Clearance Time (s)	5.0	6.0	5.0	6.0	5.0	6.0	5.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	150	1622	263	1547	177	362	204	457		
v/s Ratio Prot	c0.06	0.29	0.01	c0.47	0.02	0.20	c0.09	0.20		
v/s Ratio Perm	0.47		0.10		0.10		c0.21			
v/c Ratio	0.92	0.56	0.21	0.96	0.47	0.97	0.90	0.78		
Uniform Delay, d1	49.0	27.0	18.9	39.2	48.6	63.0	43.5	54.6		
Progression Factor	1.36	0.52	0.74	0.93	1.00	1.00	1.00	1.00		
Incremental Delay, d2	48.3	1.3	0.4	14.6	2.0	38.2	37.1	8.0		
Delay (s)	114.9	15.4	14.5	51.0	50.6	101.1	80.6	62.6		
Level of Service	F	B	B	D	D	F	F	E		
Approach Delay (s)		28.4		49.7		91.5		68.6		
Approach LOS		C		D		F		E		
Intersection Summary										
HCM 2000 Control Delay	51.4									
HCM 2000 Volume to Capacity ratio	0.95									
Actuated Cycle Length (s)	160.0									
Intersection Capacity Utilization	91.8%									
Analysis Period (min)	15									
Critical Lane Group										