TOOLE DESIGN

TAKOMA PARK LAUREL AVENUE TRAFFIC STUDY

Supported by a MWCOG Transportation-Land Use Connections Grant

May 29, 2024

TABLE OF CONTENTS

Information contained in this document is for planning purposes. All results, recommendations, concept drawings, cost opinions, and commentary contained herein are based on available data and information and on existing conditions that are subject to change. Further analysis and engineering design are necessary prior to implementing any of the recommendations contained herein.

I. EXECUTIVE SUMMARY

The City of Takoma Park is considering permanently closing the southbound lane of Laurel Avenue between Carroll Avenue and Eastern Avenue to vehicle traffic. The goal is to convert the space into a public plaza, building on the popular outdoor dining area (streetery) and the Takoma Park Farmers Market, which have been in operation on the northbound lane of Laurel Avenue and the adjacent parking lot respectively since the COVID-19 pandemic began.

To assess the feasibility of this change and inform decision making, the City contracted with Toole Design Group to conduct a traffic study to analyze the potential impacts of the proposed closure on traffic patterns and operations, both on Laurel Avenue itself and the surrounding street network. The study aimed to answer the question of how this would impact traffic patterns on adjacent streets and neighborhoods.

Toole Design collected comprehensive traffic volume, speed, and turning movement data at ten intersections and three street segments over seven days in October 2023 to establish a detailed baseline of existing conditions. Toole Design supplemented this data with signal timing and nearby development information from the District Department of Transportation (DDOT) and Montgomery County Department of Transportation (MCDOT) and origin-destination insights from Replica, a Big Data traffic model. Traffic modeling was performed using Synchro, with detour routes informed by stakeholder input, commercial mapping applications (e.g., Google Maps), and engineering judgement.

KEY FINDINGS

- Traffic volumes peak during the weekday AM and PM rush hours, with the AM peak hour experiencing the highest traffic on southbound Laurel Avenue at approximately 210 vehicles per hour.
- Currently, most vehicles (80%) using southbound Laurel Avenue are passing through the area, starting their trips in areas past Takoma Junction and heading primarily to destinations in Washington, D.C. More than half (58%) use southbound Laurel Avenue to reach the Metrorail underpass at Aspen Street NW.
- Traffic modelling indicates that with the closure of southbound Laurel Avenue, most traffic would reroute to Willow Street and Maple Avenue/Street to reach the Aspen Street underpass or continue straight on Carroll onto Cedar Street. Some traffic would reroute through the Westmoreland neighborhood – using Pine, Westmoreland, and Walnut Avenues – to reach destinations along Eastern Avenue.
- The closure would have the greatest impact during the weekday AM peak hour. The analysis projects an increase of around 175 vehicles per hour (14% overall increase) on Willow/Maple/Cedar Streets during the AM peak and an additional 30 vehicles per hour (20% overall increase) on Westmoreland neighborhood streets. Impact on individual streets vary from the overall increase and are shown in the figure on next page.
- Projected vehicle volume changes on neighborhood streets in the AM peak are comparable to the changes experienced in the PM peak when northbound Laurel Avenue was closed for the streetery, but in the reverse direction.
- With the rerouting, most study area intersections would continue to operate at an acceptable Level of Service (LOS) D or better. The intersection of Carroll Avenue with Willow Street and Eastern Avenue would operate at LOS F during the AM peak due to increased left turns, which may increase conflicts with pedestrians in the crosswalk. Targeted measures at key intersections can help mitigate these conflicts and impacts on the level of service.

Based on the analysis, Toole Design finds that the City of Takoma Park could implement the closure of the southbound lane of Laurel Avenue with moderate and manageable impacts to traffic operations on the surrounding street network. Some targeted traffic mitigation measures should be considered in conjunction with the closure:

- Optimize signal timing and phasing at Carroll and Laurel Avenue to give more green time to eastbound traffic and at Carroll and Willow Street/Eastern Avenue to accommodate new turning patterns. These adjustments would improve the overall intersection LOS to be the same or better than existing conditions.
- Consider restricting left turns from westbound Carroll Avenue onto Willow Street to reduce potential conflicts with pedestrians. Drivers would continue straight on Carroll or turn left at Maple Street instead. This change would raise the LOS at the Carroll/Willow/Eastern intersection to LOS D during the AM peak.
- In the longer term, the City should evaluate a roundabout at the Carroll/Willow/Eastern intersection to further streamline operations and improve safety for all users.

With these mitigation measures, the potential traffic impacts of a closure of Laurel Avenue would be limited further. The analysis shows that the City of Takoma Park can turn the southbound lane of Laurel Avenue into a larger pedestrian area without causing too much traffic on nearby streets. By carefully monitoring traffic and making the recommended adjustments, Takoma Park can balance the needs of both vehicles, pedestrians, and local residents, creating an attractive new public space in the heart of city's historic downtown.

II. EXISTING CONDITIONS

A. METHODOLOGY

Toole Design conducted a traffic study to analyze the potential impact of a closure of the southbound lane of Laurel Avenue, between Carroll Avenue and Eastern Avenue, in the City of Takoma Park. The study provides a comprehensive understanding of the traffic impacts of both a recurring and permanent closure on Laurel Avenue and potential actions within the study area that can be taken to moderate traffic impacts, including roadway redesigns and changes to intersections, signage, and traffic patterns in the area around the potential closure.

Data on existing conditions in the study area was collected using various methods. Traffic counters placed on-site recorded vehicle volumes, speeds, and turns at ten intersections and three street segments on a typical week in late October. Signal data provided by DDOT and MCDOT was combined with the traffic counts to calculate performance measures for intersections in the study area. These performance measures of motor vehicle operations will serve as a baseline to compare different closure scenarios in the analysis phase of the study. Additionally, the consultant team gathered information on future developments from DDOT to incorporate their near-term impact on the street network, and origin-destination data from Replica – a traffic model that makes use of Big Data sources – to better understand why drivers use Laurel Avenue and support sensible reroutes during the analysis phase.

For the analysis, Toole Design modeled the impact of a closure of Laurel Avenue on the study area during peak hours in the weekday AM and PM as well as on Sunday. Findings from this analysis – which showed an impact on only three intersections within the study area – were used to target our recommendations for potential mitigation options such as signal timing changes and turn restrictions. These mitigation options enhance pedestrian safety and could attenuate traffic impacts within the study area compared to existing conditions. Overall, traffic impacts of a potential closure of Laurel Avenue are moderate and can be managed with simple mitigation options at adjacent intersections paired with the closure of the street.

B. ROADWAY CONTEXT

Laurel Avenue is located in the heart of the City of Takoma Park's primary commercial, cultural, and historic district, often called Old Takoma. The business district stretches from the Takoma Theater and Metrorail station area in D.C. to the Takoma Junction area where Carroll, Ethan Allen, and Philadelphia Avenues meet. While Carroll Avenue serves as the primary east-west arterial, the concentration of businesses located on Laurel Avenue between Carroll and Eastern Avenues gives this stretch of the road a desirable small-town main street appeal. On the opposite side of the street is the historic Takoma Park Seventh-day Adventist Church.

Figure 1: View of 6900-block of Laurel Avenue from Landscaped Median (Source: Toole Design)

The 6900-block of Laurel Avenue was designed to be a two-way local street divided by a wide median with trees and benches flush with the street. Parking lanes were available on both sides. This layout allowed for the street to be closed to motor vehicles on Sundays to accommodate vendor stalls for the Takoma Park Farmers Market. As a response to the COVID-19 pandemic, the northbound travel and parking were turned into an outdoor dining area (or streetery) for the adjacent businesses as a response to the COVID-19 pandemic, while the market expanded into the nearby municipal parking lot to increase space for social distancing. The streetery has proved popular with nearby businesses and the public, and in July 2021 the Takoma Park City Council extended the streetery indefinitely per City Council Resolution 2021-27. The City of Takoma Park and the local business association are now considering closing the entire block of Laurel Avenue to motor vehicles and converting the street into a permanent public plaza.

C. MOTOR VEHICLE VOLUMES AND SPEEDS

Twenty-four-hour speed and volume data were collected at Laurel Avenue, Carrol Avenue, and Eastern Avenue for the 7-day period from Saturday, October 21, 2023 to Friday, October 27, 2023. Peak period (7–9 AM and 4–6 PM) multimodal turning movement counts (TMCs) were collected at ten study intersections on Wednesday, October 18, 2023 and from 10 AM to 2 PM on Sunday, October 22. Data collection locations are shown on Figure 2. The study area is comprised of the ten study intersections and the approaches to those intersections. Detailed traffic counts, which includes bicycle and pedestrian counts, are provided in Appendix A – Turning Movement Counts.

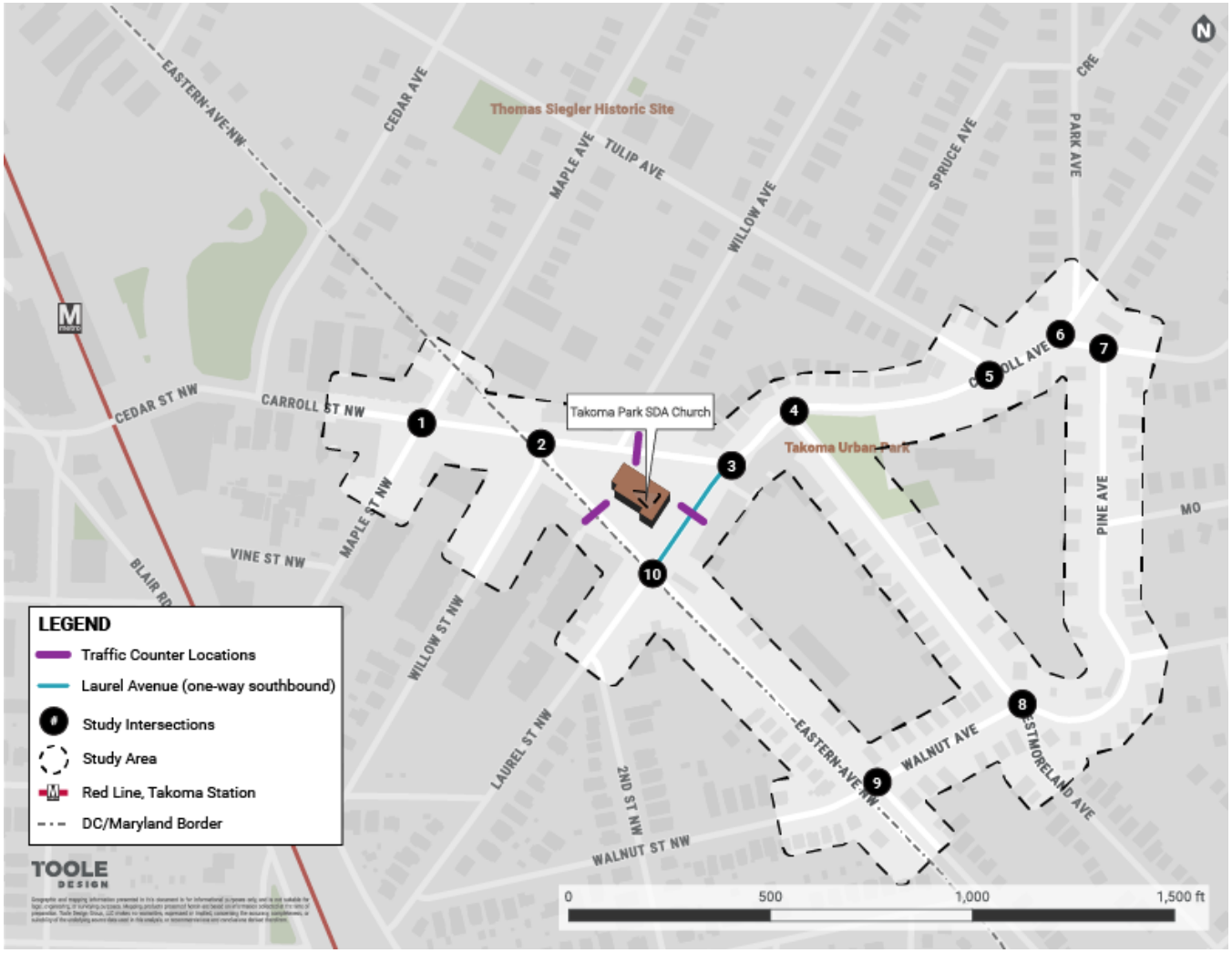


Figure 2: Data Collection and Study Area Map (Source: Toole Design)

7-DAY VOLUMES AND PEAK HOURS

As shown in Figure 3, at each 7-day count location there are distinct weekday AM and PM peaks, with the PM peak generally experiencing higher traffic volumes for a longer duration than the AM peak. The network peak hours were determined to be (8:00 AM – 9:00 AM and 4:00 PM – 5:00 PM). As the hours of highest demand on the network, many of the subsequent analyses focus on the peak period. Table 2 lists hourly volumes as a percentage of the peak for the AM and PM periods.

- The AM peak period typically lasts approximately two hours with vehicle volumes at least 80% of the peak hour during the hour before the peak at all locations.
- The PM peak period typically lasts approximately four hours on Carroll Avenue and Eastern Avenue with vehicle volumes at least 90% of the peak hour during the one hours before the peak and two hours after the peak at all locations.
- Laurel Avenue experiences a distinct mid-day peak with volumes nearly matching the PM peak from 1 PM – 2 PM. Volumes from 12 PM – 7 PM are at least (82%) of the PM peak volume.
- Weekend volumes are impacted by activity at the Takoma Park Seventh-day Adventist Church. Sabbath School at the church begins at 10:00 AM on Saturday and the church's Worship Service begins at 11:30 AM on Saturdays. The church building is also rented for services on Sunday.
- The Takoma Park Farmers Market is held in the parking lot behind the shops on Laurel Avenue on Sunday from 10:00 AM – 2:00 PM.

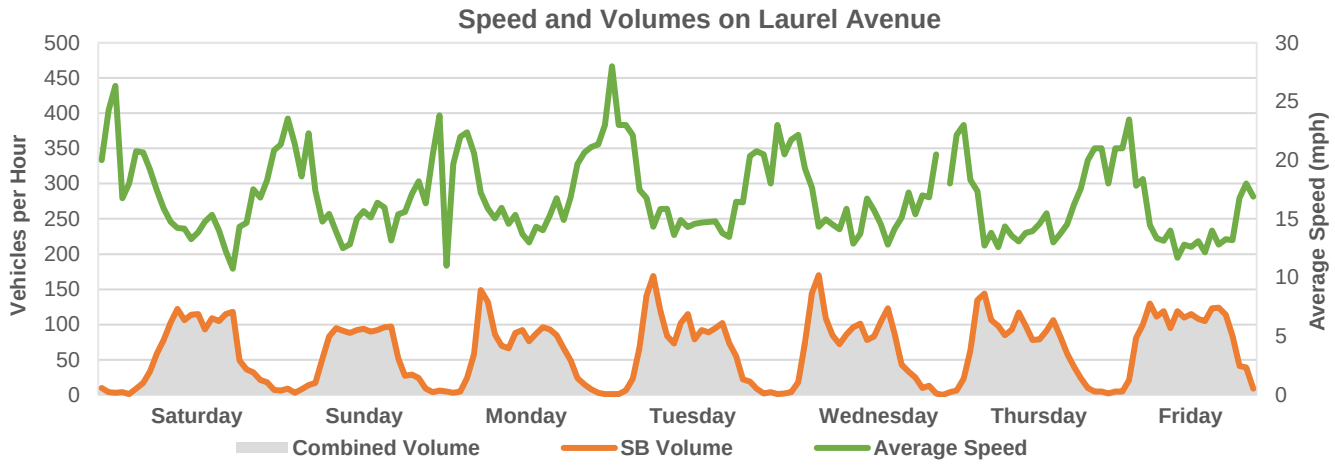
On Carroll Avenue and Eastern Avenue, westbound/inbound volumes are higher during the AM peak and eastbound/outbound volumes are higher during the PM peak.

SPEEDS

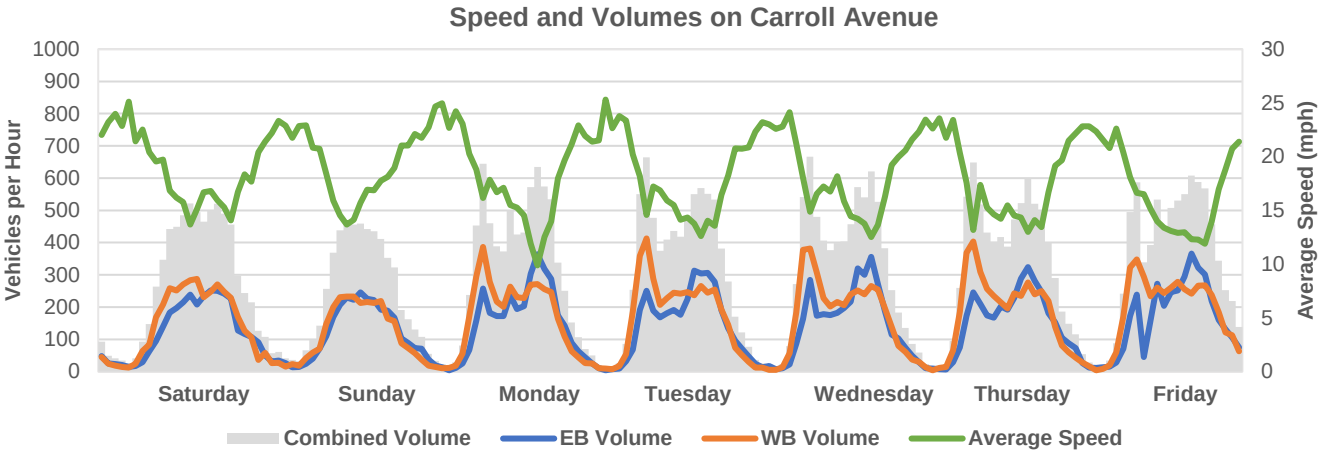
The posted speed limit in the study area is 25 mph. The average speed in all locations was below the posted speed limit, ranging between 15 mph and 18 mph. The 85th percentile speed, or the speed at or below which 85% of the drivers travel, ranged from 20 mph up to 24 mph. Seven-day speed and vehicle volume data is summarized in Table 1 and shown in Figure 3. Congestion during the peaks likely contributed to lower speeds. Speeds tend to drop during the peaks, with faster speeds during off-peak times.

Table 1: Speed and Volume Data Summary in Takoma Park (Source: DCI/Toole Design)

Count Location	Direction	Weekday ADT (vpd)	Average Speed	85th Percentile Speed
Laurel Avenue	**Southbound**	**1,562**	**15 mph**	**20 mph**
Carroll Avenue	Eastbound	3,553	18 mph	24 mph
	Westbound	4,048	15 mph	22 mph
	Combined	**7,601**	**-**	**-**
Eastern Avenue	Eastbound	2,953	17 mph	22 mph
	Westbound	2,305	15 mph	21 mph
	Combined	**5,258**	**-**	**-**



Note: Laurel Avenue only has southbound traffic; vehicles per hour scale is smaller to visualize differences.



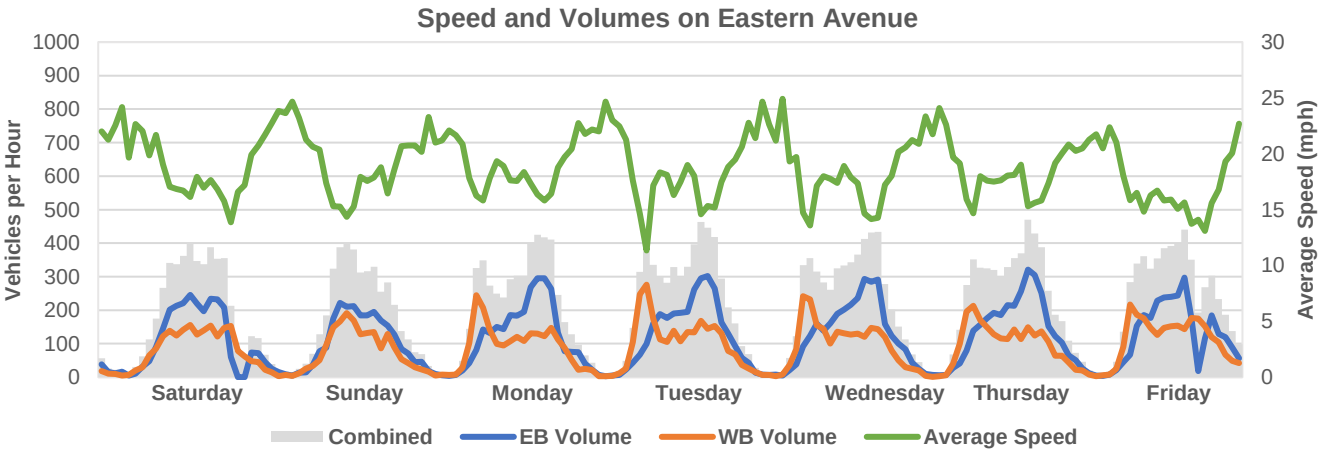


Figure 3: 7-day Speed and Volume Data from Traffic Counter Locations in Figure 2 (Source: DCI/Toole Design)

Table 2: Weekday Peak Hour Relative Vehicle Volumes in Takoma Park (Source: DCI/Toole Design)

Hour	Laurel Avenue	Carroll Avenue	Eastern Avenue
12 AM – 1 AM	4%	8%	11%
1 AM – 2 AM	2%	4%	4%
2 AM – 3 AM	1%	3%	3%
3 AM – 4 AM	2%	2%	3%
4 AM – 5 AM	3%	4%	4%
5 AM – 6 AM	15%	13%	15%
6 AM – 7 AM	46%	39%	39%
7 AM – 8 AM	**90%**	**80%**	**87%**
8 AM – 9 AM	**100%**	**100%**	**100%**
9 AM – 10 AM	71%	71%	**91%**
10 AM – 11 AM	61%	62%	84%
11 AM – 12 PM	52%	65%	82%
12 PM – 1 PM	**90%**	74%	77%
1 PM – 2 PM	**98%**	73%	78%
2 PM – 3 PM	**87%**	80%	81%
3 PM – 4 PM	82%	**94%**	**93%**
4 PM – 5 PM	84%	**100%**	**100%**
5 PM – 6 PM	**94%**	**97%**	**90%**
6 PM – 7 PM	**100%**	**90%**	**90%**
7 PM – 8 PM	79%	66%	65%
8 PM – 9 PM	54%	48%	47%
9 PM – 10 PM	30%	32%	37%
10 PM – 11 PM	23%	25%	26%
11 PM – 12 AM	9%	16%	18%

Speeds along a corridor increase both the likelihood and severity of crashes. The faster a driver is traveling, the less they can see at any one time (e.g., to notice and begin to slow for a crossing pedestrian) and the greater the distance required to stop. Pedestrians and bicyclists are particularly vulnerable in the event of a crash with a motor vehicle. The severity of a pedestrian injury in the event of a crash is directly related to the speed of the vehicle at the point of impact. For example, a pedestrian who is hit by a motor vehicle traveling at 20 mph has a 13% likelihood of fatality or severe injury, whereas a pedestrian hit by a motor vehicle traveling at 40 mph has a 73% likelihood of fatality or severe injury, see Figure 4. The percent of drivers traveling between these speed thresholds is shown on Figure 5.

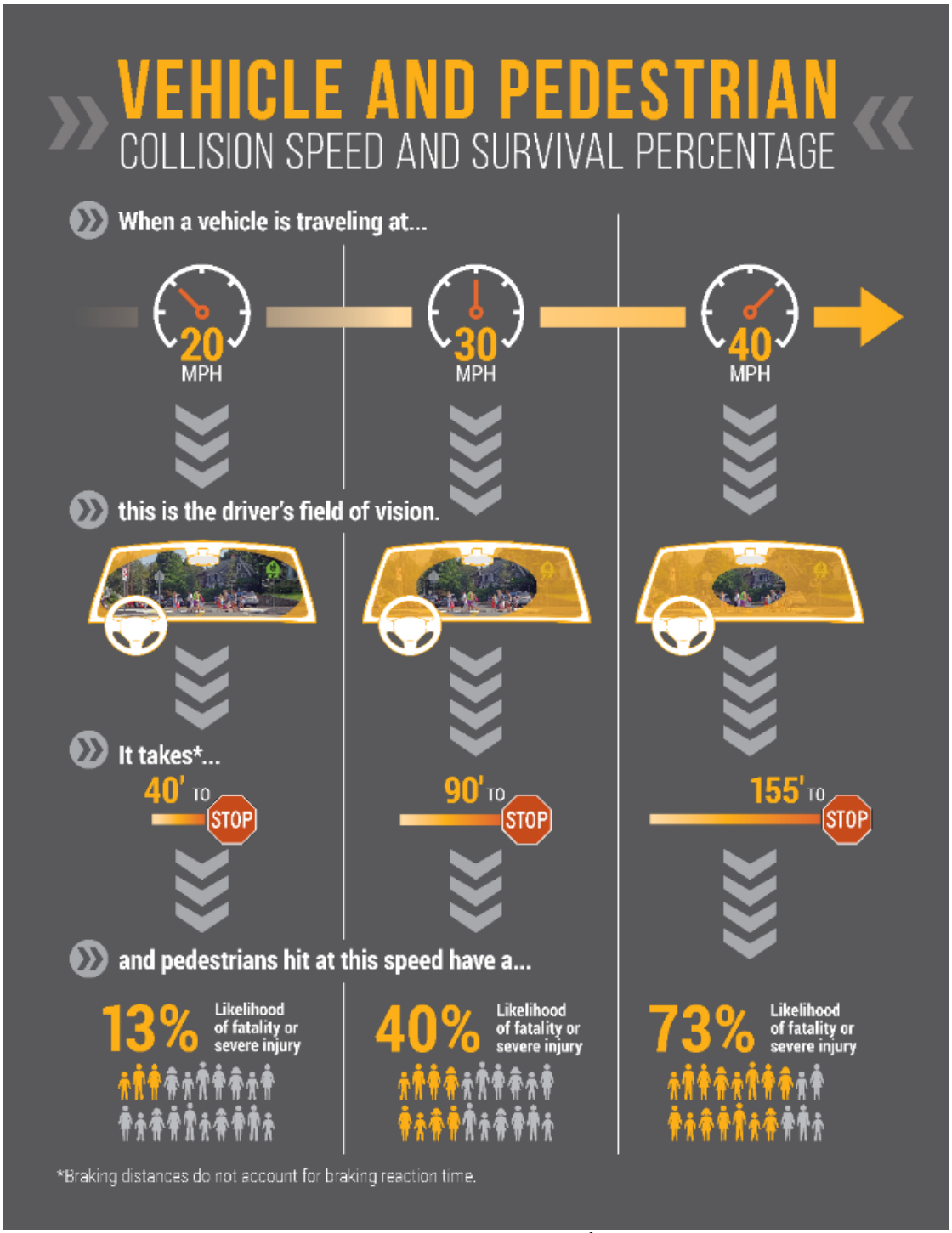


Figure 4: Safe Speeds[1]

[1] Tefft, B.C. "Impact Speed and a Pedestrian's Risk of Severe Injury or Death." Accident Analysis and Prevention, Vol. 50, 2013, pp. 71-878; AASHTO A Policy on Geometric Design of Highways and Streets (Green Book, 2011 edition)

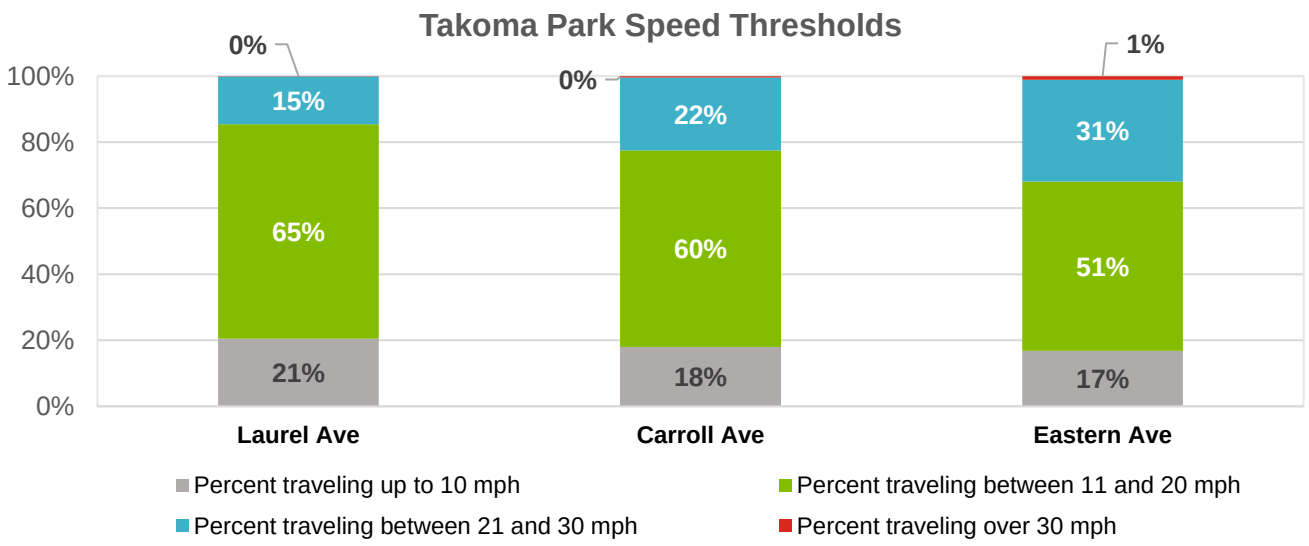


Figure 5: Speed Thresholds (Source: DCI/Toole Design)

INTERSECTION TURNING MOVEMENTS

Motor vehicle volumes from the multimodal TMCs throughout the study area were rounded to the nearest 5 and balanced between study intersections. The rounded and balanced volumes are shown in Figure 6 through Figure 8 in the following pages. TMCs were collected on Wednesday, October 17 and Sunday, October 22, 2023 at ten intersections. These counts, combined with signal timing information provided by DDOT and MCDOT, are used to calculate measures in the Motor Vehicle Operations section of this report.

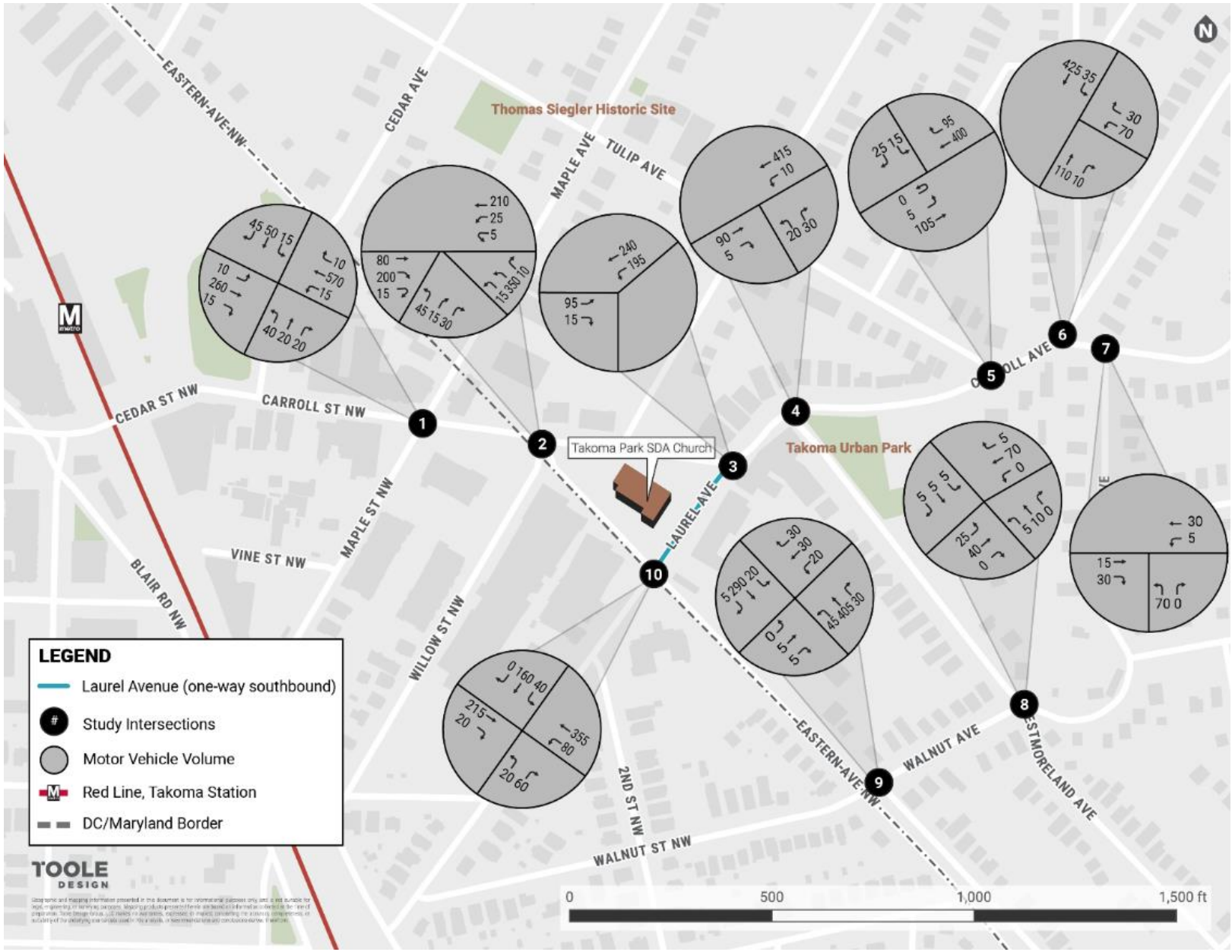


Figure 6: Existing 2023 Turning Movement Counts – AM Peak (Source: DCI/Toole Design)

Figure 7: Existing 2023 Turning Movement Counts – PM Peak (Source: DCI/Toole Design)

Figure 8: Existing 2023 Turning Movement Counts – Sunday Peak (Source: DCI/Toole Design)

BACKGROUND DEVELOPMENTS

Background developments are planned developments which may have an impact on traffic in the study area but have not yet been opened or occupied. Four multi-family developments were identified in the Takoma neighborhood of Washington, D.C. as having potential impacts on motor vehicle volumes in the study. Three developments (i.e., 218 Cedar St NW, 325 Vine St NW, and 6896 Laurel St, NW) are currently under construction and are slated to open in 2024; while a larger redevelopment around the Takoma Metro station was approved by DC's Zoning Commission in September 2023. Background development locations are shown on Figure 9.

Of the four developments identified, only the Takoma Metro Station Redevelopment had trip generation and distribution data available from DDOT. According to DDOT staff, the other developments were not required to submit this information as the developments were by-right. To account for the potential impact of the trips generated by these developments, the consultant team calculated the expected trip generation using the number of dwelling units and commercial square footage for each development using standard practice formulas published by the Institute of Transportation Engineers (ITE). Further adjustments to the trip generation were made according to Montgomery County Local Area Transportation Review (LATR) guidelines for Takoma Park of the neighborhood and expected use of transit and non-motorized modes of transportation. Montgomery County LATR guidelines were used as they are publicly available and tuned to the local conditions of the area; comparable trip generation guidelines are not available from DDOT. Trip generation results are shown in Table 3 and Table 4. The results will inform adjustments that need to be made to the existing turning movement counts to account for the increase in traffic when modeling closure scenarios.

Figure 9: Background Developments (Source: DDOT)

Table 3: Background Development Trip Generation – AM Peak (Source: DDOT/ITE/Toole Design)

Property	Trip Generation Source	Land Use	Size	Auto Driver			Auto Passenger			Transit			Non-Motorized			Total Person Trips		
				In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
6896 Laurel St NW, Washington, D.C. 20012	Calculated – ITE and MoCo Adjustments	Residential	353 du	**25**	**72**	**98**	**10**	**28**	**38**	**5**	**14**	**18**	**7**	**20**	**27**	**47**	**134**	**181**
218 Cedar St NW, Washington, D.C. 20012	Calculated – ITE and MoCo Adjustments	Residential	36 du	3	8	10	1	3	4	1	1	2	1	2	3	5	14	19
		Office	9,000 sf	25	4	29	4	1	5	6	1	7	4	1	5	40	6	46
		Total		**28**	**12**	**39**	**5**	**4**	**9**	**6**	**2**	**9**	**5**	**3**	**8**	**45**	**21**	**65**
325 Vine St NW, Washington, D.C. 20012	Calculated – ITE and MoCo Adjustments	Residential	159 du	**12**	**33**	**45**	**5**	**13**	**17**	**2**	**6**	**8**	**3**	**9**	**12**	**22**	**61**	**83**
Takoma Metro Station Redevelopment	DDOT CTR	Residential	440 du	24	76	100	-	-	-	18	57	75	6	16	22	48	149	197
		Retail	17,650 sf	9	6	15	-	-	-	16	11	27	14	9	23	39	26	65
		Total		**33**	**82**	**115**	**-**	**-**	**-**	**34**	**68**	**102**	**20**	**25**	**45**	**87**	**175**	**262**

Table 4: Background Development Trip Generation – PM Peak (Source: DDOT/ITE/Toole Design)

Property	Trip Generation Source	Land Use	Size	Auto Driver			Auto Passenger			Transit			Non-Motorized			Total Person Trips		
				In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
6896 Laurel St NW, Washington, D.C. 20012	Calculated – ITE and MoCo Adjustments	Residential	353 du	**75**	**48**	**123**	**29**	**19**	**48**	**14**	**9**	**23**	**21**	**13**	**34**	**139**	**89**	**229**
218 Cedar St NW, Washington, D.C. 20012	Calculated – ITE and MoCo Adjustments	Residential	36 du	8	5	14	3	2	5	2	1	3	2	1	4	16	10	26
		Office	9,000 sf	2	8	10	0	1	2	0	2	2	0	1	2	2	13	15
		Total		**10**	**13**	**23**	**4**	**3**	**7**	**2**	**3**	**5**	**3**	**3**	**6**	**18**	**23**	**41**
325 Vine St NW, Washington, D.C. 20012	Calculated – ITE and MoCo Adjustments	Residential	159 du	**35**	**22**	**57**	**14**	**9**	**22**	**7**	**4**	**11**	**10**	**6**	**16**	**65**	**41**	**106**
Takoma Metro Station Redevelopment	DDOT CTR	Residential	440 du	58	37	95	-	-	-	43	28	71	12	8	20	113	73	186
		Retail	17,650 sf	20	21	41	-	-	-	37	38	75	32	32	64	89	91	180
		Total		**78**	**58**	**136**	**-**	**-**	**-**	**80**	**66**	**146**	**44**	**40**	**84**	**202**	**164**	**366**

D. MOTOR VEHICLE OPERATIONS

The capacity analysis methodology for motor vehicles is based on the concepts and procedures in the Highway Capacity Manual (HCM) utilizing *Synchro 10* software. The motor vehicle capacity analysis was conducted for the morning (AM) and afternoon (PM) peak hours. The section below summarizes the existing conditions results. The next phase of the study will include analysis scenarios with the Laurel Avenue closure.

PERFORMANCE MEASURES

The following measures were used to assess the impacts to vehicular travel:

Intersection Delay – Delay is the average amount of time, in seconds, that it takes a vehicle passing through an intersection beyond what would be experienced in a free-flow condition. Intersection delay is reported as overall vehicle delay and vehicle delay by movement for select locations that will include re-routed traffic.

Level of Service (LOS) – Vehicular Level of Service (LOS) is a qualitative measure of traffic congestion based on the average delay for a motorist. LOS is reported as overall intersection LOS and LOS by movement for select locations that will include re-routed traffic. LOS A defines minimum traffic delay and is an indication that there is underutilized roadway capacity during the peak hour. LOS F represents high levels of traffic delay. The table below, excerpted from the Highway Capacity Manual, provides LOS criteria for signalized intersections.

Table 5: Level of Service Relationship with Control Delay (Source: Highway Capacity Manual)

Level of Service	Signalized Intersection Control Delay (seconds)	Stop-Controlled Intersection Control Delay (seconds)
A	0 to 10	0 to 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

One weakness of using vehicular level of service as a primary measure of traffic operations is that the use of a letter grade scale implies that “A” is the best condition. LOS A, B, or C means that there is excess vehicle capacity, which can have negative consequences like speeding, endangering people walking or biking. There are no national standards for LOS, and cities or states have discretion to adopt LOS targets that reflect their unique constraints and their tolerance for traffic congestion. As stated in the HCM, “the existence of a LOS F condition does not, by itself indicate that action must be taken to correct the condition” if other goals of the project are being met.

Volume-to-Capacity (v/c) Ratio – A volume-to-capacity ratio quantifies the degree to which a phase’s capacity is utilized by a lane group at a signalized intersection. V/c ratio will be reported by movement in the next phase of the study.

50th and 95th Percentile Queues – The 95th-percentile queue is defined to be the queue length (in vehicles) that has only a 5-percent probability of being exceeded. It is a useful parameter for determining the appropriate length of turn lane pockets, but it is not typical of what an average driver would experience. The 50th-percentile queue is the queue length on a typical cycle. Queues will be reported by movement in the next phase of the study.

RESULTS

Overall intersection results for motor vehicle operations are given in Table 6 and shown on Figure 10. Detailed reports are provided in Appendix B – Synchro Reports. All intersections operate at LOS C or higher except Carroll Ave at Eastern Ave & Willow St which operates at LOS D, E, and F for the AM Peak, PM Peak, and Sunday Peak respectively. All approaches at this intersection are striped as one-lane. The eastbound Carroll Avenue approach includes one 17' lane which may operate as a de facto right-turn lane. This approach may operate with less delay than is being reported from the results of the Synchro models, particularly in the AM peak where this is the primary movement.

Table 6: Overall Existing Conditions Intersection Motor Vehicle Operation Results (Source: Toole Design)

	Intersection	Control	AM Peak		PM Peak		Sunday Peak	
			Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	Signalized (HCM 2000)	19.6	B	21.3	C	12.1	B
2	Carroll Ave at Eastern Ave & Willow St	Signalized (HCM 2000)	40.2	D	79.2	E	122.3	F
3	Carroll Ave at Laurel St	Signalized (HCM 2000)	21.9	C	33.3	C	26.3	C
4	Carroll Ave at Westmoreland Ave (NB)	One-way Stop Controlled (NB)	11.1	B	11.8	B	11.0	B
5	Carroll Ave at Tulip Ave	Signalized	5.2	A	5.5	A	4.7	A
6	Carroll Ave at Columbia Ave (WB)	One-way Stop Controlled (WB)	14.4	B	13.6	B	10.7	B
7	Columbia Ave at Pine Ave (NB)	One-way Stop Controlled (NB)	9.2	A	9.7	A	9.2	A
8	Westmoreland Ave at Elm Ave / Walnut Ave	All-way Stop Controlled	7.4	A	8.3	A	7.5	A
9	Eastern Ave at Walnut St (WB)	Two-way Stop Controlled (EB/WB)	15.2 / 21.1	C	23.0 / 21.9	C	14.4 / 14.1	C
10	Eastern Ave at Laurel St	All-way Stop Controlled	15.8	C	12.1	B	10.1	B

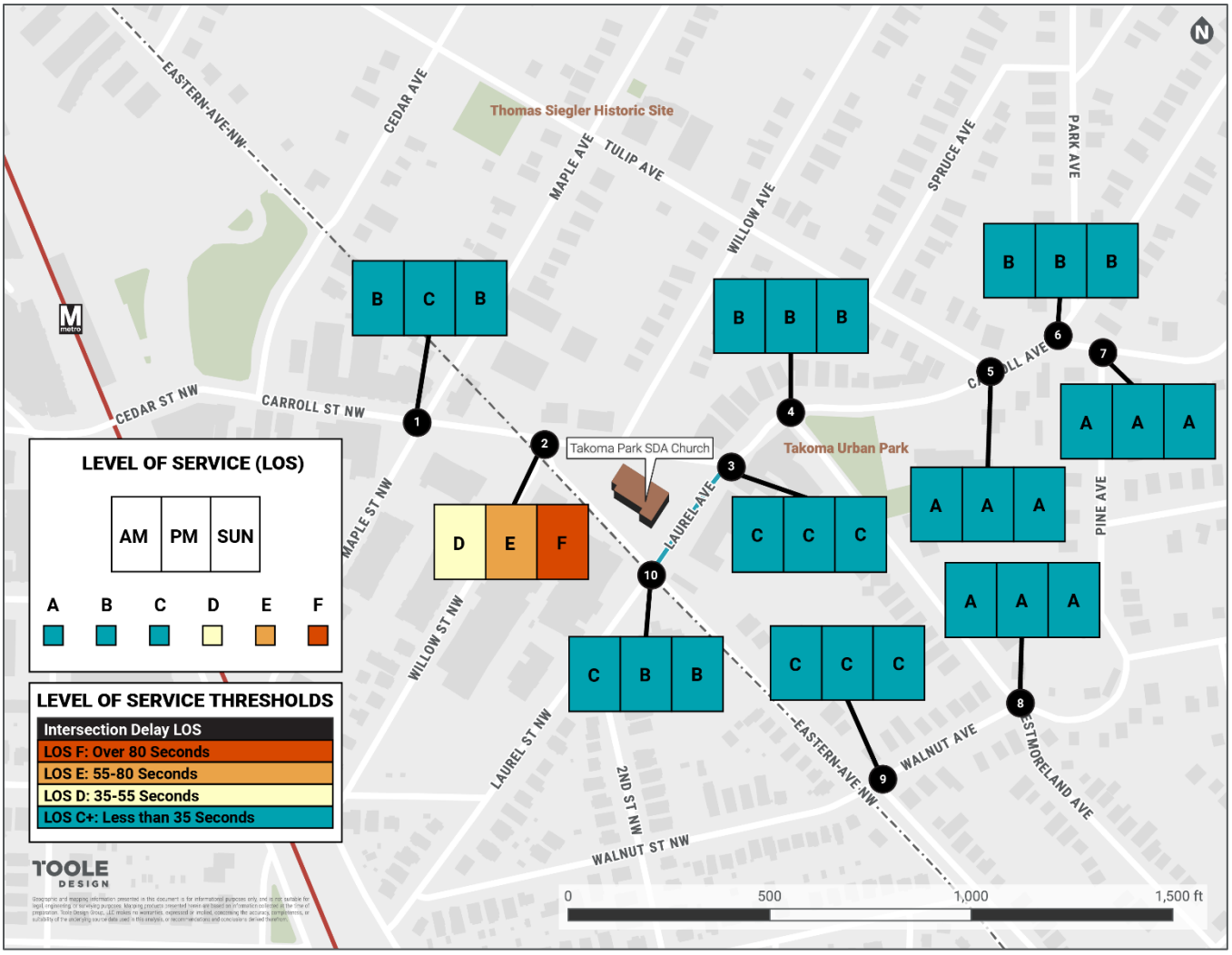


Figure 10: Motor Vehicle Level of Service at Intersections: Existing Conditions (Source: Toole Design)

E. ORIGIN-DESTINATION ANALYSIS

To inform trip re-routing in the next phase of the study, Replica was used to understand how people move currently through the study area. Replica uses Big Data sources to create large-scale models of multimodal travel activity. It leverages a variety of data sources, including demographic and locational data (such as from smartphones), to produce models with granular, privacy-safe data on mobility and people. Replica's models are calibrated and validated by comparing modeled outputs with observed travel metrics, which are sourced by Replica directly and optionally provided by Replica's customers. This information allows the team to understand the origins and destinations of people traveling by car in this corridor and where they may detour should Laurel Avenue be closed.

Replica data was pulled for Spring 2023. Replica provides data for a typical weekday (Thursday) and weekend (Saturday). For this analysis, trips were filtered to only those taken by private auto and commercial vehicle (freight) that passed through the southbound portion of Laurel Avenue between Carroll and Eastern Avenues. The percentage of vehicle trips that passed through the 6900-block of Laurel Avenue is shown in Figure 11 and Figure 12. These figures show that drivers primarily approach Laurel Avenue and end up at destinations to the south and west.

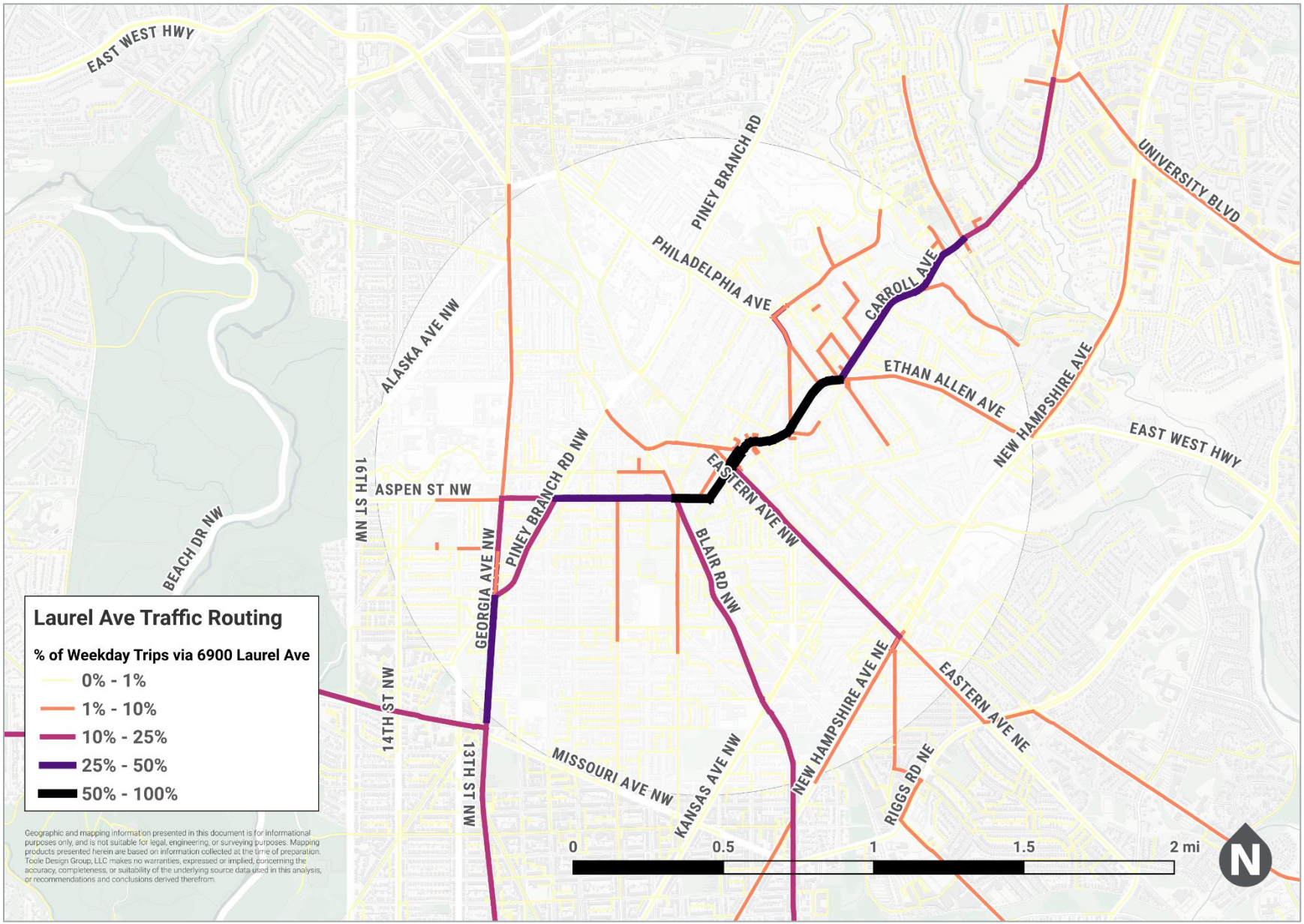


Figure 11: Laurel Avenue Traffic Routing – Weekday (Source: Replica/Toole Design)

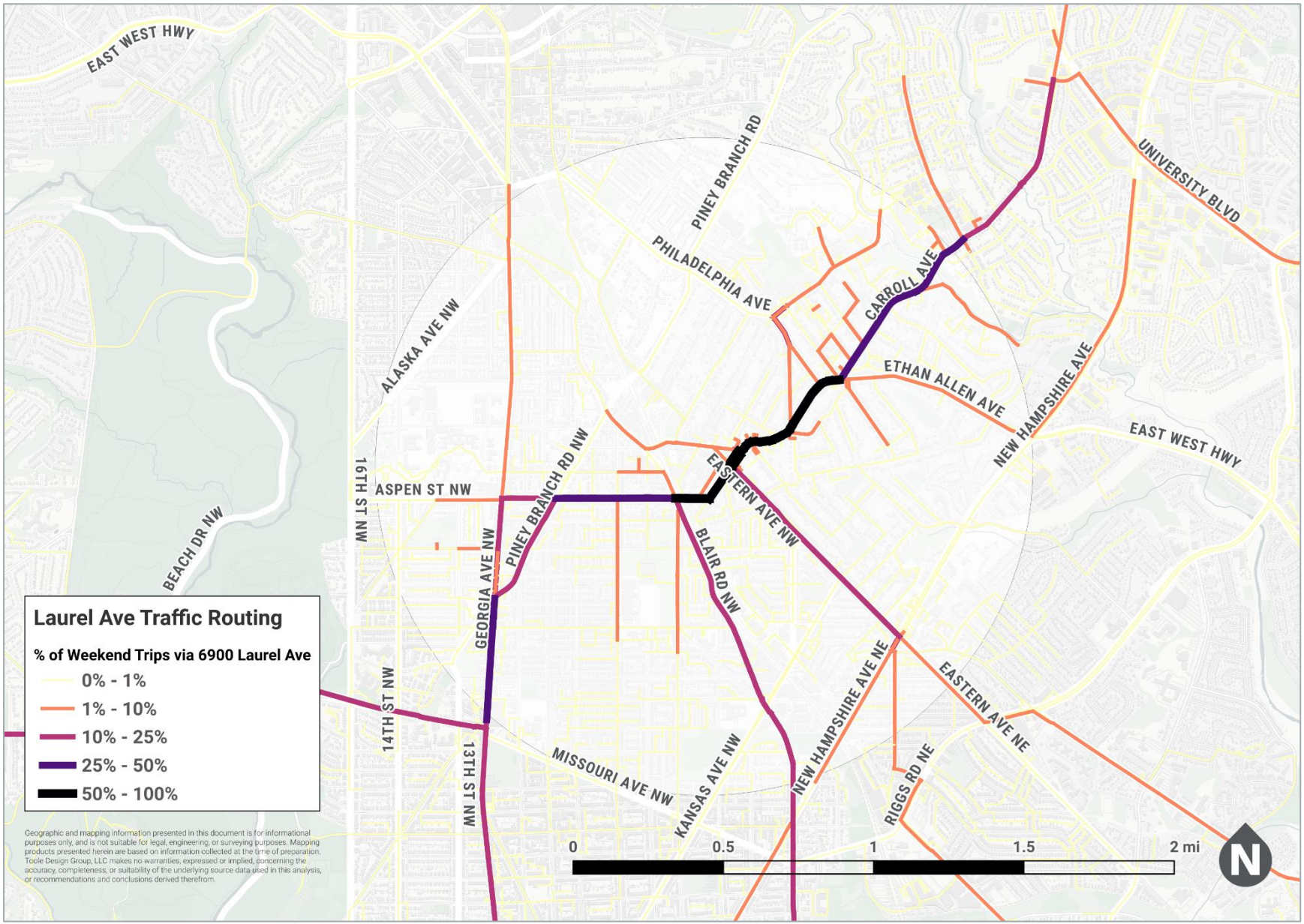


Figure 12: Laurel Avenue Traffic Routing – Weekend (Source: Replica/Toole Design)

Specific origins and destinations (see Figure 13) were identified in the study area to further understand subsets of motor vehicle traffic flows that currently use the 6900-block of Laurel Ave. Percentages of traffic between these origins and destinations and Laurel Avenue are shown in Figure 14, and the flows between specific origin-destination pairs are shown in Table 7 and Table 8.

Figure 13: Analysis Origins and Destinations for Figure 14 and Tables 7 and 8 (Source: Toole Design)

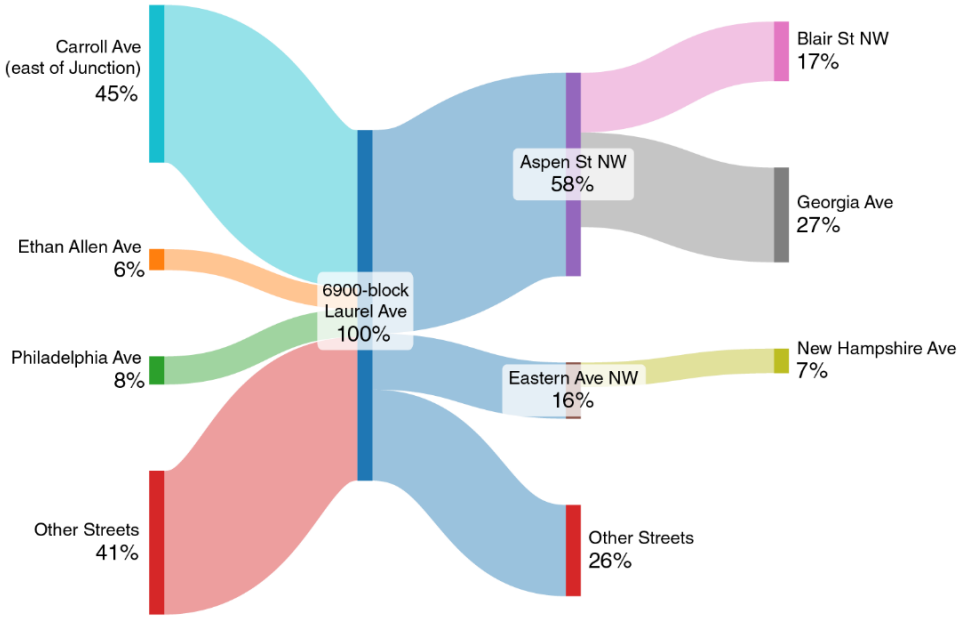


Figure 14: Percentages of Origins and Destinations for 6900 Laurel Avenue Weekday Traffic (Source: Replica/Toole Design)

As shown in Table 7 and Table 8, 80% of the trips that passed through the 6900-block of Laurel Avenue begin or end at the origins and destinations identified in Figure 12, including Philadelphia Avenue, Carroll Avenue, Ethan Allen Avenue, Aspen Street NW, and Eastern Avenue NW. The plurality of trips (36% weekday, 32% weekend) passing through the potential closure area begin from Carroll Avenue east of Takoma Junction and continue onto the Aspen Street Metrorail underpass. This specific origin and destination (O-D) pair, and other O-D pairs identified in the tables above, will be looked at more closely in the next phase of the project to determine how trips may reroute if Laurel Avenue were closed for motor vehicle traffic.

Table 7: Origin-Destination Matrix Weekday (Source: Replica/Toole Design)

		To			
		Aspen St NW	Eastern Ave NW	Other	**Total**
From	Philadelphia Ave	4%	4%	0%	**8%**
	Carroll Ave	36%	6%	3%	**45%**
	Ethan Allen Ave	4%	0%	2%	**6%**
	Other	15%	6%	20%	**42%**
	Total	**58%**	**16%**	**26%**	**100%**

Note: Values shown as % of total weekday vehicles passing through 6900-block of Laurel Ave from Replica Data

Table 8: Origin-Destination Matrix Weekend (Source: Replica/Toole Design)

		To			
		Aspen St NW	Eastern Ave NW	Other	**Total**
From	Philadelphia Ave	3%	3%	1%	**7%**
	Carroll Ave	32%	4%	10%	**46%**
	Ethan Allen Ave	4%	0%	1%	**6%**
	Other	14%	8%	19%	**41%**
	Total	**54%**	**16%**	**31%**	**100%**

Note: Values shown as % of total weekend vehicles passing through 6900-block of Laurel Ave from Replica Data

III. DATA ANALYSIS AND FORECASTING

A. MOTOR VEHICLE VOLUME FORECASTS

Using an adjusted baseline of vehicle volumes to account for background real estate developments and existing origin-destination patterns gathered from Big Data sources, we modeled the changes in vehicle flows and volumes to understand their impact on streets and intersections in the study area, which is comprised of ten neighboring intersections and their connecting street segments within Old Town Takoma (see Figure 13).

BASELINE VOLUME ADJUSTMENTS

Based on the background development trip generation calculations, presented in Table 3 and Table 4 in the Background Developments section, there would be a total of 297 new vehicle trips generated from the nearby developments in the AM peak, and 340 vehicle trips in the PM peak. Based on the Takoma Metro Station Redevelopment Comprehensive Transportation Review, which included trip distribution, 10% of trips during both the AM and PM peaks would route on Carroll Avenue through the Laurel Avenue study area (the other 90% would use streets that bypass the study area, such as Piney Branch Road). To account for the additional trips generated by new developments that will pass through the study area, their total was compared to the existing total intersection volumes during each peak, and it was determined to apply an overall growth factor of 4% throughout the study area network to account for the new developments as well as regional growth and additional future infill development. Adjusted baseline volumes for all study intersections can be found in Appendix D – Baseline, Change, and Rerouted Turning Movement Counts.

The adjusted baseline volumes were then compared with the findings in the Origin-Destination Analysis section, in particular Table 7 and Table 8, to estimate the new volumes for different subsets of motor vehicle traffic flows that currently use the 6900-block of Laurel Avenue. Expected near-future percentages and total daily and peak hour traffic volumes between specific origin-destination (O-D) pairs for weekdays and weekends are shown in Table 9 through Table 12.

WEEKDAY O-D ANALYSIS

Table 9: Origin-Destination Matrix Weekday – Total Daily Volume (Source: Toole Design)

		To			
		Aspen St NW	Eastern Ave NW	Other	**Total**
From	Philadelphia Ave	62	61	5	128
	Carroll Ave	557	88	52	698
	Ethan Allen Ave	58	4	26	88
	Other	235	96	317	648
	Total	912	250	400	**1,562**

Table 10: Origin-Destination Matrix Weekday – AM and *(PM)* Peak Hour (Source: Toole Design)

		To			
		Aspen St NW	Eastern Ave NW	Other	**Total**
From	Philadelphia Ave	8 *(4)*	8 *(4)*	1 *(0)*	17 *(9)*
	Carroll Ave	73 *(39)*	12 *(6)*	7 *(4)*	92 *(49)*
	Ethan Allen Ave	8 *(4)*	1 *(0)*	3 *(2)*	12 *(6)*
	Other	31 *(17)*	13 *(7)*	42 *(22)*	85 *(46)*
	Total	120 *(64)*	33 *(18)*	52 *(28)*	**205 *(110)***

WEEKEND O-D ANALYSIS

Table 11: Origin-Destination Matrix Weekend – Total Daily Volume (Source: Toole Design)

		To			
		Aspen St NW	Eastern Ave NW	Other	**Total**
From	Philadelphia Ave	42	46	11	98
	Carroll Ave	424	56	126	606
	Ethan Allen Ave	56	2	19	76
	Other	189	102	252	544
	Total	711	205	408	**1,324**

Table 12: Origin-Destination Matrix Weekend – Sunday Peak Hour (Source: Toole Design)

		To			
		Aspen St NW	Eastern Ave NW	Other	**Total**
From	Philadelphia Ave	3	3	1	7
	Carroll Ave	29	4	9	41
	Ethan Allen Ave	4	0	1	5
	Other	13	7	17	37
	Total	48	14	28	**90**

REROUTE SCENARIO

Based on the above analysis, likely reroutes were developed for each of the O-D pairs in consultation with city staff to model the new traffic patterns that may emerge in a reroute scenario if Laurel Avenue were to be closed to southbound vehicle traffic. These reroutes were based on the following factors:

- Specific origin-destination pairs
- Existing traffic counts from Carroll Avenue at Laurel Avenue and Eastern Avenue at Laurel Avenue
- Existing intersection operations
- Potential reroutes trip time and length
- Corroborated using Google Maps route suggestions.
- Engineering judgement and local knowledge

To model the impact of the closure conservatively, the reroute scenario assumes that all vehicle traffic within the study area will continue travelling through at least one of the study intersections when southbound Laurel Avenue is closed. That is, the scenario will *not* model motorists that take detours outside of the study area, even though it may be advantageous for them to do so in real life. To model detours outside of the study area, use of a regional travel demand model would be needed but is outside of the purview of this project.

Reroutes for each of the specific O-D pairs can be found in Appendix C – Existing, Transitional, and Rerouted Vehicle Flows, but an example is shown in Figure 15 (see next page). Overall, vehicles traveling towards the Aspen Street Metrorail underpass are projected to reroute onto Willow Street, with some traveling on Maple Street or continuing on Carroll towards Cedar Street. Vehicles traveling towards Eastern Avenue are projected to reroute onto Pine and Westmoreland Avenues and exit back out on Eastern at Walnut Avenue. To calculate the change in traffic, volumes associated with each O-D pair are moved from “existing” to “rerouted” intersections per the detours outlined in Appendix C as part of scenario modeling.

Trips with an origin or destination noted as “Other” in Tables 1 through 6 start or end in a location that does not lead through one of the identified origins or destinations. These could be trips that start or end within a local neighborhood in Takoma Park, or travel through the study in a way that avoids the analysis origins or destinations. Reroutes for these trips were calculated from subtracting the origin-destination pair volumes from the existing turning movement volumes at both Carroll Avenue at Laurel Avenue and Eastern Avenue at Laurel Avenue and placing them in other nearby intersections as illustrated in the figures in Appendix D – Baseline, Change, and Rerouted Turning Movement Counts.

As an additional check, a transitional vehicle flow pattern between the existing condition and the reroute scenario was also analyzed in a preliminary way to understand the impact of drivers not knowing the closure in advance and therefore having detour at an intersection downstream from Carroll at Laurel. The results of this transitional scenario resulted in more pressure (i.e., turning traffic volume) at the intersection of Carroll Avenue at Willow Street/Eastern Avenue compared to the reroute scenario, primarily in the weekday AM and PM peak. However, it is unlikely to be permanent as drivers are likely to begin taking the more optimal reroute within the study area or reroute outside the study area after a few weeks, in a pattern similar to the closure of northbound Laurel Avenue.

Figure 15: Example Map of Existing, Transitional, and Rerouted Vehicle Flows from Carroll Avenue east of Takoma Junction to Eastern Avenue Origin-Destination Pair (Source: Toole Design)

REROUTE RESULTS

The applicable vehicle volumes from the adjusted baseline were shifted from the existing vehicle flows to the rerouted flows using Synchro to model the impact of a closure of Laurel Avenue. The existing turning movement volume diagrams, the change in volumes, and the reroute scenario volumes for the AM, PM, and Sunday peak are shown in figures available in Appendix D – Baseline, Change, and Rerouted Turning Movement Counts. Appendix D figures show where and how many vehicles turn (or not) at each study intersection. Summarized figures which add up the rerouted turning movement counts are shown below by peak hour in Figure 16 through Figure 21.

In the case that a closure of Laurel Avenue is for a temporary but predictable interval, such as a closure paired with the Takoma Park Farmers Market on Sundays, it is expected that only the impact in the relevant peak period will be realized (i.e., Sunday Peak) while at other times the conditions in the study area will revert to existing conditions.

AM PEAK

Weekday morning rush hour is when southbound Laurel Avenue currently receives the most traffic, with around 210 vehicles during the peak hour needing to be rerouted. Of those about 175 vehicles were heading towards the Aspen Street Metrorail underpass and are forecasted to take the reroutes highlighted in Figure 16, primarily impacting the block of Carroll Avenue in front of the Seventh-Day Adventist Church and Willow Street. About 30 vehicles were heading towards Eastern Avenue and are forecasted to take reroutes highlighted in Figure 17 to reach Walnut Avenue. The callout boxes in the figures below show the net change in vehicle volumes on relevant street segments.

Figure 16: Forecasted Reroutes for Aspen Street-bound Vehicle Traffic – AM Peak (Source: Toole Design)

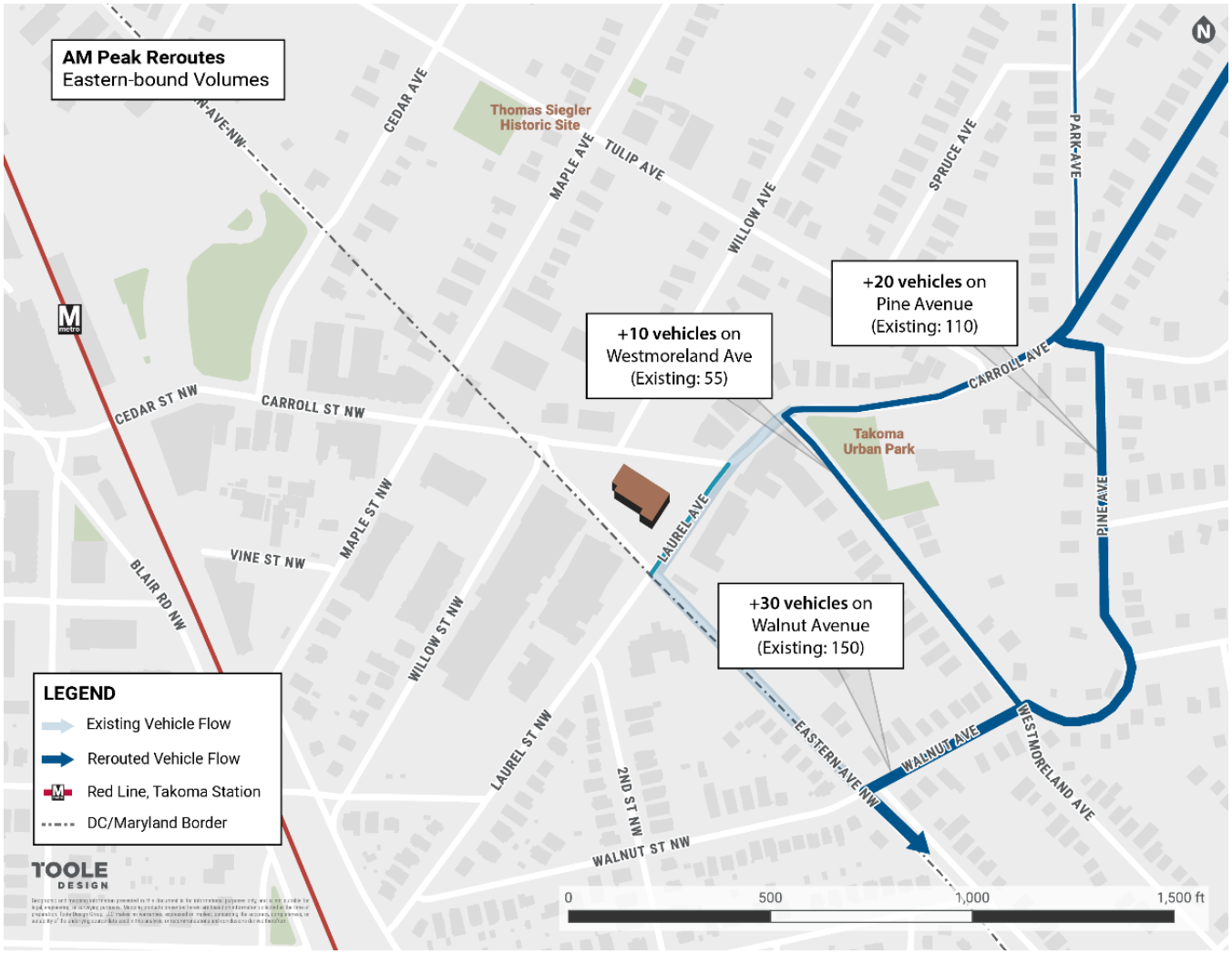


Figure 17: Forecasted Reroutes for Eastern Avenue-bound Vehicle Traffic – AM Peak (Source: Toole Design)

PM PEAK

Weekday afternoon rush hour is less busy on southbound Laurel Avenue compared to the morning rush, with around 115 vehicles during the peak hour needing to be rerouted. Of those, about 75 vehicles were heading towards the Aspen Street Metrorail underpass and are forecasted to take the reroutes highlighted in Figure 18, while about 25 vehicles were heading towards Eastern Avenue and are forecasted to take reroutes highlighted in Figure 19. Impacts are likely to be less severe as the net changes in vehicle traffic are less than the AM Peak. The balance of 15 vehicles are rerouted to other parts of the network, which have been omitted from the graphic for ease of readability but are accounted for in further operational analyses.

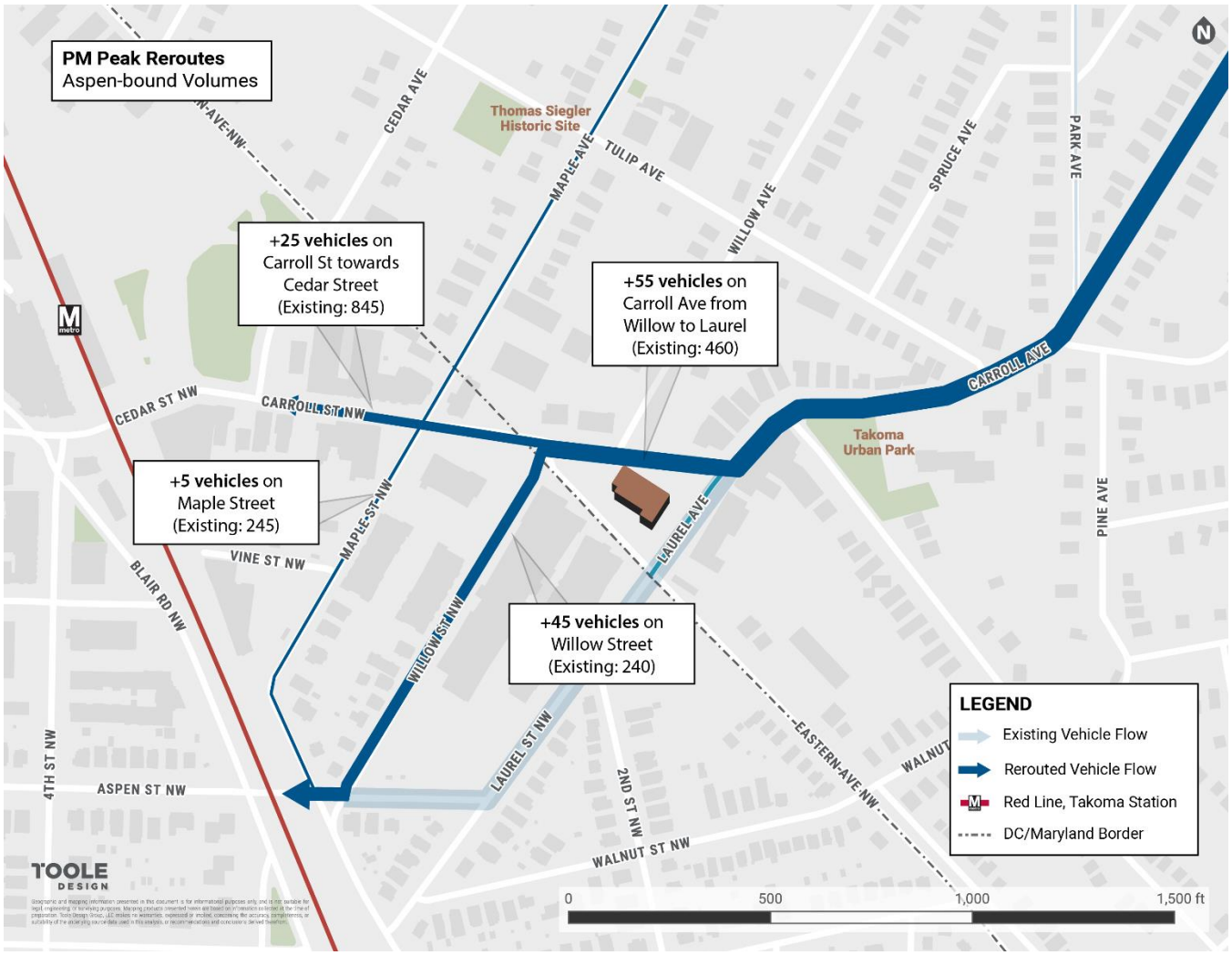


Figure 18: Forecasted Reroutes for Aspen Street-bound Vehicle Traffic – PM Peak (Source: Toole Design)

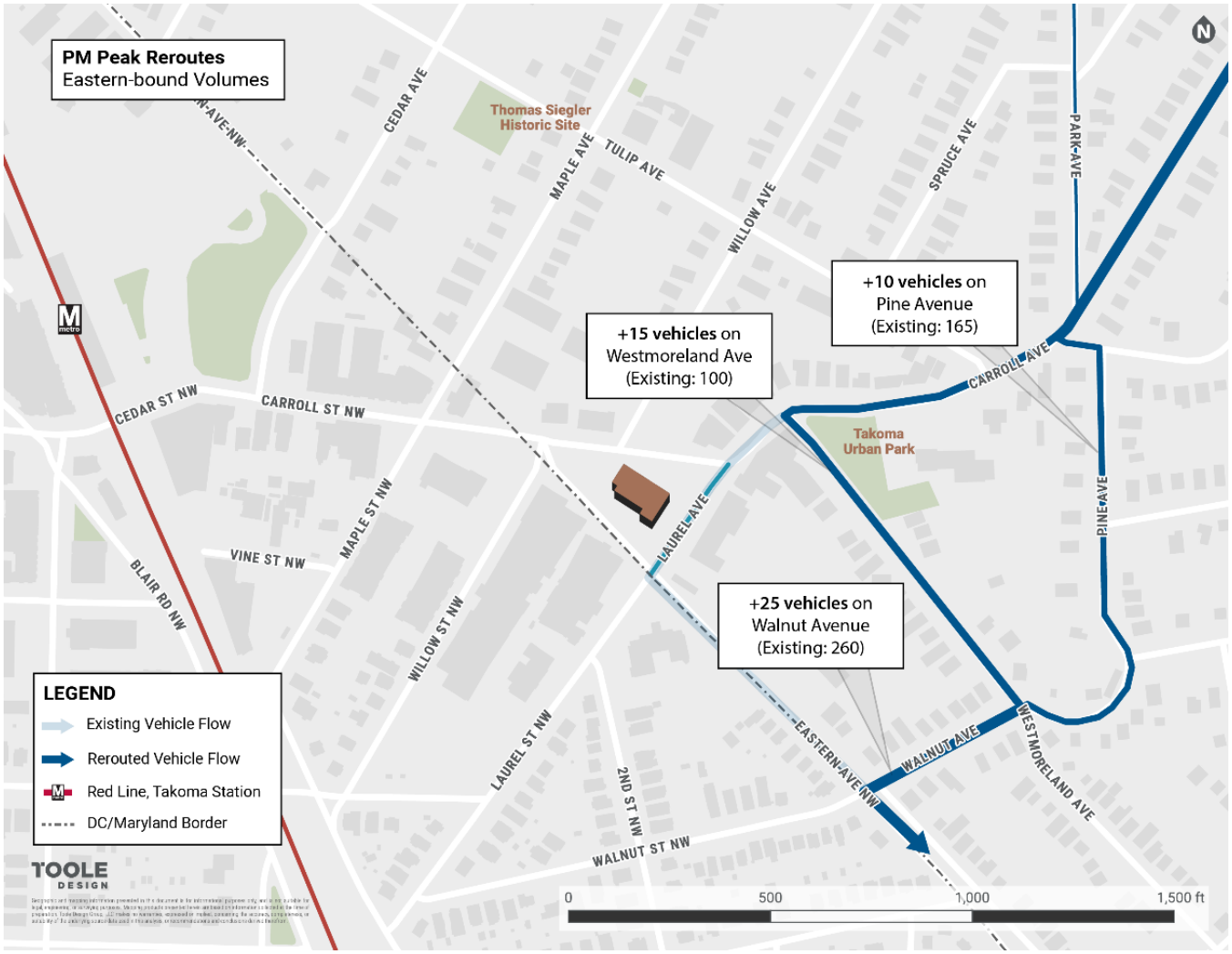


Figure 19: Forecasted Reroutes for Eastern Avenue-bound Vehicle Traffic – PM Peak (Source: Toole Design)

SUNDAY PEAK

Sunday peak hour is less busy on southbound Laurel Avenue compared to weekday rush hours, with around 75 vehicles during the peak hour needing to be rerouted. Of those, about 40 vehicles were heading towards the Aspen Street Metrorail underpass and are forecasted to take the reroutes highlighted in Figure 20, while about 20 vehicles were heading towards Eastern Avenue and are forecasted to take reroutes highlighted in Figure 21. Impacts are likely to be less severe as the net changes in vehicle traffic are less than the AM Peak. As with the PM Peak, the balance of 15 vehicles is rerouted to other parts of the network, which have been omitted from the graphic for ease of readability but are accounted for in further operational analyses.

In the case that a closure of Laurel Avenue is only temporary and timed with the Takoma Park Farmers Market business hours, the results would be the only ones that are applicable in this temporary closure scenario. When the street is reopened to vehicular traffic, it is expected that motor vehicle flows will resume a pattern similar to current conditions.

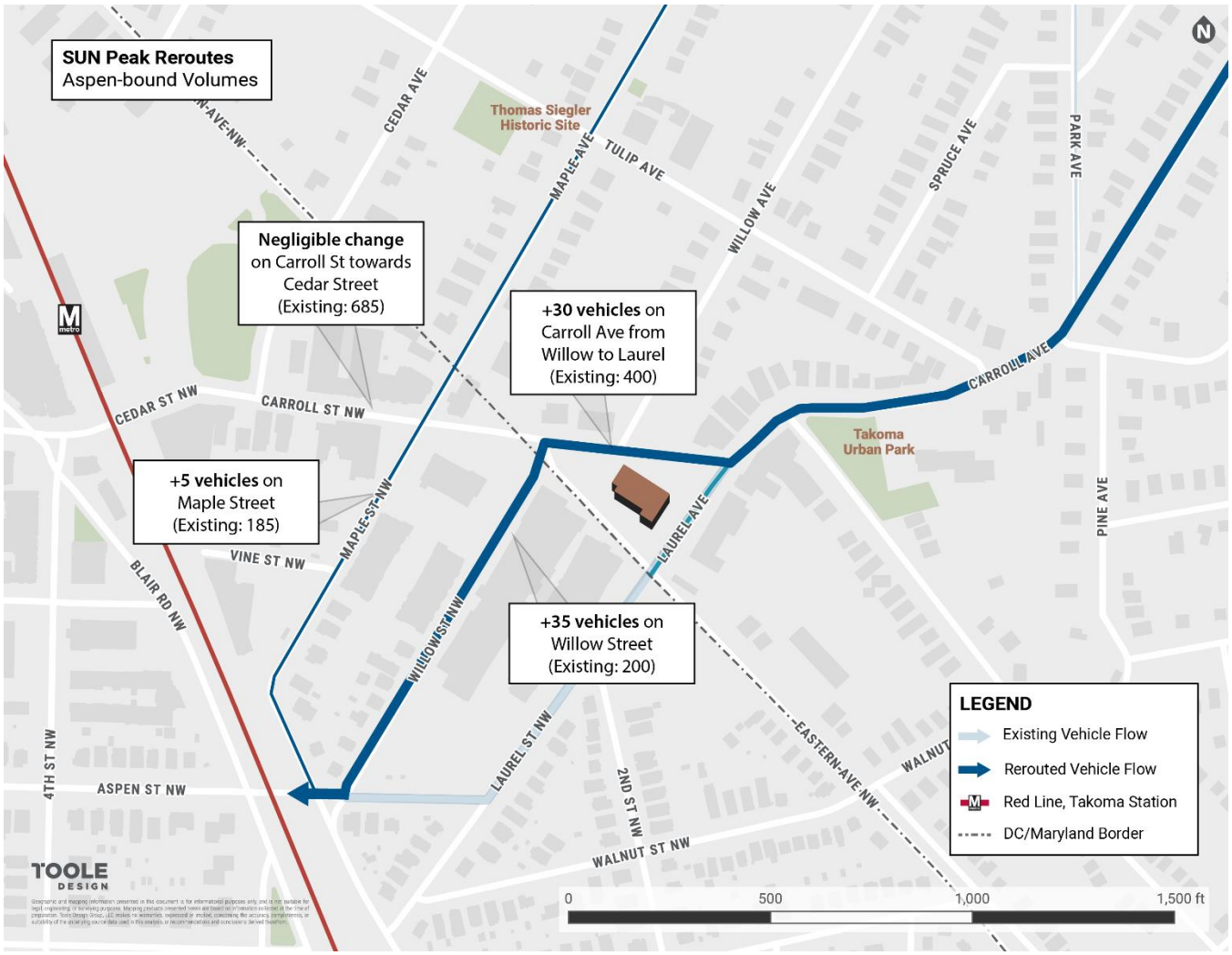


Figure 20: Forecasted Reroutes for Aspen Street-bound Vehicle Traffic – Sunday Peak (Source: Toole Design)

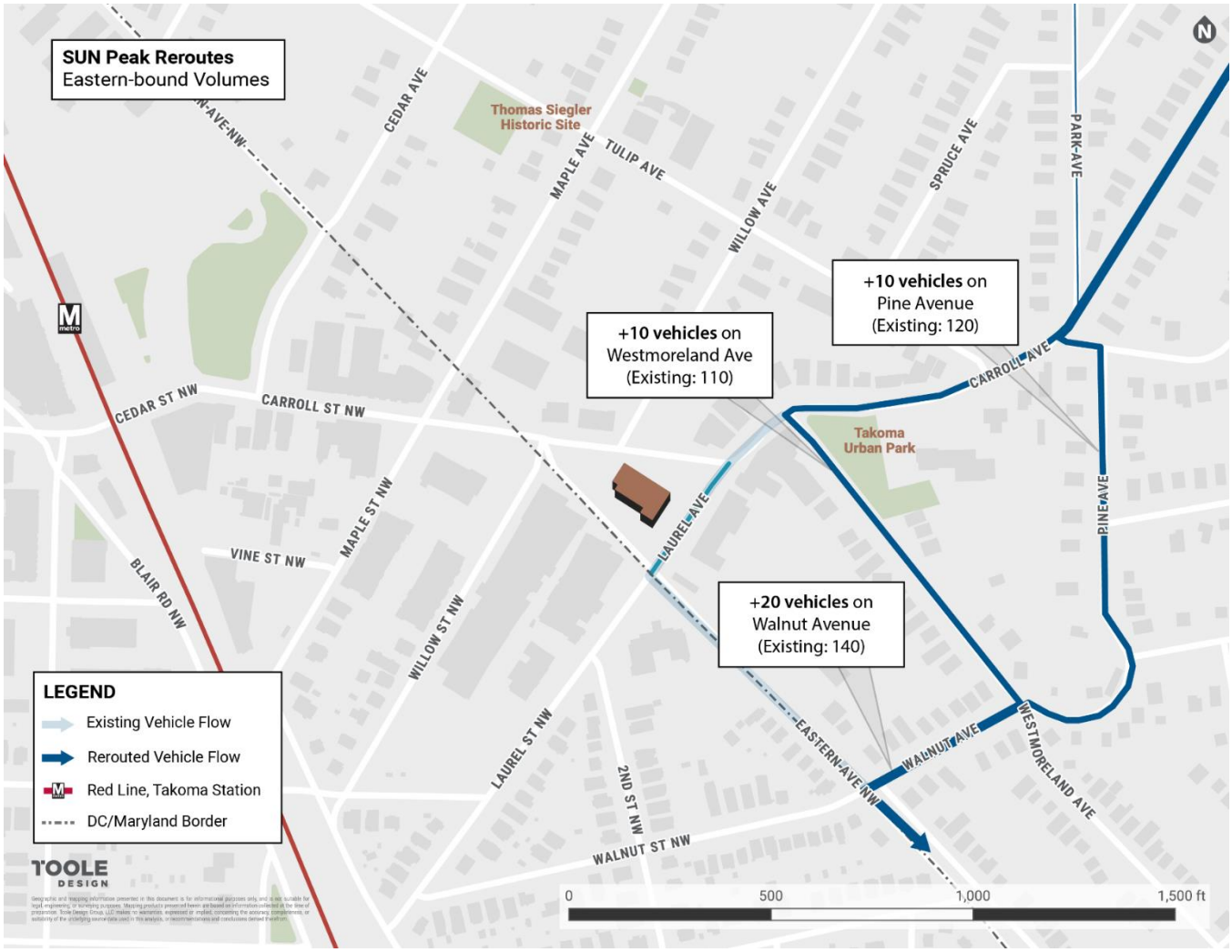


Figure 21: Forecasted Reroutes for Eastern Avenue-bound Vehicle Traffic – Sunday Peak (Source: Toole Design)

B. MOTOR VEHICLE OPERATIONS FORECASTS

Using the forecasted motor vehicle volumes in the reroute scenario, the Synchro program can generate the forecasted motor vehicle operation results at the study intersections – both at signalized and unsignalized intersections. Before-and-after intersection results for motor vehicle operations are given in Table 13 through Table 15 for the AM, PM, and Sunday peak in terms of average delay for all vehicles and a Level of Service (LOS) rating. The LOS ratings are summarized in Figure 22.

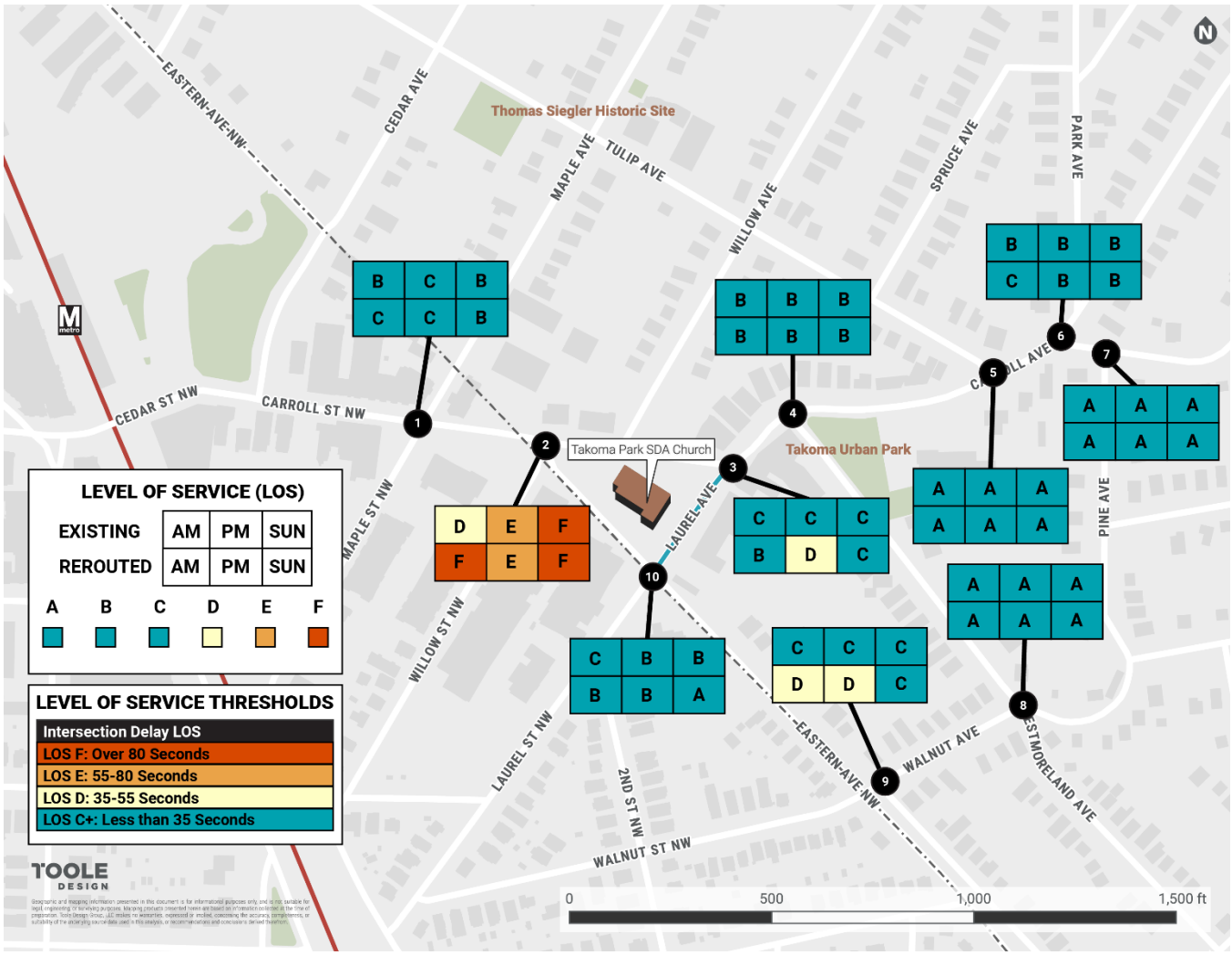


Figure 22: Motor Vehicle Level of Service at Intersections – Existing vs. Rerouted Scenario for AM, PM, and Sunday Peak (Source: Toole Design)

Table 13: Overall Intersection Motor Vehicle Operation Results – AM Peak (Source: Toole Design)

	Intersection	Control	Existing		Reroute	
			Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	Signalized	19.6	B	22.4	C
2	Carroll Ave at Eastern Ave & Willow St	Signalized	40.2	D	91.8	F
3	Carroll Ave at Laurel Ave	Signalized	21.9	C	18.1	B
4	Carroll Ave at Westmoreland Ave	One-way Stop Controlled (NWB)	11.1	B	11.1	B
5	Carroll Ave at Tulip Ave	Signalized	5.2	A	5.2	A
6	Carroll Ave at Columbia Ave	One-way Stop Controlled (WB)	14.4	B	15.3	C
7	Columbia Ave at Pine Ave	One-way Stop Controlled (NB)	9.2	A	9.3	A
8	Westmoreland Ave at Elm Ave / Walnut Ave	All-way Stop Controlled	7.4	A	7.5	A
9	Eastern Ave at Walnut St	Two-way Stop Controlled **(EB)**	15.2	C	15.1	C
9	Eastern Ave at Walnut Ave	Two-way Stop Controlled **(WB)**	21.1	C	26.5	D
10	Eastern Ave at Laurel Ave	All-way Stop Controlled	15.8	C	12.6	B

Table 14: Overall Intersection Motor Vehicle Operation Results – PM Peak (Source: Toole Design)

	Intersection	Control	Existing		Reroute	
			Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	Signalized	21.3	C	20.8	C
2	Carroll Ave at Eastern Ave & Willow St	Signalized	79.2	E	79.3	E
3	Carroll Ave at Laurel Ave	Signalized	33.3	C	38.1	D
4	Carroll Ave at Westmoreland Ave	One-way Stop Controlled (NWB)	11.8	B	12.0	B
5	Carroll Ave at Tulip Ave	Signalized	5.5	A	5.5	A
6	Carroll Ave at Columbia Ave	One-way Stop Controlled (WB)	13.6	B	14.0	B
7	Columbia Ave at Pine Ave	One-way Stop Controlled (NB)	9.7	A	9.7	A
8	Westmoreland Ave at Elm Ave / Walnut Ave	All-way Stop Controlled	8.3	A	8.4	A
9	Eastern Ave at Walnut St	Two-way Stop Controlled **(EB)**	23.0	C	23.2	C
9	Eastern Ave at Walnut Ave	Two-way Stop Controlled **(WB)**	21.9	C	28.2	D
10	Eastern Ave at Laurel Ave	All-way Stop Controlled	12.1	B	11.3	B

Table 15: Overall Intersection Motor Vehicle Operation Results – Sunday Peak (Source: Toole Design)

	Intersection	Control	Existing		Reroute	
			Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	Signalized	12.1	B	11.9	B
2	Carroll Ave at Eastern Ave & Willow St	Signalized	122.3	F	112.3	F
3	Carroll Ave at Laurel Ave	Signalized	26.3	C	26.6	C
4	Carroll Ave at Westmoreland Ave	One-way Stop Controlled (NWB)	11.0	B	11.1	B
5	Carroll Ave at Tulip Ave	Signalized	4.7	A	4.7	A
6	Carroll Ave at Columbia Ave	One-way Stop Controlled (WB)	10.7	B	10.9	B
7	Columbia Ave at Pine Ave	One-way Stop Controlled (NB)	9.2	A	9.3	A
8	Westmoreland Ave at Elm Ave / Walnut Ave	All-way Stop Controlled	7.5	A	7.6	A
9	Eastern Ave at Walnut St	Two-way Stop Controlled **(EB)**	14.4	B	14.4	B
9	Eastern Ave at Walnut Ave	Two-way Stop Controlled **(WB)**	14.1	B	15.9	C
10	Eastern Ave at Laurel Ave	All-way Stop Controlled	10.1	B	9.9	A

In summary, all intersections operate at LOS C or higher in the baseline condition except at Carroll Ave at Eastern Ave & Willow St, which operates at LOS D, E, and F during the AM, PM, and Sunday peak respectively. In the reroute scenario, with no additional changes to signal timings or operations, the same intersection would operate at LOS F, E, and F during the AM, PM, and Sunday peak respectively. Additionally, two other intersections would also have their LOS rating lowered: Carroll Avenue at Laurel Avenue would operate at LOS D in the PM Peak and the westbound approach of Eastern Avenue at Walnut Street would operate at LOS D in the AM and PM peaks.

Despite these changes to intersection operations, the closure of the 6900-block of Laurel Avenue could be enacted with little to no changes or mitigation to the surrounding street network as the reroute scenario would not severely increase delays to levels not seen today on the network. That being said, mitigation options are recommended for the most heavily impacted intersections to improve traffic operations in the area.

C. POTENTIAL MITIGATION OPTIONS

Mitigation options were analyzed for the four most impacted intersections in a reroute scenario: Carroll Street at Maple Street NW (intersection #1), Carroll Avenue at Eastern Avenue & Willow Street (#2), Carroll Avenue at Laurel Avenue (#3), and Eastern Avenue at Walnut Street (#9). The following range of mitigation options were considered to improve vehicular operations at these intersections as well as pedestrian safety:

- **Intersections #1-3: Carroll Avenue from Maple Street to Laurel Avenue**
  - Option A: Signal Timing Optimization at Intersections #1-3
  - Option B: Left-Turn Lane with Protected Signal Phase on Westbound Carroll Avenue (Int. #2)
  - Option C: Left Turn Restriction on Westbound Carroll Avenue (Intersection #2)
  - Option D: Roundabout at Intersection #2
- **Intersection #9: Eastern Avenue at Walnut Avenue**
  - All-Way Stop Control

INTERSECTIONS #1-3: CARROLL AVENUE FROM MAPLE STREET TO LAUREL AVENUE

Option A: Signal Timing Optimization at Intersections #1-3

A relatively easy to implement mitigation option, primarily to the benefit of drivers, would be signal timing adjustments focused on the intersections of Carroll at Laurel Avenues and at Eastern Avenue & Willow Street.

With the closure of the southbound direction of Laurel Avenue, rather than splitting between Carroll Avenue and Laurel Avenue, nearly all south-westbound traffic will be continuing onto Carroll Avenue. However, the sole access point to the parking lot located behind Laurel Avenue is through this intersection. Due to the curve of the street, it is recommended to provide a short left-turn arrow for south-westbound drivers turning into the driveway that would serve at the beginning of the cycle. Following that phase, south-west bound drivers continuing onto Carroll Avenue and eastbound Carroll Avenue could operate concurrently for an extended phase, followed by an exclusive pedestrian phase (see Figure 23).

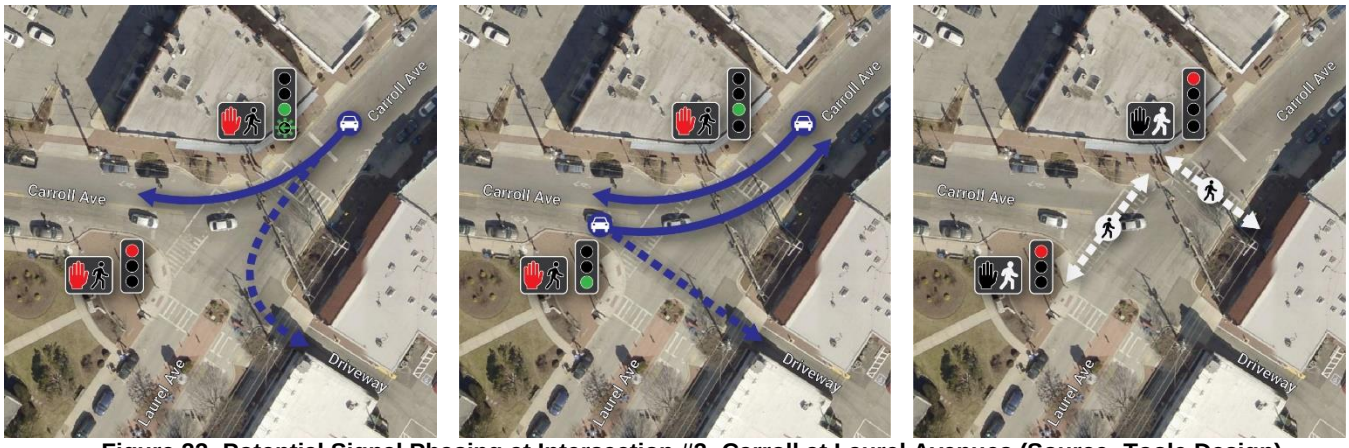


Figure 23: Potential Signal Phasing at Intersection #3: Carroll at Laurel Avenues (Source: Toole Design)

Additionally, in order to better accommodate the traffic at Carroll Avenue at Willow Street and Eastern Avenue, and Carroll Avenue at Maple Street, the signal timings were optimized at these intersections to provide more time for vehicles on Carroll Avenue. The results of this mitigation strategy on these three neighboring signalized intersections in the study area are given in Table 16 through Table 18. Compared to the reroute scenario with no mitigation, delay for drivers would be significantly reduced at Carroll Avenue at Eastern Avenue & Willow Street and Carroll Avenue at Laurel Avenue with signal timing optimization.

Given the ease of implementation and the improvement of vehicular operations at these three intersections, implementing signal timing adjustments is a reasonable request to be made of the signal operators and should be done in conjunction with a closure of Laurel Avenue. Signals at intersections 1 and 2 are owned and controlled by DDOT, while the signal at intersection 3 is owned by MDOT SHA and controlled by MCDOT. Applying this mitigation strategy would result in a before-and-after LOS rating as shown in Figure 24. Measurements of average delay can be found in Table 16 through Table 18.

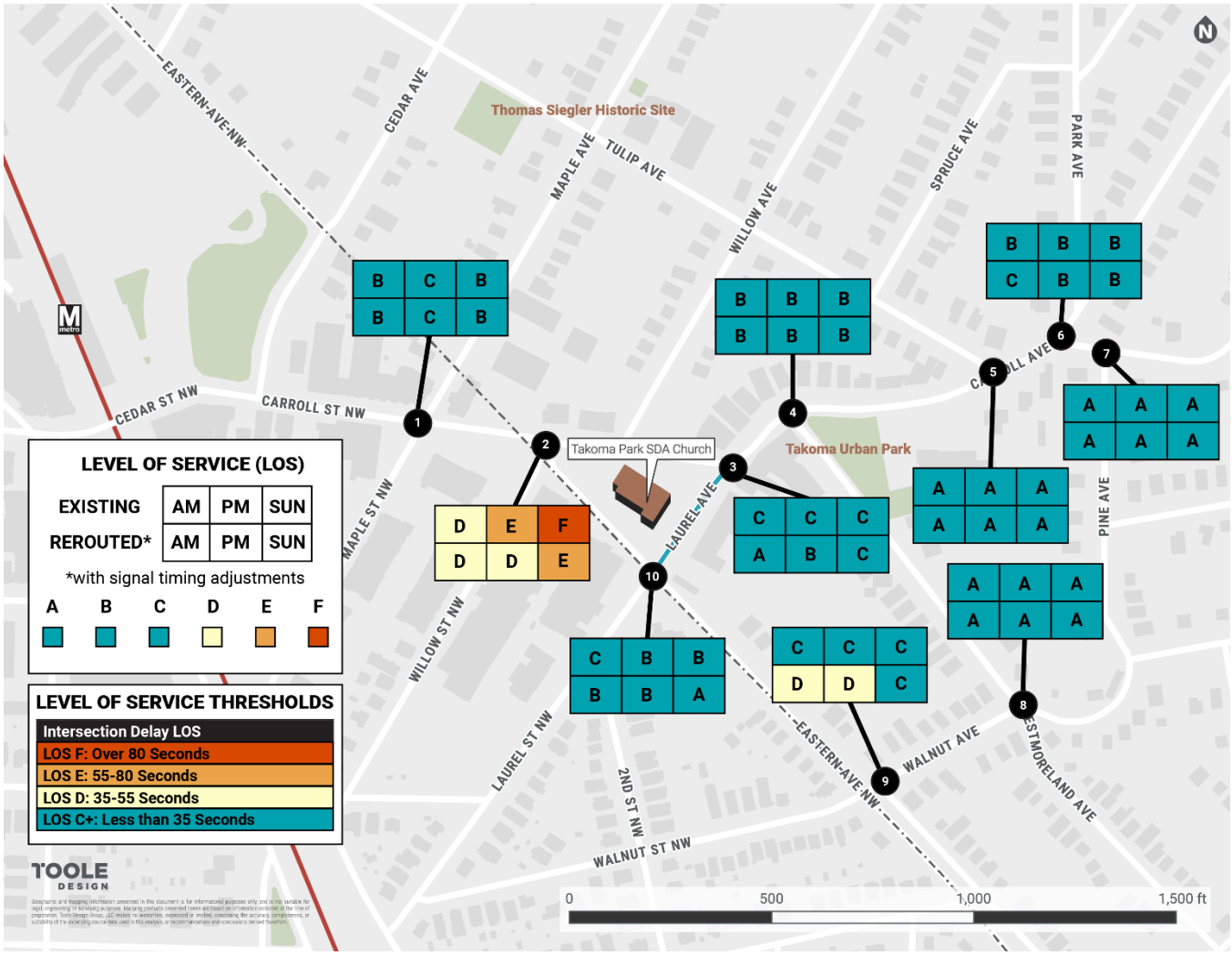


Figure 24: Motor Vehicle Level of Service at Intersections – Existing vs. Rerouted Scenario with Signal Timing Adjustments for AM, PM, and Sunday Peak (Source: Toole Design)

Option B: Left-Turn Lane and Protected Signal Phase on Westbound Carroll Avenue (Intersection #2)

The additional turning volumes from Carroll Avenue onto Willow Street would result in a greater number of conflicts between pedestrians using the crosswalk across Willow Street and left-turning drivers. These left-turning drivers are in a shared travel lane with through traffic and operate under a permitted left-turn condition where they must pay attention to oncoming traffic but may be less attentive to pedestrians crossing the crosswalk. Given these conditions, mitigation is recommended to lessen the degree of conflict for these movements.

This could be accomplished through protected-only left-turn phase for westbound Carroll Avenue onto Willow Street and Eastern Avenue, as shown in Figure 25. During this dedicated left-turn phase, pedestrians would not be allowed to cross the crosswalk at Willow and Eastern Avenues. In order to implement this phasing, a left-turn lane on westbound Carroll Avenue must be provided as well to give vehicles enough space to queue. Table 16 through Table 18 shows the results of this mitigation on intersection operations, which is a slight improvement for vehicular operations compared to no mitigation and would create a safer crossing for pedestrians.

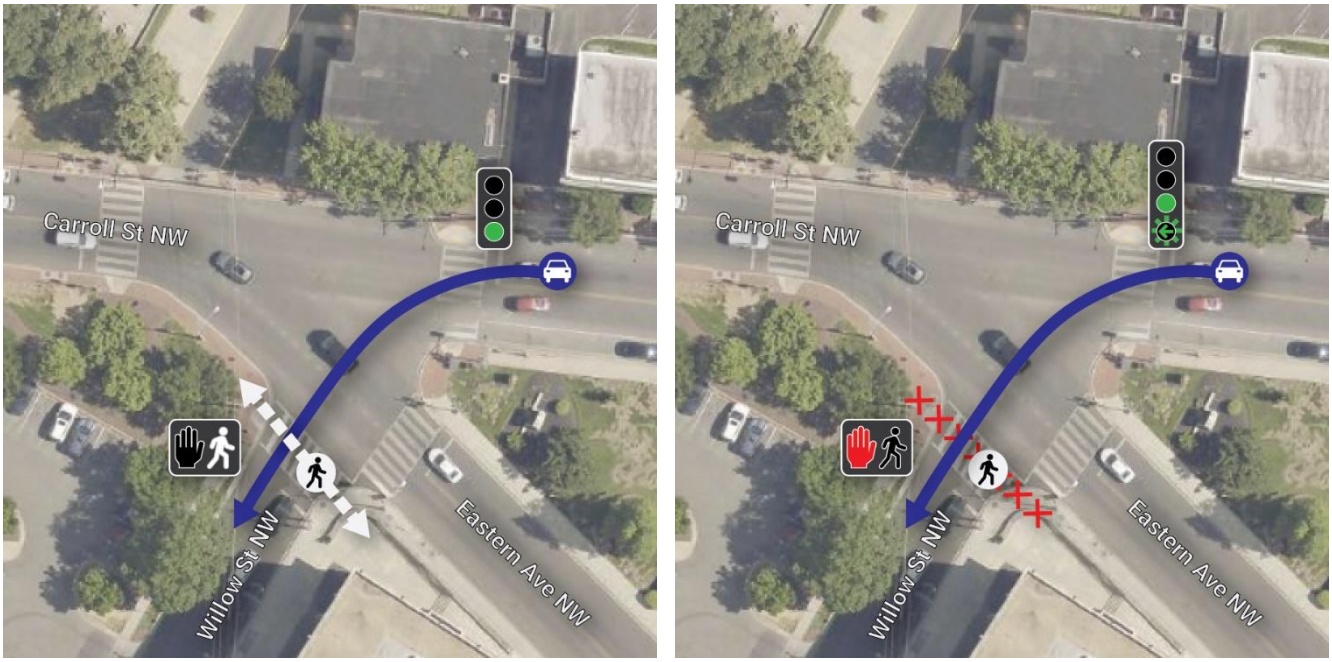


Figure 25: Illustration of Potential Vehicular-Pedestrian Conflict at Intersection #2: Carroll and Willow (left) and Protected Left-Turn Signal Phasing Mitigation Strategy (right) (Source: Toole Design)

Option C: Left Turn Restriction on Westbound Carroll Avenue (Intersection #2)

Another option to mitigate the left-turning conflicts is to restrict all left turns from Carroll Avenue onto Willow Street and Eastern Avenue. This would result in those drivers being rerouted further down Carroll to turn left onto Maple Street to reach Aspen Street NW for the Metrorail underpass or to reach destinations on Eastern Avenue at Laurel and Willow Streets. Some drivers may also continue straight onto Cedar Street to use the other Metrorail underpass by Takoma Station. The intersection of Carroll Street at Maple Street intersection has relatively simpler operations compared to Carroll Avenue at Eastern Avenue & Willow Street and more desirable geometry for permitting the left-turn movement. Table 16 through Table 18 shows the results of this potential mitigation, which is the most favorable overall for vehicular operations within the existing roadway geometry based on LOS ratings at the relevant intersections, while also providing a safer pedestrian crossing at Willow Street.

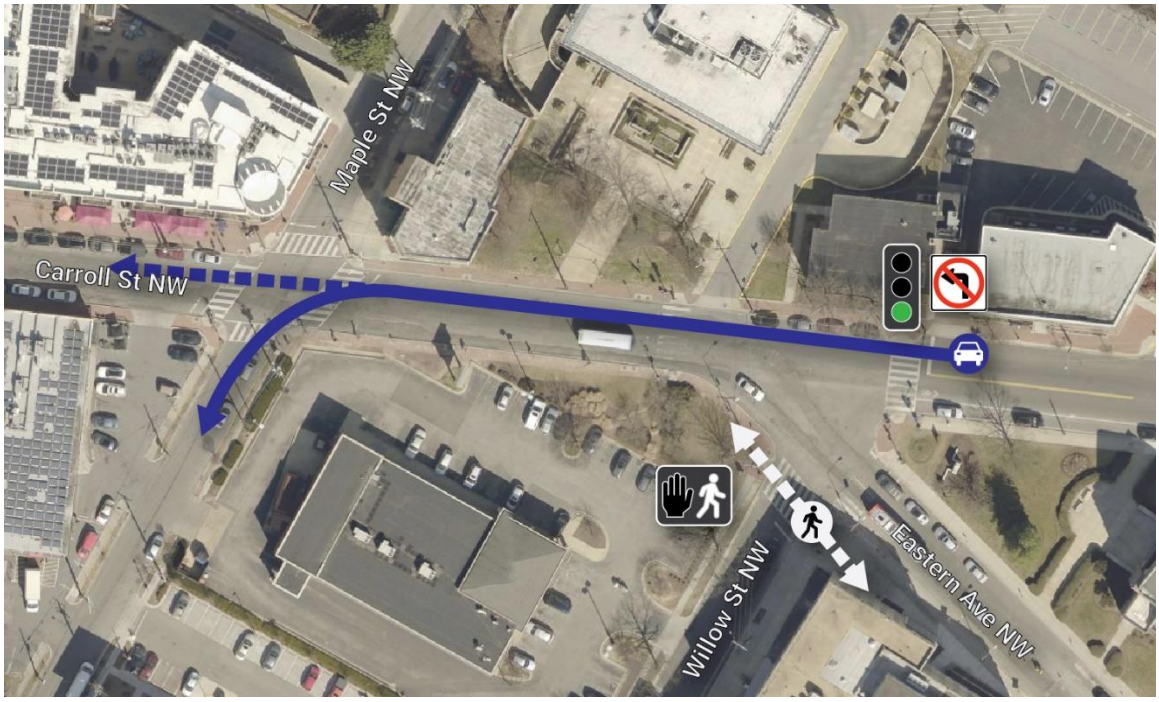


Figure 26: Illustration of Left Turn Restriction at Intersection # 2: Carroll and Willow and Reroute to Intersection #1: Carroll at Maple Streets (Source: Toole Design)

Option D: Roundabout at Intersection #2

A longer-term option for mitigating the impacts of the traffic volume changes that may result from the southbound closure of Laurel Avenue is a roundabout at the intersection of Carroll Avenue at Eastern Avenue and Willow Street. This potential mitigation strategy was evaluated using Sidra, a traffic engineering software used primarily for analyzing roundabout operations. Table 16 through Table 18 shows the results of these operations, which shows large reductions in delay compared to existing conditions and a corresponding improvement in LOS.

A roundabout could be used to create a gateway into Takoma Park at the intersection and is a similar strategy employed to simplify operations at other boundary intersections between Washington, D.C. and neighboring jurisdictions. Due to the size and layout of the intersection, the roundabout may need to be designed as a mini roundabout. Consideration should be given to accommodate buses through the intersection which could be constructed with a mountable center island, similar to the new roundabout pictured at right, located at Chillum Road and Knollbrook Drive in nearby Prince George's County. The roundabout was built at a cost of $1.5 million.[2]

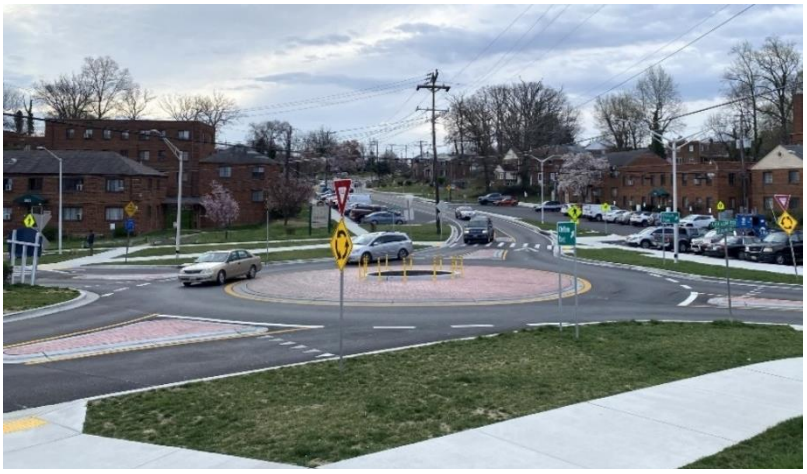


Figure 27: Roundabout at Chillum Road at Knollbrook Drive (Source: Toole Design)

[2] Prince George's County Department of Public Works and Transportation Capital Improvement Program (CIP) Active Projects map: https://princegeorges.maps.arcgis.com/apps/webappviewer/index.html?id=c13928ea8a2946acba51feb034088ce3

Table 16: Overall Intersection Motor Vehicle Operation Results by Potential Mitigation Options – AM Peak (Source: Toole Design)

	Intersection	Existing		Reroute without Mitigations		Reroute with Signal Timing Adjustments		Reroute with Left Turn Lane and Phasing		Reroute with Left-Turn Restriction		Reroute with Roundabout	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	19.6	B	22.4	C	12.1	B	13.7	B	15.8	B	-	-
2	Carroll Ave at Eastern & Willow	40.2	D	91.8	F	46.2	D	48.7	D	36.1	D	9.4	A
3	Carroll Ave at Laurel Ave	21.9	C	18.1	B	10.0	A	10.0	A	9.5	A	-	-

Table 17: Overall Intersection Motor Vehicle Operation Results by Potential Mitigation Options – PM Peak (Source: Toole Design)

	Intersection	Existing		Reroute without Mitigations		Reroute with Signal Timing Adjustments		Reroute with Left Turn Lane and Phasing		Reroute with Left-Turn Restriction		Reroute with Roundabout	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	21.3	C	20.8	C	20.8	C	20.4	C	20.8	C	-	-
2	Carroll Ave at Eastern & Willow	79.2	E	79.3	E	53.6	D	72.0	E	51.7	D	7.8	A
3	Carroll Ave at Laurel Ave	33.3	C	38.1	D	19.3	B	18.6	B	19.3	B	-	-

Table 18: Overall Intersection Motor Vehicle Operation Results by Potential Mitigation Options – Sunday Peak (Source: Toole Design)

	Intersection	Existing		Reroute without Mitigations		Reroute with Signal Timing Adjustments		Reroute with Left Turn Lane and Phasing		Reroute with Left-Turn Restriction		Reroute with Roundabout	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	Carroll Ave at Maple St	12.1	B	11.9	B	12.8	B	13.0	B	13.8	B	-	-
2	Carroll Ave at Eastern & Willow	122.3	F	112.3	F	68.3	E	131.0	F	61.7	E	7.7	A
3	Carroll Ave at Laurel Ave	26.3	C	26.6	C	24.3	C	23.2	C	24.0	C	-	-

INTERSECTION #9: EASTERN AVENUE AT WALNUT AVENUE

All-Way Stop Control

Trips that reroute through the Westmoreland neighborhood that are traveling to Eastern Avenue were assumed to travel onto Walnut Avenue, turning left onto Eastern Avenue. This would result in an additional 30, 25, and 20 trips during the AM, PM, and Sunday peak hours respectively for a total of 125, 105, and 95 total trips from the Walnut Avenue (the minor street) during the AM, PM, and Sunday peak hours respectively.

This rerouting does not increase the volumes on Walnut Avenue to meet the 8-Hour Volume All-Way Stop Control Warrant as listed in the Manual on Uniform Traffic Control Devices (MUTCD), which includes at least 300 combined vehicle, bicycle, and pedestrian trips entering the intersection from the major street and 200 combined vehicle, bicycle, and pedestrian trips entering the intersection from the minor street for each of any 8 hours of a typical day. Therefore, an all-way stop at this intersection is not warranted. Table 19 through 21 list the operational results of the intersection with a two-way stop as it functions currently and in a reroute scenario. Vehicles travelling westbound on Walnut Avenue may experience increased delay, which may naturally limit the number of drivers who choose to take this reroute over other alternatives that are beyond the scope of this study (e.g., travel outside the study area).

Table 19: Operational Results by Intersection Leg With and Without All-Way Stop – AM Peak (Source: Toole Design)

Intersection		Existing			Reroute w/o Mitigation	
		Control	Delay (sec)	LOS	Delay (sec)	LOS
9	Eastern Ave at Walnut St/Ave	Two-way Stop Controlled **(EB)**	14.4	B	15.1	C
		Two-way Stop Controlled **(WB)**	14.1	B	26.5	D
		Uncontrolled **(NB)**	No delay/LOS		No delay/LOS	
		Uncontrolled **(SB)**	No delay/LOS		No delay/LOS	

Table 20: Operational Results by Intersection Leg With and Without All-Way Stop – PM Peak (Source: Toole Design)

Intersection		Existing			Reroute w/o Mitigation	
		Control	Delay (sec)	LOS	Delay (sec)	LOS
9	Eastern Ave at Walnut St/Ave	Two-way Stop Controlled **(EB)**	23.0	B	23.2	C
		Two-way Stop Controlled **(WB)**	21.9	B	28.2	D
		Uncontrolled **(NB)**	No delay/LOS		No delay/LOS	
		Uncontrolled **(SB)**	No delay/LOS		No delay/LOS	

Table 21: Operational Results by Intersection Leg With and Without All-Way Stop – Sunday Peak (Source: Toole Design)

Intersection		Existing			Reroute w/o Mitigation	
		Control	Delay (sec)	LOS	Delay (sec)	LOS
9	Eastern Ave at Walnut St/Ave	Two-way Stop Controlled **(EB)**	14.4	B	14.4	B
		Two-way Stop Controlled **(WB)**	14.1	B	15.9	C
		Uncontrolled **(NB)**	No delay/LOS		No delay/LOS	
		Uncontrolled **(SB)**	No delay/LOS		No delay/LOS	

IV. CONCLUSION

A closure to motor vehicle traffic on Laurel Avenue between Carroll and Eastern Avenues is expected to create moderate but manageable impacts to traffic patterns within the study area. Given that most of the existing traffic passing through the potential closure area is heading towards the District of Columbia (see Figure 11), particularly to reach the Aspen Street Metrorail underpass, drivers will seek alternative routes within or outside the study area of Old Town Takoma and the closure will have the greatest impact on weekday morning peak hour traffic. Assuming conservatively that all existing traffic will reroute onto streets within the Old Town area and accounting for the general increase in traffic from new developments on the D.C. side, it is expected that most of the traffic will reroute to Willow, Maple, and Carroll/Cedar Streets following a closure of Laurel Avenue, while some traffic will reroute through the Westmoreland neighborhood. Estimates vary by street, but overall, Willow/Maple/Cedar Streets may see a combined 175 additional vehicles per hour (14% overall increase, see Figure 16) and the Westmoreland neighborhood may see an additional 30 vehicles per hour during the morning peak (20% overall increase, see Figure 17), with lower vehicle volume changes per hour at all other times and days of the week. Were Laurel Avenue to be closed, streets adjacent to the closure may likely see levels of traffic in the morning peak hours comparable to those during the evening peak hours, in the reverse direction.

Operational analyses of this change in traffic patterns confirm that most intersections will perform as they currently do, and some intersections may see improvements over existing conditions with simple signal timing and phasing changes to coincide with the change in traffic (see Figure 24), such as a longer green light for eastbound traffic on Carroll Avenue at Laurel Avenue. Additional traffic mitigation options were explored at the intersection of Carroll Avenue at Eastern & Willow which, due to its irregular shape, may experience an increase in pedestrian-vehicle conflicts as more drivers turn left onto Willow Street at the same time pedestrians have the right of way at the crosswalk (see Figure 25). Of the three mitigation options explored, the recommended short-term alternative is to restrict left turns from Carroll Avenue to Willow Street – which encourages traffic on Carroll to turn left at Maple Street or to continue straight onto Cedar Street (see Figure 26) – while a longer-term alternative may be a roundabout at the Carroll/Eastern/Willow intersection. An all-way stop sign was considered for the Eastern and Walnut Avenue intersection but was not warranted even when including the projected increases in vehicle volumes.

V. APPENDICES

APPENDIX A – TURNING MOVEMENT COUNTS

TAKOMA PARK LAUREL AVENUE TRAFFIC STUDY
Appendix A – Turning Movement Counts

Job No.:

Location: Carroll Avenue at Columbia Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	678				16:45	17:45	712		

Street Name-->	Carroll Avenue					Carroll Avenue					Columbia Avenue										GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
07:15	0	5	64	0	69	0	0	9	1	10	1	7	0	11	19	0	0	0	0	0	98
07:30	0	4	87	0	91	0	0	16	2	18	0	3	0	14	17	0	0	0	0	0	126
07:45	0	2	111	0	113	0	0	13	0	13	0	4	0	5	9	0	0	0	0	0	135
08:00	0	10	117	0	127	0	0	21	1	22	0	12	0	7	19	0	0	0	0	0	168
08:15	0	6	118	0	124	0	0	24	6	30	0	24	0	7	31	0	0	0	0	0	185
08:30	0	8	108	0	116	0	0	32	2	34	0	15	0	7	22	0	0	0	0	0	172
08:45	0	10	84	0	94	0	0	32	3	35	0	17	0	7	24	0	0	0	0	0	153
09:00	0	13	79	0	92	0	0	31	3	34	0	14	0	12	26	0	0	0	0	0	152
16:15	0	3	52	0	55	0	0	72	10	82	0	6	0	16	22	0	0	0	0	0	159
16:30	0	9	51	0	60	0	0	90	8	98	0	8	0	12	20	0	0	0	0	0	178
16:45	0	6	59	0	65	0	0	66	7	73	0	5	0	14	19	0	0	0	0	0	157
17:00	0	13	65	0	78	0	0	84	2	86	0	12	0	21	33	0	0	0	0	0	197
17:15	0	16	40	0	56	0	0	71	11	82	0	15	0	19	34	0	0	0	0	0	172
17:30	0	8	37	0	45	0	0	77	7	84	0	10	0	26	36	0	0	0	0	0	165
17:45	0	10	58	0	68	0	0	68	8	76	0	6	0	28	34	0	0	0	0	0	178
18:00	0	15	58	0	73	0	0	57	8	65	0	9	0	17	26	0	0	0	0	0	164
TOTAL	**0**	**138**	**1188**	**0**	**1326**	**0**	**0**	**763**	**79**	**842**	**1**	**167**	**0**	**223**	**391**	**0**	**0**	**0**	**0**	**0**	**2559**
AM Peak Vol	0	34	427	0	461	0	0	109	12	121	0	68	0	28	96	0	0	0	0	0	678
PM Peak Vol	0	47	200	0	247	0	0	300	28	328	0	43	0	94	137	0	0	0	0	0	712

Job No.:

Location: Carroll Avenue at Columbia Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	678				16:45	17:45	712		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Carroll Avenue			From South – Carroll Avenue			From East – Columbia Avenue			From West – 0		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	2	0	0	0	0	0	2	1	0	0	0
07:30	0	1	0	0	0	0	0	5	1	0	0	0
07:45	0	4	0	0	0	0	0	2	0	0	0	0
08:00	0	4	0	0	1	0	0	2	0	0	0	0
08:15	0	3	1	0	0	0	0	7	0	0	0	0
08:30	0	9	0	0	0	0	0	4	0	0	0	0
08:45	0	9	0	0	3	0	0	3	0	0	0	0
09:00	0	5	0	0	0	0	0	5	3	0	0	0
16:15	0	7	1	0	0	0	0	4	0	0	0	0
16:30	0	3	0	0	0	0	0	12	0	0	0	0
16:45	0	5	0	0	0	0	0	4	1	0	0	0
17:00	0	4	0	0	0	0	0	7	2	0	0	0
17:15	0	4	0	0	0	0	0	15	2	0	0	0
17:30	0	7	0	0	0	0	0	8	3	0	0	0
17:45	0	9	0	0	0	0	0	10	5	0	0	0
18:00	0	8	0	0	0	0	0	19	4	0	0	0
TOTAL	**0**	**84**	**2**	**0**	**4**	**0**	**0**	**109**	**22**	**0**	**0**	**0**
AM Peak Vol	0	25	1	0	4	0	0	16	0	0	0	0
PM Peak Vol	0	24	0	0	0	0	0	40	12	0	0	0

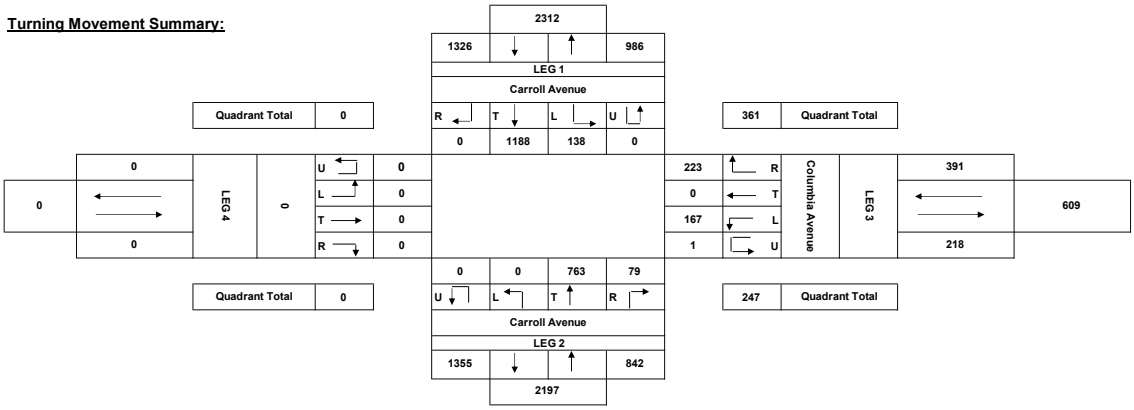
Job No.:

Location: Carroll Avenue at Columbia Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

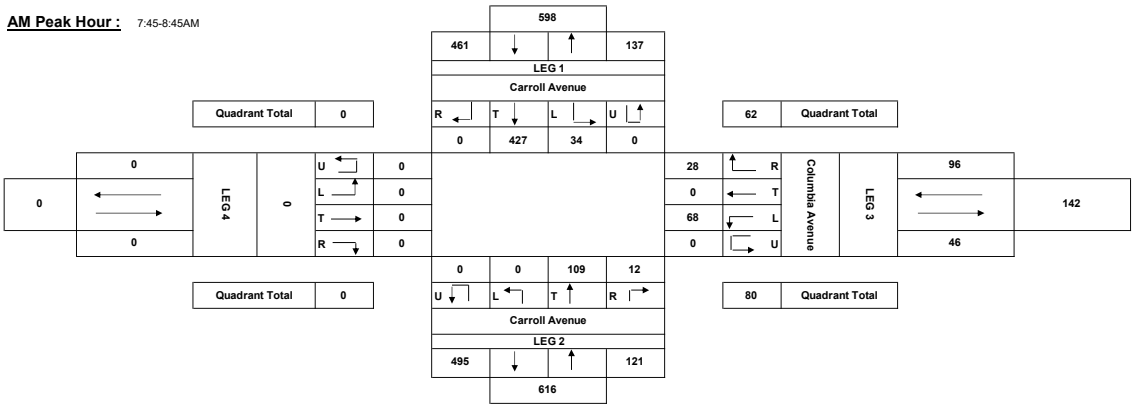
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	678				16:45	17:45	712		

Turning Movement Summary:

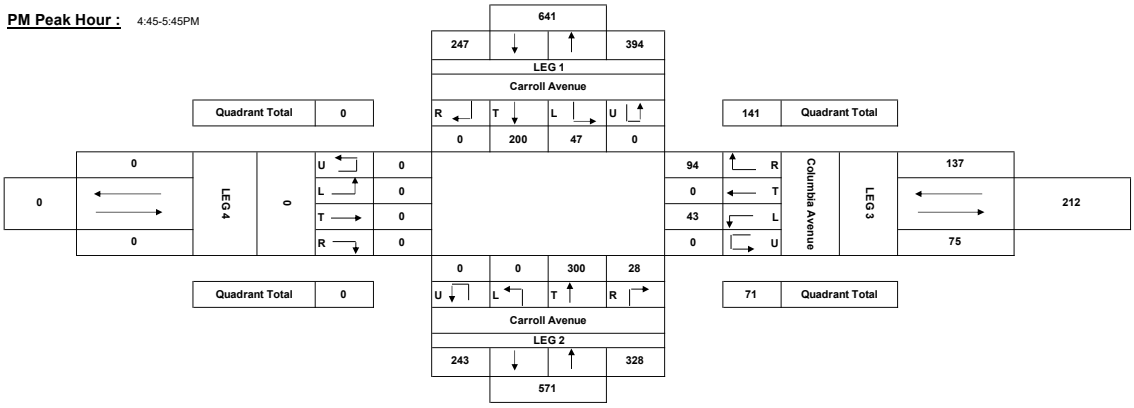


Comments:

AM Peak Hour : 7:45-8:45AM



PM Peak Hour : 4:45-5:45PM



Appendix A – Turning Movement Counts

Job No.:

Location: Carroll Avenue at Columbia Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**540**		

Street Name-->	Carroll Avenue					Carroll Avenue					Columbia Avenue										GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
11:15	0	10	48	0	58	0	0	32	4	36	0	1	0	18	19	0	0	0	0	0	113
11:30	0	8	54	0	62	0	0	42	1	43	0	5	0	17	22	0	0	0	0	0	127
11:45	0	6	53	0	59	0	0	55	1	56	0	4	0	21	25	0	0	0	0	0	140
12:00	0	10	49	0	59	0	0	45	4	49	0	5	0	21	26	0	0	0	0	0	134
12:15	0	13	45	0	58	0	0	37	4	41	0	4	0	17	21	0	0	0	0	0	120
12:30	0	11	61	0	72	0	0	40	7	47	0	4	0	14	18	0	0	0	0	0	137
12:45	0	6	65	0	71	0	0	53	3	56	0	8	0	14	22	0	0	0	0	0	149
13:00	0	6	44	0	50	0	0	49	2	51	0	5	0	15	20	0	0	0	0	0	121
TOTAL	**0**	**70**	**419**	**0**	**489**	**0**	**0**	**353**	**26**	**379**	**0**	**36**	**0**	**137**	**173**	**0**	**0**	**0**	**0**	**0**	**1041**
Peak Vol	0	40	220	0	260	0	0	175	18	193	0	21	0	66	87	0	0	0	0	0	540

Job No.:

Location: Carroll Avenue at Columbia Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**540**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Carroll Avenue			From South – Carroll Avenue			From East – Columbia Avenue			From West – 0		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	2	0	0	1	0	0	32	1	0	0	0
11:30	0	7	0	0	1	0	0	36	3	0	0	0
11:45	0	2	0	0	0	0	0	13	5	0	0	0
12:00	0	5	0	0	0	0	0	25	5	0	0	0
12:15	0	0	0	0	0	0	0	29	1	0	0	0
12:30	0	3	0	0	0	0	0	14	1	0	0	0
12:45	0	2	0	0	0	0	0	30	4	0	0	0
13:00	0	0	0	0	0	0	0	14	3	0	0	0
TOTAL	**0**	**21**	**0**	**0**	**2**	**0**	**0**	**193**	**23**	**0**	**0**	**0**
Peak Vol	0	10	0	0	0	0	0	98	11	0	0	0

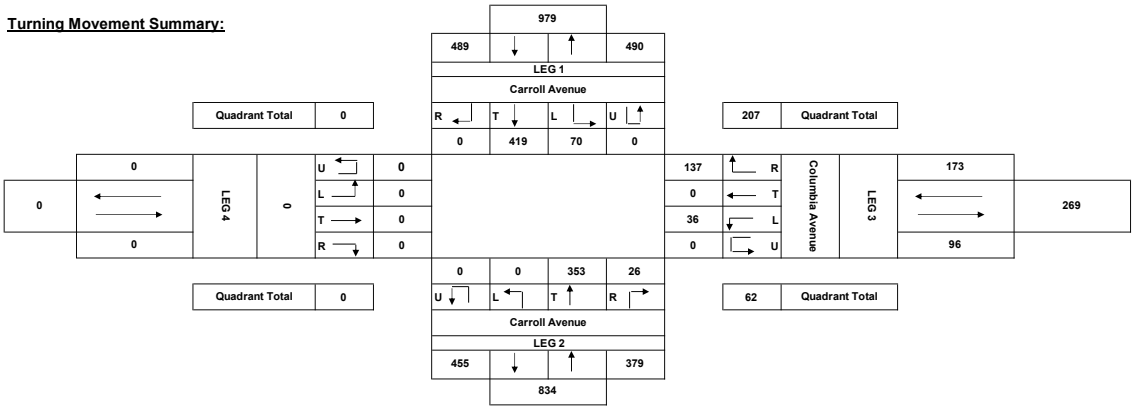
Job No.:

Location: Carroll Avenue at Columbia Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

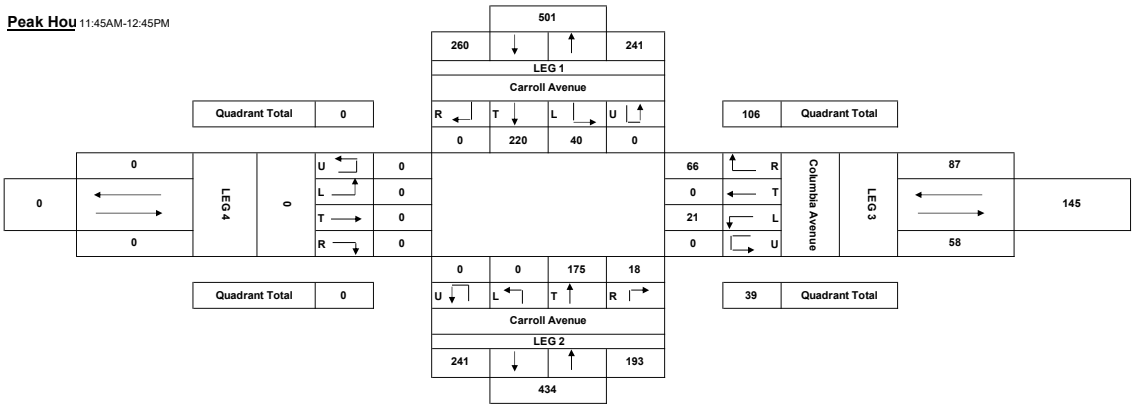
	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	540		

Turning Movement Summary:



Comments:

Peak Hou 11:45AM-12:45PM



Job No.:

Location: Carroll Avenue at Eastern Avenue and Willow Street
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS		Start	End	Volume	LOS		V/C		Start	End		Volume	LOS	V/C
	AM PERIOD 6:00AM-12:00PM	07:45	08:45	**1008**				**PM PERIOD 12:00PM-7:00PM**	16:45	17:45		**1029**		

Street Name-->	Willow Street						Willow Street NW						Carroll Avenue						Eastern Avenue NW						Carroll Street NW						GRAND
HOUR	From North						From South						From East						From Southeast						From West						
ENDING	U turn	Left (To Carroll Avenue)	Bear Left (To Eastern Avenue NW)	Through	Right	Total	U turn	Left	Through	Right (To Carroll Avenue)	Hard Right (To Eastern Avenue NW)	Total	U turn	Hard Left (To Eastern Avenue NW)	Left (To Willow Street NW)	Through	Right	Total	U turn	Hard Left (To Willow Street NW)	Bear Left (To Carroll Street NW)	Bear Right (To Willow Street)	Hard Right (To Carroll Avenue)	Total	U turn	Left	Through	Bear Right (To Eastern Avenue NW)	Right (To Willow Street NW)	Total	TOTAL
07:15	0	0	0	0	0	0	0	2	0	0	1	3	0	1	3	43	0	47	0	3	67	0	0	70	0	0	6	30	2	38	158
07:30	0	0	0	0	0	0	0	2	0	2	2	6	0	0	4	46	0	50	0	2	89	0	4	95	0	0	11	35	3	49	200
07:45	0	0	1	0	0	1	0	3	0	3	5	11	0	1	5	45	0	51	0	1	95	0	3	99	0	0	12	39	4	55	217
08:00	0	0	0	1	0	1	0	3	0	8	3	14	0	1	8	55	1	65	0	2	87	0	2	91	0	0	14	47	1	62	233
08:15	0	0	1	0	1	2	0	0	0	4	5	9	0	0	11	50	0	61	0	4	78	0	0	82	0	1	20	56	3	80	234
08:30	0	0	0	0	1	1	0	24	0	4	13	41	1	1	3	36	2	43	0	7	89	0	4	100	0	0	26	42	5	73	258
08:45	0	0	0	0	0	0	0	20	0	8	12	40	0	0	4	44	7	55	0	4	94	1	7	106	0	0	22	53	7	82	283
09:00	0	0	0	0	0	0	0	8	0	8	9	25	0	0	10	31	0	41	0	6	73	1	8	88	0	0	23	47	7	77	231
16:15	0	2	0	0	0	2	0	8	0	25	10	43	0	2	3	25	1	31	0	3	44	0	7	54	0	0	46	60	4	110	240
16:30	0	0	0	0	1	1	0	7	0	23	4	34	0	1	10	29	0	40	0	3	50	1	8	62	0	1	52	90	3	146	283
16:45	0	0	0	0	0	0	0	7	0	24	4	35	0	0	6	27	0	33	0	3	38	1	19	61	0	1	35	60	4	100	229
17:00	0	0	0	0	0	0	0	3	0	21	6	30	0	0	5	33	0	38	0	5	47	0	12	64	0	0	44	66	8	118	250
17:15	0	0	0	0	0	0	0	10	0	32	11	53	0	0	5	21	0	26	0	3	60	0	12	75	0	0	36	68	6	110	264
17:30	0	0	0	0	0	0	0	7	1	22	13	43	0	1	4	20	1	26	0	5	45	1	11	62	0	0	48	70	9	127	258
17:45	0	0	1	0	0	1	0	12	0	29	15	56	0	0	5	26	1	32	0	8	53	0	7	68	0	0	39	56	5	100	257
18:00	0	0	0	0	0	0	0	7	0	24	5	36	0	2	4	34	0	40	0	5	50	0	9	64	0	0	35	59	7	101	241
TOTAL	0	2	3	1	3	9	0	123	1	237	118	479	1	10	90	565	13	679	0	64	1059	5	113	1241	0	3	469	878	78	1428	3836
AM Peak Vol	0	0	1	1	2	4	0	47	0	24	33	104	1	2	26	185	10	224	0	17	348	1	13	379	0	1	82	198	16	297	1008
PM Peak Vol	0	0	1	0	0	1	0	32	1	104	45	182	0	1	19	100	2	122	0	21	205	1	42	269	0	0	167	260	28	455	1029

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour	From North – Willow Street			From South – Willow Street NW			From East – Carroll Avenue			From Southeast – Eastern Avenue NW			From West – Carroll Street NW		
Ending	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	11	0	0	4	0	0	3	0	0	2	0	0	0	0
07:30	0	11	1	0	2	0	0	3	0	0	5	0	0	2	0
07:45	0	21	3	0	8	0	0	4	0	0	10	1	0	1	0
08:00	0	24	1	0	0	0	0	8	0	0	5	0	0	0	1
08:15	0	16	1	0	7	0	0	4	1	0	9	0	0	0	0
08:30	0	21	3	0	6	0	0	5	0	0	8	0	0	0	0
08:45	0	24	1	0	9	0	0	12	0	0	13	1	0	1	0
09:00	0	27	0	0	10	0	0	7	0	0	4	1	0	2	0
16:15	0	26	0	0	16	0	0	7	0	0	25	0	0	2	0
16:30	0	11	0	0	13	0	0	3	0	0	17	0	0	0	0
16:45	0	15	0	0	15	0	0	11	0	0	13	0	0	2	0
17:00	0	25	0	0	14	0	0	4	2	0	13	0	0	6	0
17:15	0	31	1	0	18	0	0	9	0	0	20	0	0	5	0
17:30	0	20	0	0	23	0	0	11	0	0	20	0	0	1	0
17:45	0	48	0	0	18	0	0	9	1	0	18	1	0	1	0
18:00	0	29	0	0	4	0	0	12	0	0	8	0	0	1	0
TOTAL	0	360	11	0	167	0	0	112	4	0	190	4	0	24	1
AM Peak Vol	0	85	6	0	22	0	0	29	1	0	35	1	0	1	1
PM Peak Vol	0	124	1	0	73	0	0	33	3	0	71	1	0	13	0

10-18-23

Job No.:

Location: Carroll Avenue at Eastern Avenue and Willow Street
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	**858**		

Street Name-->	Willow Street						Willow Street NW						Carroll Avenue						Eastern Avenue NW						Carroll Street NW						
HOUR	**From North**						**From South**						**From East**						**From Southeast**						**From West**						**GRAND**
ENDING	**U turn**	**Left (To Carroll Avenue)**	**Bear Left (To Eastern Avenue NW)**	**Through**	**Right**	**Total**	**U turn**	**Left**	**Through**	**Right (To Carroll Avenue)**	**Hard Right (To Eastern Avenue NW)**	**Total**	**U turn**	**Hard Left (To Eastern Avenue NW)**	**Left (To Willow Street NW)**	**Through**	**Right**	**Total**	**U turn**	**Hard Left (To Willow Street NW)**	**Bear Left (To Carroll Street NW)**	**Bear Right (To Willow Street)**	**Hard Right (To Carroll Avenue)**	**Total**	**U turn**	**Left**	**Through**	**Bear Right (To Eastern Avenue NW)**	**Right (To Willow Street NW)**	**Total**	**TOTAL**
11:15	0	0	0	0	0	0	0	6	0	11	9	26	0	1	7	25	1	34	0	6	43	0	7	56	0	0	28	38	12	78	194
11:30	0	0	0	0	0	0	0	2	0	11	10	23	0	0	11	22	0	33	0	5	43	0	10	58	0	0	30	48	6	84	198
11:45	0	0	0	0	0	0	0	2	0	14	7	23	1	2	3	26	0	32	0	6	52	1	12	71	0	0	34	45	11	90	216
12:00	0	0	0	0	0	0	0	10	0	12	11	33	0	1	11	31	0	43	0	3	47	0	11	61	0	0	34	30	8	72	209
12:15	0	0	0	0	0	0	0	5	0	12	8	25	0	1	11	27	0	39	0	5	45	1	8	59	0	1	20	49	5	75	198
12:30	0	1	0	0	1	2	0	5	0	13	3	21	0	4	8	23	0	35	0	8	43	0	9	60	0	0	36	36	9	81	199
12:45	0	0	0	0	0	0	0	12	0	8	6	26	0	2	15	28	1	46	0	10	53	0	8	71	0	0	37	56	5	98	241
13:00	0	0	0	0	0	0	0	6	0	15	7	28	0	3	4	35	1	43	0	5	57	1	7	70	0	0	28	44	7	79	220
TOTAL	0	1	0	0	1	2	0	48	0	96	61	205	1	14	70	217	3	305	0	48	383	3	72	506	0	1	247	346	63	657	1675
Peak Vol	0	1	0	0	1	2	0	28	0	48	24	100	0	10	38	113	2	163	0	28	198	2	32	260	0	1	121	185	26	333	858

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Willow Street			From South – Willow Street NW			From East – Carroll Avenue			From Southeast – Eastern Avenue NW			From West – Carroll Street NW		
	School Children	**Pedestrians**	**Bicycles**	**School Children**	**Pedestrians**	**Bicycles**	**School Children**	**Pedestrians**	**Bicycles**	**School Children**	**Pedestrians**	**Bicycles**	**School Children**	**Pedestrians**	**Bicycles**
11:15	0	51	0	0	33	1	0	11	2	0	32	1	0	8	0
11:30	0	55	0	0	34	0	0	15	0	0	45	0	0	9	0
11:45	0	48	0	0	32	1	0	13	1	0	42	2	0	13	0
12:00	0	80	3	0	34	0	0	20	0	0	39	1	0	15	1
12:15	0	77	0	0	31	0	0	18	0	0	49	0	0	10	0
12:30	0	50	0	0	55	0	0	33	0	0	54	0	0	5	0
12:45	0	48	3	0	39	0	0	18	1	0	53	0	0	6	0
13:00	0	50	0	0	46	0	0	12	0	0	57	1	0	8	0
TOTAL	0	459	6	0	304	2	0	140	4	0	371	5	0	74	1
Peak Vol	0	225	3	0	171	0	0	81	1	0	213	1	0	29	0

10-22-23

TAKOMA PARK LAUREL AVENUE TRAFFIC STUDY
Appendix A – Turning Movement Counts

Job No.:

Location: Carroll Avenue at Laurel Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	534				16:15	17:15	545		

Street Name-->	Carroll Avenue					Laurel Avenue					Driveway					Carroll Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
07:15	0	2	16	44	62	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	70
07:30	0	0	32	55	87	0	0	0	0	0	0	0	0	0	0	0	15	1	1	17	104
07:45	0	1	45	49	95	0	0	0	0	0	0	0	0	0	0	0	16	0	0	16	111
08:00	0	1	43	78	122	0	0	0	0	0	0	0	0	0	0	0	18	2	1	21	143
08:15	0	2	52	64	118	0	0	0	0	0	0	0	0	0	0	0	23	0	1	24	142
08:30	0	2	46	48	96	0	0	0	0	0	0	0	0	0	0	0	27	1	7	35	131
08:45	0	2	33	52	87	0	0	0	0	0	0	0	0	0	0	0	27	1	3	31	118
09:00	0	4	22	44	70	0	0	0	0	0	0	0	0	0	0	0	28	2	1	31	101
16:15	0	6	15	25	46	0	0	0	0	0	0	0	0	0	0	0	73	2	7	82	128
16:30	0	5	13	39	57	0	0	0	0	0	0	0	0	0	0	0	84	4	2	90	147
16:45	0	7	17	33	57	0	0	0	0	0	0	0	0	0	0	0	58	4	5	67	124
17:00	1	7	21	43	72	0	0	0	0	0	0	0	0	0	0	0	65	0	5	70	142
17:15	1	6	19	26	52	0	0	0	0	0	0	0	0	0	0	0	78	0	2	80	132
17:30	2	4	19	23	48	0	0	0	0	0	0	0	0	0	0	0	68	2	1	71	119
17:45	2	5	11	34	52	0	0	0	0	0	0	0	0	0	0	0	60	2	3	65	117
18:00	0	6	15	35	56	0	0	0	0	0	0	0	0	0	0	0	56	6	8	70	126
TOTAL	**6**	**60**	**419**	**692**	**1177**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**704**	**27**	**47**	**778**	**1955**
AM Peak Vol	0	7	174	242	423	0	0	0	0	0	0	0	0	0	0	0	95	4	12	111	534
PM Peak Vol	2	25	70	141	238	0	0	0	0	0	0	0	0	0	0	0	285	8	14	307	545

Job No.:

Location: Carroll Avenue at Laurel Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	534				16:15	17:15	545		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North: Carroll Avenue			From South: Laurel Avenue			From East: Driveway			From West: Carroll Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	0	0	0	1	0	0	2	0	0	0	0
07:30	0	4	0	0	3	0	0	5	0	0	0	0
07:45	0	5	0	0	7	0	0	5	1	0	3	0
08:00	0	4	0	0	2	0	0	4	0	0	0	1
08:15	0	3	0	0	11	0	0	9	0	0	0	0
08:30	0	9	0	0	4	0	0	8	0	0	2	2
08:45	0	8	0	0	14	0	0	14	0	0	10	0
09:00	0	8	0	0	7	0	0	17	0	0	1	1
16:15	0	13	0	0	18	1	0	30	1	0	7	0
16:30	0	21	1	0	15	1	0	36	0	0	3	2
16:45	0	6	0	0	10	0	0	21	1	0	7	0
17:00	0	28	0	0	18	1	0	34	1	0	4	0
17:15	0	26	0	0	19	0	0	36	4	0	5	0
17:30	0	48	0	0	17	2	0	25	6	0	9	0
17:45	0	26	0	0	18	0	0	40	2	0	9	0
18:00	0	26	0	0	18	0	0	32	4	0	8	0
TOTAL	**0**	**235**	**1**	**0**	**182**	**5**	**0**	**318**	**20**	**0**	**68**	**6**
AM Peak Vol	0	24	0	0	31	0	0	35	0	0	12	3
PM Peak Vol	0	81	1	0	62	2	0	127	6	0	19	2

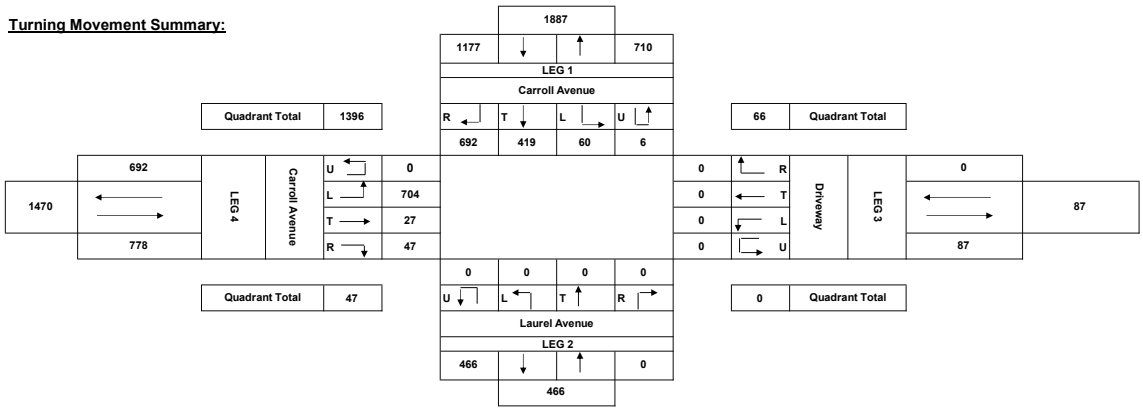
Job No.:

Location: Carroll Avenue at Laurel Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

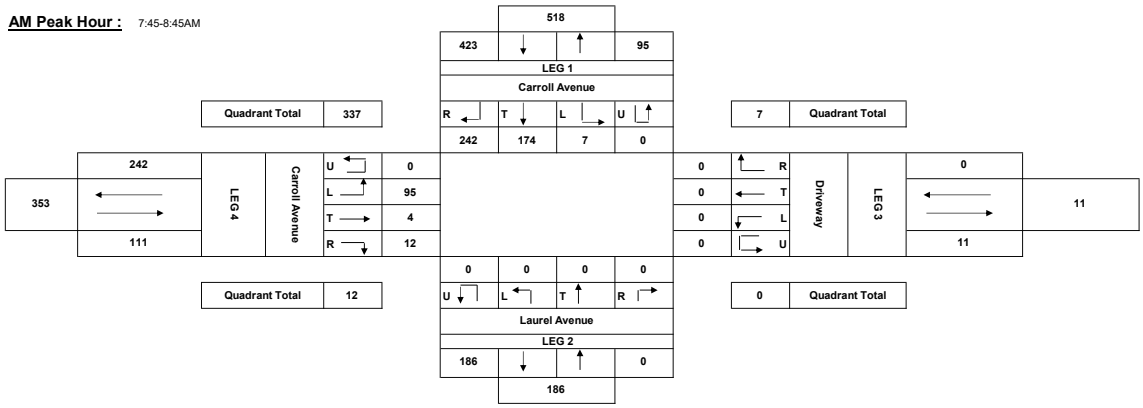
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	534				16:15	17:15	545		

Turning Movement Summary:

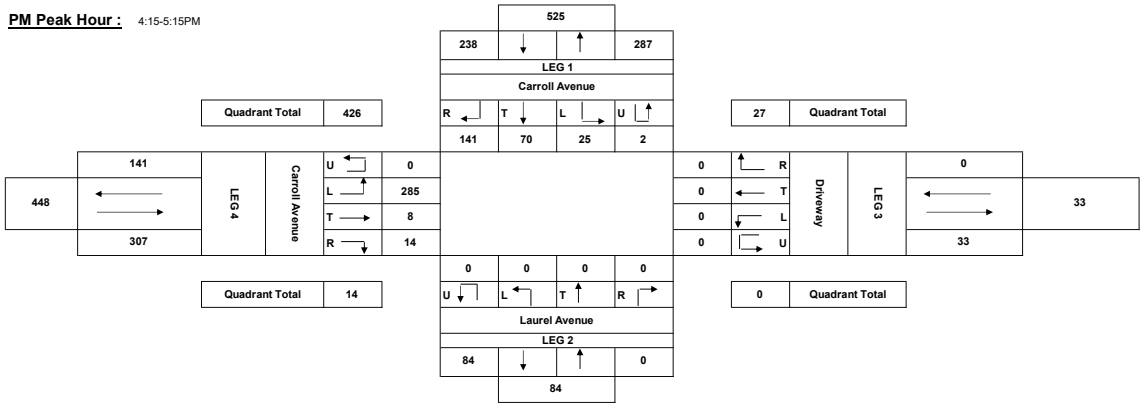


Comments:

AM Peak Hour : 7:45-8:45AM



PM Peak Hour : 4:15-5:15PM



Job No.:

Location: Carroll Avenue at Laurel Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**429**		

Street Name-->	Carroll Avenue					Laurel Avenue					Driveway					Carroll Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
11:15	0	0	17	39	56	0	0	0	0	0	0	0	0	0	0	0	37	0	6	43	99
11:30	0	0	21	36	57	0	0	0	0	0	0	0	0	0	0	0	40	0	2	42	99
11:45	0	0	17	41	58	0	0	0	0	0	0	0	0	0	0	0	43	0	6	49	107
12:00	0	0	17	38	55	0	0	0	0	0	0	0	0	0	0	0	47	0	2	49	104
12:15	0	0	15	42	57	0	0	0	0	0	0	0	0	0	0	0	32	0	6	38	95
12:30	0	0	17	38	55	0	0	0	0	0	0	0	0	0	0	0	42	0	6	48	103
12:45	1	0	13	52	66	0	0	0	0	0	0	0	0	0	0	0	53	0	8	61	127
13:00	1	0	9	42	52	0	0	0	0	0	0	0	0	0	0	0	36	2	4	42	94
TOTAL	**2**	**0**	**126**	**328**	**456**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**330**	**2**	**40**	**372**	**828**
Peak Vol	1	0	62	170	233	0	0	0	0	0	0	0	0	0	0	0	174	0	22	196	429

Job No.:

Location: Carroll Avenue at Laurel Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**429**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North: Carroll Avenue			From South: Laurel Avenue			From East: Driveway			From West: Carroll Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	69	0	0	72	1	0	107	1	0	21	0
11:30	0	55	0	0	92	1	0	71	1	0	28	1
11:45	0	60	0	0	76	2	0	95	2	0	31	0
12:00	0	74	0	0	72	2	0	113	2	0	30	2
12:15	0	71	0	0	83	0	0	97	0	0	28	0
12:30	0	62	0	0	96	2	0	130	2	0	17	0
12:45	0	75	0	0	92	3	0	108	1	0	26	0
13:00	0	70	0	0	88	0	0	122	0	0	14	2
TOTAL	**0**	**536**	**0**	**0**	**671**	**11**	**0**	**843**	**9**	**0**	**195**	**5**
Peak Vol	0	282	0	0	343	7	0	448	5	0	101	2

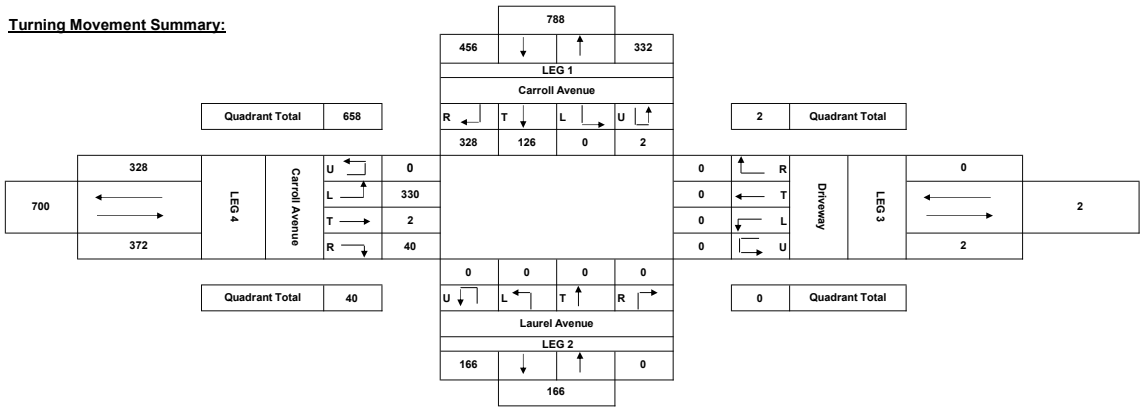
Job No.:

Location: Carroll Avenue at Laurel Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

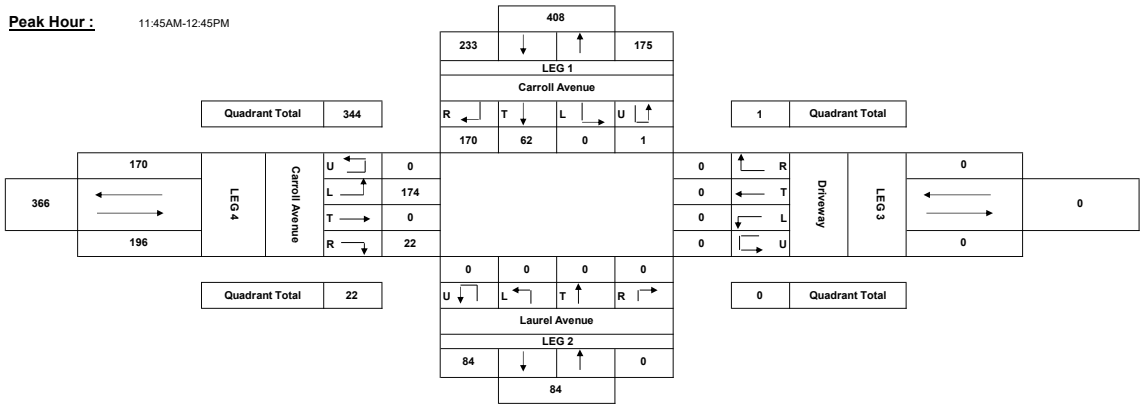
	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	429		

Turning Movement Summary:



Comments:

Peak Hour : 11:45AM-12:45PM



Job No.:

Location: Carroll Avenue at Tulip Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	624				16:00	17:00	618		

Street Name-->	Tulip Avenue										Carroll Avenue					Carroll Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
07:15	0	1	0	0	1	0	0	0	0	0	0	0	62	9	71	0	0	9	0	9	81
07:30	0	0	0	0	0	0	0	0	0	0	0	0	87	3	90	0	1	18	0	19	109
07:45	0	2	0	2	4	0	0	0	0	0	0	0	106	8	114	0	0	16	0	16	134
08:00	0	3	0	0	3	0	0	0	0	0	0	0	108	19	127	0	0	20	0	20	150
08:15	0	8	0	1	9	0	0	0	0	0	0	0	116	25	141	0	4	21	0	25	175
08:30	0	3	0	1	4	0	0	0	0	0	0	0	95	28	123	0	1	31	0	32	159
08:45	0	4	0	1	5	0	0	0	0	0	0	0	83	18	101	0	2	32	0	34	140
09:00	0	2	0	2	4	0	0	0	0	0	0	0	67	25	92	0	2	33	0	35	131
16:15	0	14	0	9	23	0	0	0	0	0	0	0	50	7	57	0	3	66	0	69	149
16:30	0	9	0	3	12	0	0	0	0	0	0	0	53	8	61	2	0	95	0	97	170
16:45	0	9	0	2	11	0	0	0	0	0	0	0	54	8	62	0	1	60	0	61	134
17:00	0	4	0	6	10	0	0	0	0	0	0	0	64	12	76	0	1	78	0	79	165
17:15	0	12	0	2	14	0	0	0	0	0	0	0	40	13	53	0	3	74	0	77	144
17:30	0	9	0	2	11	0	0	0	0	0	0	0	34	13	47	0	5	73	0	78	136
17:45	0	10	0	3	13	0	0	0	0	0	0	0	53	11	64	0	3	63	0	66	143
18:00	0	9	0	3	12	0	0	0	0	0	0	0	59	7	66	0	4	56	0	60	138
TOTAL	**0**	**99**	**0**	**37**	**136**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1131**	**214**	**1345**	**2**	**30**	**745**	**0**	**777**	**2258**
AM Peak Vol	0	18	0	3	21	0	0	0	0	0	0	0	402	90	492	0	7	104	0	111	624
PM Peak Vol	0	36	0	20	56	0	0	0	0	0	0	0	221	35	256	2	5	299	0	306	618

Job No.:

Location: Carroll Avenue at Tulip Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	**624**				16:00	17:00	**618**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North: Tulip Avenue			From South: 0			From East: Carroll Avenue			From West: Carroll Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	5	3	0	0	0	0	0	0	0	1	0
07:30	0	5	0	0	0	0	0	1	0	0	4	0
07:45	0	3	3	0	0	0	0	0	0	0	1	0
08:00	0	11	3	0	0	0	0	0	0	0	4	0
08:15	0	7	3	0	0	0	0	2	0	0	4	0
08:30	0	6	4	0	0	0	0	0	0	0	7	0
08:45	0	13	4	0	0	0	0	2	0	0	6	0
09:00	0	12	2	0	0	0	0	0	0	0	10	1
16:15	0	7	1	0	0	0	0	0	0	0	7	0
16:30	0	5	2	0	0	0	0	0	0	0	6	0
16:45	0	12	1	0	0	0	0	2	0	0	10	0
17:00	0	17	2	0	0	0	0	0	0	0	17	0
17:15	0	10	2	0	0	0	0	0	0	0	2	1
17:30	0	16	2	0	0	0	0	0	0	0	7	0
17:45	0	22	6	0	0	0	0	1	0	0	8	0
18:00	0	19	1	0	0	0	0	0	0	0	4	0
TOTAL	**0**	**170**	**39**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**98**	**2**
AM Peak Vol	0	37	14	0	0	0	0	4	0	0	21	0
PM Peak Vol	0	41	6	0	0	0	0	2	0	0	40	0

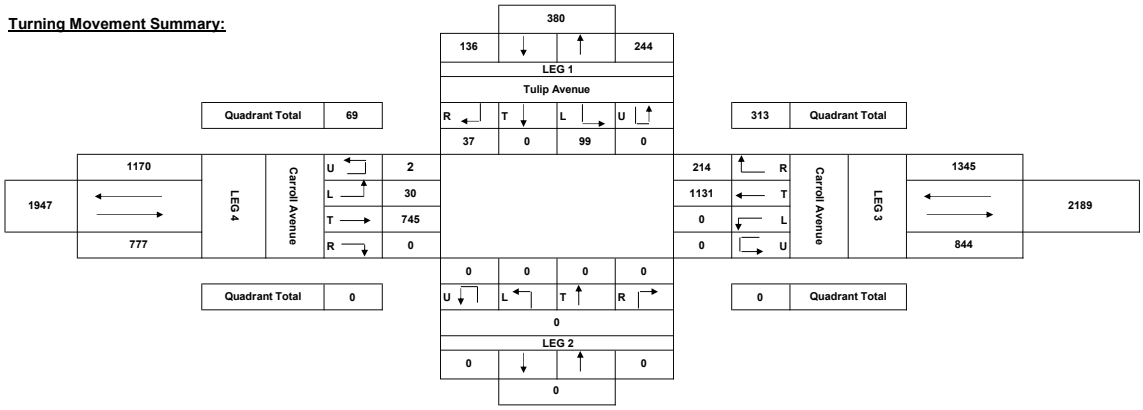
Job No.:

Location: Carroll Avenue at Tulip Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

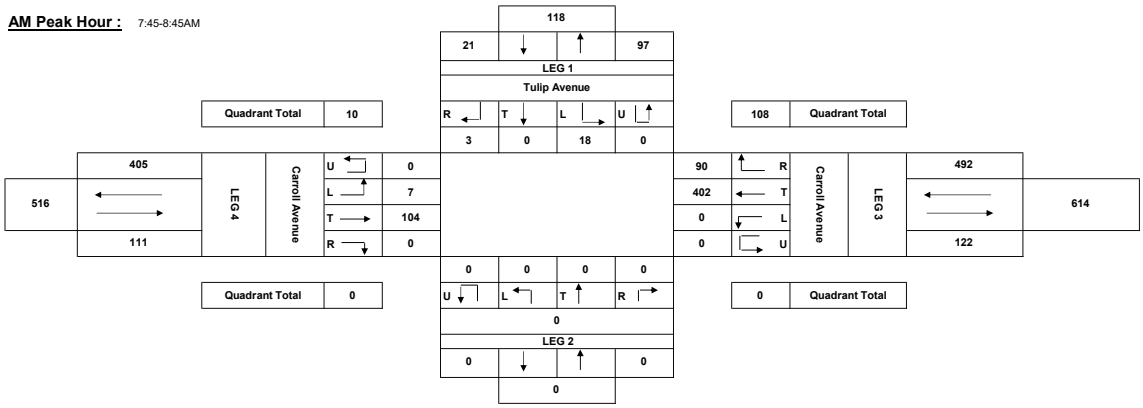
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	624				16:00	17:00	618		

Turning Movement Summary:

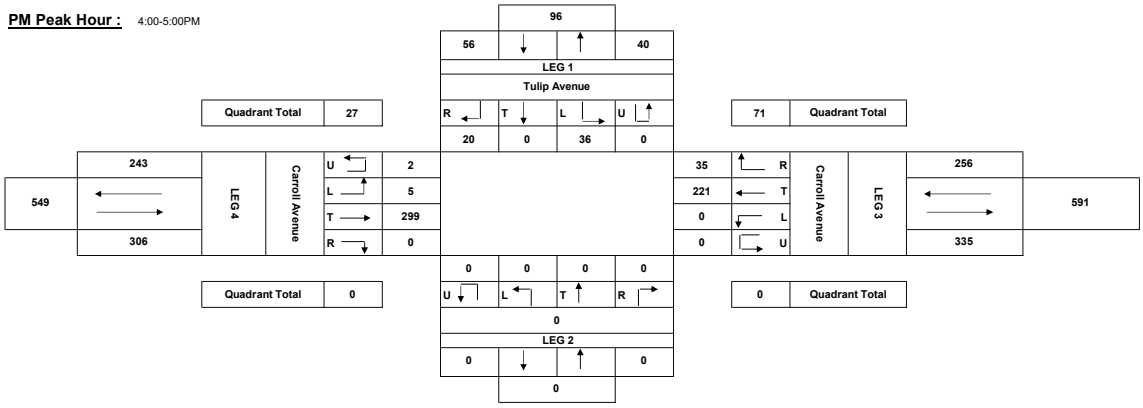


Comments:

AM Peak Hour : 7:45-8:45AM



PM Peak Hour : 4:00-5:00PM



Job No.:

Location: Carroll Avenue at Tulip Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	469		

Street Name-->	Tulip Avenue										Carroll Avenue					Carroll Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
11:15	0	6	0	6	12	0	0	0	0	0	0	0	47	1	48	1	8	29	0	38	98
11:30	0	4	0	4	8	0	0	0	0	0	0	0	52	7	59	0	3	39	0	42	109
11:45	0	10	0	7	17	0	0	0	0	0	0	0	52	4	56	0	4	42	0	46	119
12:00	0	8	0	1	9	0	0	0	0	0	0	0	50	5	55	1	2	45	0	48	112
12:15	0	9	0	2	11	0	0	0	0	0	0	0	42	6	48	0	4	29	0	33	92
12:30	0	5	0	5	10	0	0	0	0	0	0	0	58	7	65	1	7	41	0	49	124
12:45	0	10	0	4	14	0	0	0	0	0	0	0	70	4	74	1	4	48	0	53	141
13:00	0	8	0	4	12	0	0	0	0	0	0	0	42	5	47	0	2	42	0	44	103
TOTAL	**0**	**60**	**0**	**33**	**93**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**413**	**39**	**452**	**4**	**34**	**315**	**0**	**353**	**898**
Peak Vol	0	32	0	12	44	0	0	0	0	0	0	0	220	22	242	3	17	163	0	183	469

Job No.:

Location: Carroll Avenue at Tulip Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**469**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

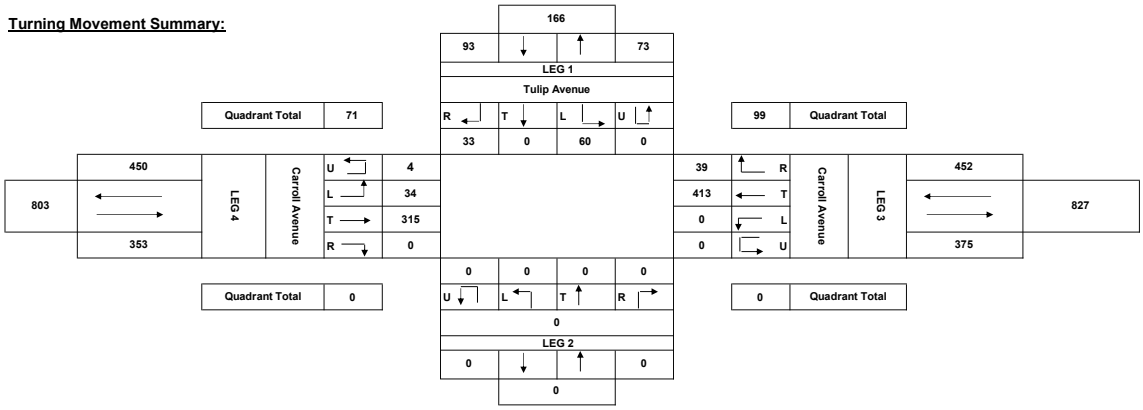
Hour Ending	From North: Tulip Avenue			From South: 0			From East: Carroll Avenue			From West: Carroll Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	24	2	0	0	0	0	0	0	0	8	0
11:30	0	20	4	0	0	0	0	0	0	0	17	1
11:45	0	22	3	0	0	0	0	0	0	0	7	0
12:00	0	18	5	0	0	0	0	2	0	0	0	0
12:15	0	21	3	0	0	0	0	1	0	0	6	2
12:30	0	22	1	0	0	0	0	0	0	0	7	0
12:45	0	22	1	0	0	0	0	0	0	0	7	0
13:00	0	22	4	0	0	0	0	0	0	0	10	0
TOTAL	**0**	**171**	**23**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**62**	**3**
Peak Vol	0	83	10	0	0	0	0	3	0	0	20	2

Job No.:

Location:	Carroll Avenue at Tulip Avenue			**County:**	Montgomery
Date:	10/22/2023 Sunday			**Town:**	Takoma Park
Recorder:	DCI			**Weather:**	Clear
Interval (dd) : (In Minutes)	15				

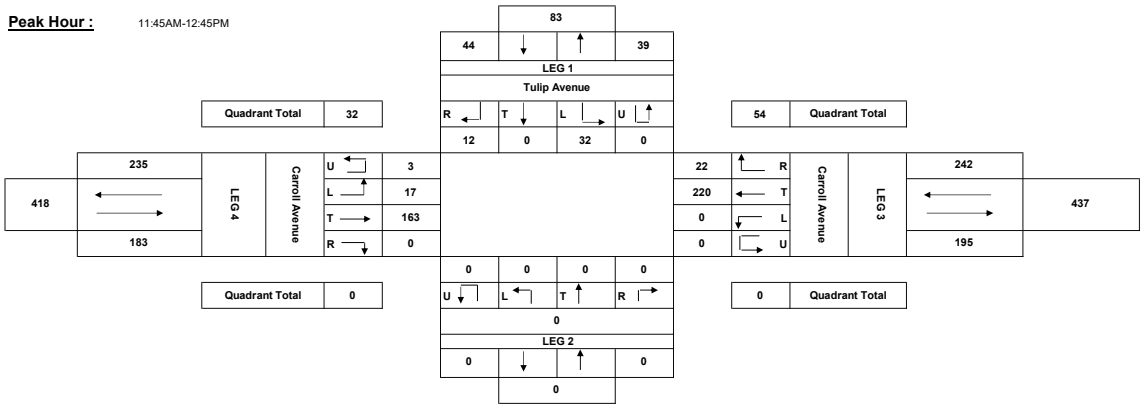
	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**469**		

Turning Movement Summary:



Comments:

Peak Hour : 11:45AM-12:45PM



Job No.:

Location: Carroll Avenue at Westmoreland Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:30	08:30	533				16:15	17:15	574		

Street Name-->	Westmoreland Avenue					Carroll Avenue					Carroll Avenue					
HOUR	From North					From South					From East					From West					GRAND
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	TOTAL
07:15	0	0	0	0	0	0	3	0	0	3	0	1	59	0	60	0	0	8	0	8	71
07:30	0	0	0	0	0	0	2	0	3	5	0	1	87	0	88	0	0	15	0	15	108
07:45	0	0	0	0	0	0	1	0	1	2	0	1	99	0	100	0	0	15	1	16	118
08:00	0	0	0	0	0	0	10	0	1	11	0	2	111	0	113	0	0	16	1	17	141
08:15	0	0	0	0	0	0	5	0	4	9	0	3	109	0	112	0	0	21	2	23	144
08:30	0	0	0	0	0	0	4	0	2	6	0	2	94	0	96	0	0	28	0	28	130
08:45	0	0	0	0	0	0	5	0	5	10	0	2	80	0	82	0	0	26	0	26	118
09:00	0	0	0	0	0	0	8	0	7	15	0	3	65	0	68	0	0	28	0	28	111
16:15	0	0	0	0	0	0	0	0	6	6	0	2	49	0	51	0	0	72	0	72	129
16:30	0	0	0	0	0	0	6	0	10	16	0	8	49	0	57	0	0	81	5	86	159
16:45	0	0	0	0	0	0	6	0	5	11	1	4	51	0	56	0	0	54	4	58	125
17:00	0	0	0	0	0	0	7	0	12	19	0	3	64	0	67	0	0	62	4	66	152
17:15	0	0	0	0	0	0	5	0	7	12	0	2	45	0	47	0	0	73	6	79	138
17:30	0	0	0	0	0	0	9	0	11	20	0	1	38	0	39	0	0	67	4	71	130
17:45	0	0	0	0	0	0	8	0	12	20	1	5	45	0	51	1	0	56	1	58	129
18:00	0	0	0	0	0	0	3	0	8	11	1	1	53	0	55	0	0	53	6	59	125
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**82**	**0**	**94**	**176**	**3**	**41**	**1098**	**0**	**1142**	**1**	**0**	**675**	**34**	**710**	**2028**
AM Peak Vol	0	0	0	0	0	0	20	0	8	28	0	8	413	0	421	0	0	80	4	84	533
PM Peak Vol	0	0	0	0	0	0	24	0	34	58	1	17	209	0	227	0	0	270	19	289	574

Job No.:

Location: Carroll Avenue at Westmoreland Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:30	08:30	**533**				16:15	17:15	**574**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North 0			From South Westmoreland Avenue			From East Carroll Avenue			From West Carroll Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	0	0	0	0	1	0	4	0	0	0	0
07:30	0	0	0	0	6	1	0	2	0	0	0	0
07:45	0	0	0	0	8	1	0	1	0	0	0	1
08:00	0	0	0	0	2	0	0	2	0	0	0	0
08:15	0	0	0	0	3	3	0	1	0	0	0	1
08:30	0	0	0	0	7	0	0	2	0	0	1	0
08:45	0	0	0	0	5	0	0	1	0	0	0	0
09:00	0	0	0	0	7	0	0	8	0	0	1	0
16:15	0	0	0	0	18	0	0	9	1	0	0	0
16:30	0	0	0	0	17	0	0	9	0	0	0	0
16:45	0	0	0	0	6	2	0	1	0	0	0	0
17:00	0	0	0	0	23	2	0	6	0	0	0	0
17:15	0	0	0	0	21	2	0	5	0	0	0	0
17:30	0	0	0	0	23	5	0	15	0	0	0	0
17:45	0	0	0	0	23	3	0	7	0	0	3	0
18:00	0	0	0	0	31	4	0	18	0	0	1	0
TOTAL	**0**	**0**	**0**	**0**	**200**	**24**	**0**	**91**	**1**	**0**	**6**	**2**
AM Peak Vol	0	0	0	0	20	4	0	6	0	0	1	2
PM Peak Vol	0	0	0	0	67	6	0	21	0	0	0	0

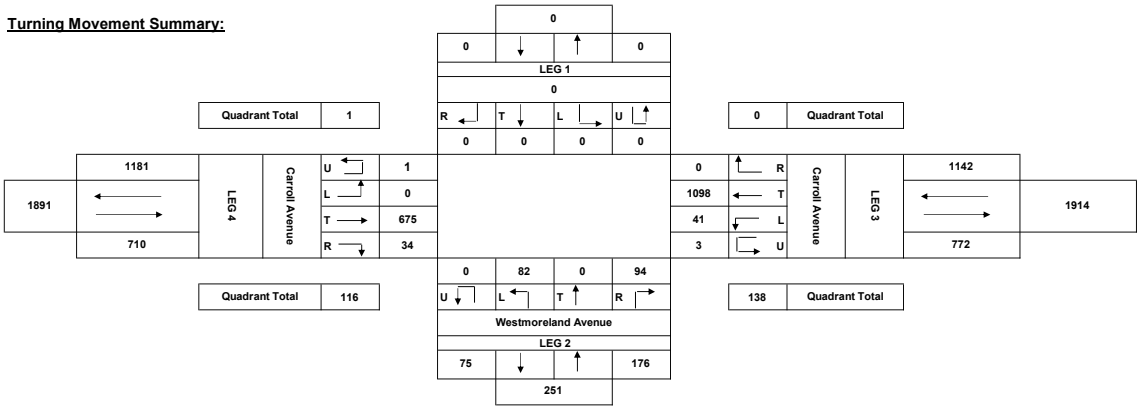
Job No.:

Location: Carroll Avenue at Westmoreland Avenue
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

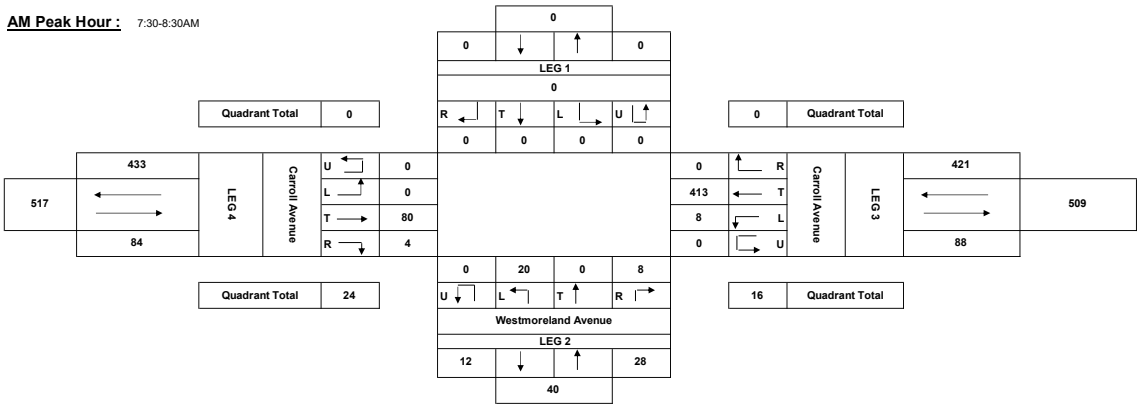
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:30	08:30	533				16:15	17:15	574		

Turning Movement Summary:

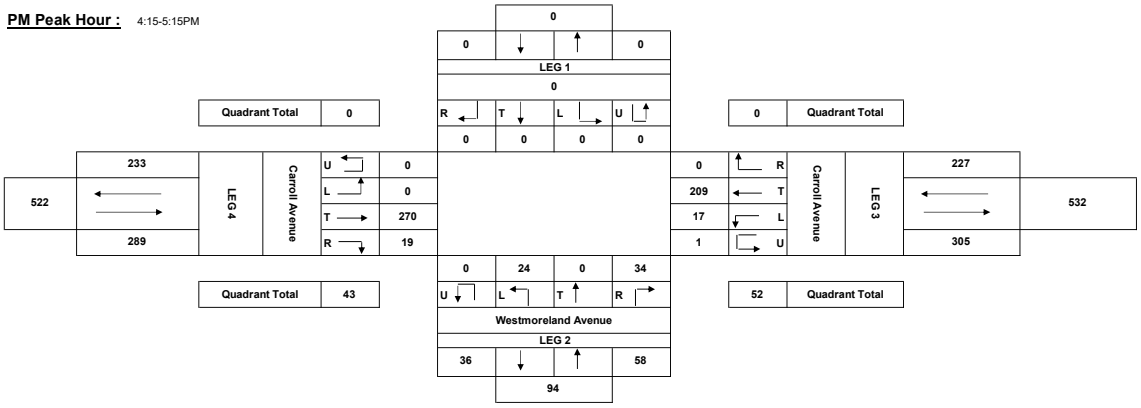


Comments:

AM Peak Hour : 7:30-8:30AM



PM Peak Hour : 4:15-5:15PM



Job No.:

Location: Carroll Avenue at Westmoreland Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	482		

Street Name-->	Westmoreland Avenue										Carroll Avenue					Carroll Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
11:15	0	0	0	0	0	0	6	0	6	12	0	5	46	0	51	0	0	33	5	38	101
11:30	0	0	0	0	0	0	6	0	7	13	0	6	50	0	56	0	0	33	7	40	109
11:45	0	0	0	0	0	0	12	0	13	25	0	11	51	0	62	0	0	39	5	44	131
12:00	0	0	0	0	0	0	8	0	9	17	0	5	46	0	51	0	0	39	8	47	115
12:15	0	0	0	0	0	0	8	0	10	18	0	4	48	0	52	1	0	27	4	32	102
12:30	0	0	0	0	0	0	7	0	9	16	0	13	50	0	63	0	0	40	2	42	121
12:45	0	0	0	0	0	0	6	0	9	15	0	9	64	0	73	0	0	48	8	56	144
13:00	0	0	0	0	0	0	5	0	12	17	0	8	44	0	52	0	0	36	2	38	107
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**58**	**0**	**75**	**133**	**0**	**61**	**399**	**0**	**460**	**1**	**0**	**295**	**41**	**337**	**930**
Peak Vol	0	0	0	0	0	0	29	0	37	66	0	31	208	0	239	1	0	154	22	177	482

Job No.:

Location: Carroll Avenue at Westmoreland Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	**482**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North 0			From South Westmoreland Avenue			From East Carroll Avenue			From West Carroll Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	0	0	0	86	2	0	18	1	0	0	0
11:30	0	0	0	0	88	5	0	27	0	0	0	2
11:45	0	0	0	0	73	1	0	31	0	0	0	0
12:00	0	0	0	0	80	9	0	23	0	0	3	0
12:15	0	0	0	0	96	2	0	10	1	0	2	0
12:30	0	0	0	0	90	3	0	19	0	0	2	0
12:45	0	0	0	0	100	3	0	34	0	0	0	0
13:00	0	0	0	0	52	1	0	27	0	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**665**	**26**	**0**	**189**	**2**	**0**	**7**	**2**
Peak Vol	0	0	0	0	366	17	0	86	1	0	7	0

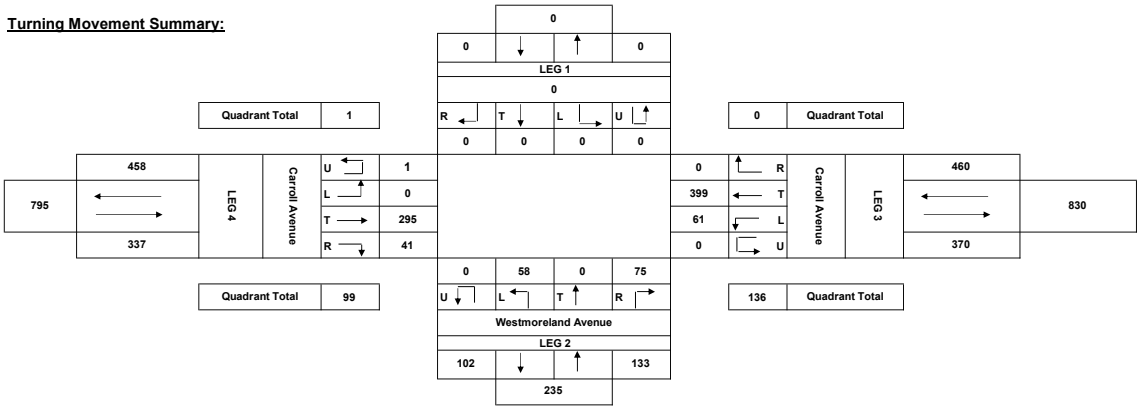
Job No.:

Location: Carroll Avenue at Westmoreland Avenue
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

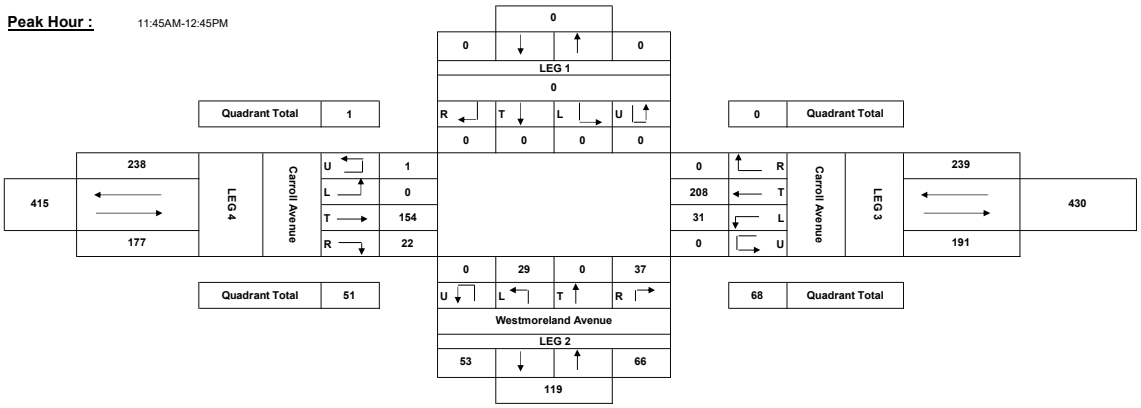
	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:45	12:45	482		

Turning Movement Summary:



Comments:

Peak Hour : 11:45AM-12:45PM



Appendix A – Turning Movement Counts

Job No.:

Location: Carroll Street at Maple Street
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD	Start	End	Volume	LOS	V/C	PM PERIOD	Start	End	Volume	LOS	V/C
	6:00AM-12:00PM	07:45	08:45	1072			12:00PM-7:00PM	17:00	18:00	1043		

Street Name-->	Maple Street NW					Maple Street NW					Carroll Street NW					Carroll Street NW					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
07:15	0	1	6	10	17	0	6	3	0	9	0	3	105	1	109	0	1	35	1	37	172
07:30	0	5	9	9	23	0	8	3	3	14	0	4	131	1	136	0	2	41	3	46	219
07:45	0	0	12	6	18	1	9	5	1	16	0	6	136	1	143	0	2	59	0	61	238
08:00	0	2	10	10	22	0	6	5	3	14	0	1	139	2	142	0	1	54	3	58	236
08:15	0	4	19	14	37	1	8	3	5	17	0	2	130	5	137	0	4	68	6	78	269
08:30	0	5	15	12	32	0	11	8	6	25	0	2	154	4	160	0	1	63	2	66	283
08:45	0	2	7	7	16	0	14	5	5	24	0	9	147	4	160	0	5	77	2	84	284
09:00	0	4	6	5	15	0	9	10	9	28	0	6	102	9	117	0	2	64	3	69	229
16:15	0	3	3	5	11	0	11	17	9	37	0	3	65	11	79	0	7	100	7	114	241
16:30	0	6	4	5	15	0	9	20	9	38	0	2	72	14	88	0	5	124	2	131	272
16:45	0	5	5	3	13	0	8	20	3	31	0	3	64	5	72	0	7	99	5	111	227
17:00	0	4	5	5	14	0	8	21	5	34	0	2	69	13	84	0	6	101	7	114	246
17:15	0	7	10	7	24	0	4	30	5	39	0	3	78	10	91	0	13	110	7	130	284
17:30	0	5	6	3	14	0	9	23	7	39	0	4	60	8	72	0	9	111	7	127	252
17:45	0	6	6	5	17	0	15	27	8	50	0	5	72	12	89	0	4	90	6	100	256
18:00	0	6	8	4	18	0	11	21	3	35	0	4	73	16	93	0	11	86	8	105	251
TOTAL	**0**	**65**	**131**	**110**	**306**	**2**	**146**	**221**	**81**	**450**	**0**	**59**	**1597**	**116**	**1772**	**0**	**80**	**1282**	**69**	**1431**	**3959**
AM Peak Vol	0	13	51	43	107	1	39	21	19	80	0	14	570	15	599	0	11	262	13	286	1072
PM Peak Vol	0	24	30	19	73	0	39	101	23	163	0	16	283	46	345	0	37	397	28	462	1043

Job No.:

Location: Carroll Street at Maple Street
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	**1072**				17:00	18:00	**1043**		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Maple Street NW			From South – Maple Street NW			From East – Carroll Street NW			From West – Carroll Street NW		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	8	0	0	12	1	0	1	0	0	1	2
07:30	0	17	1	0	15	0	0	4	0	0	2	0
07:45	0	34	1	0	9	0	0	0	0	0	3	3
08:00	0	22	0	0	10	1	0	2	0	0	3	3
08:15	0	27	1	0	8	0	0	4	0	0	11	5
08:30	0	25	1	0	21	0	0	9	0	0	2	0
08:45	0	32	2	0	23	0	0	10	1	0	5	1
09:00	0	25	0	0	23	0	0	6	0	0	5	1
16:15	0	34	0	0	27	1	0	4	1	0	1	0
16:30	0	15	3	0	13	2	0	6	0	0	3	1
16:45	0	23	0	0	40	0	0	8	1	0	7	1
17:00	0	31	0	0	27	2	0	7	3	0	9	0
17:15	0	34	4	0	20	0	0	14	2	0	13	0
17:30	0	31	0	0	26	0	0	6	1	0	12	0
17:45	0	55	2	0	21	1	0	6	3	0	11	0
18:00	0	29	0	0	19	0	0	2	2	0	12	0
TOTAL	**0**	**442**	**15**	**0**	**314**	**8**	**0**	**89**	**14**	**0**	**100**	**17**
AM Peak Vol	0	106	4	0	62	1	0	25	1	0	21	9
PM Peak Vol	0	149	6	0	86	1	0	28	8	0	48	0

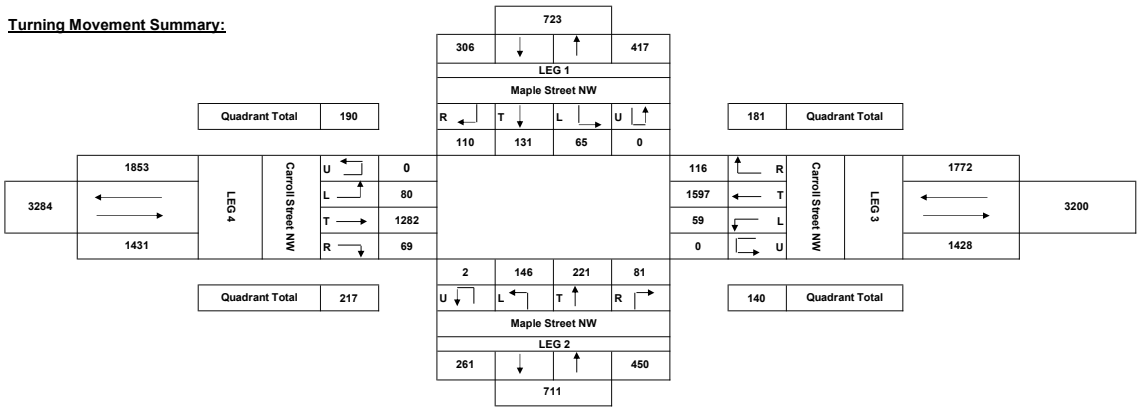
Job No.:

Location: Carroll Street at Maple Street
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

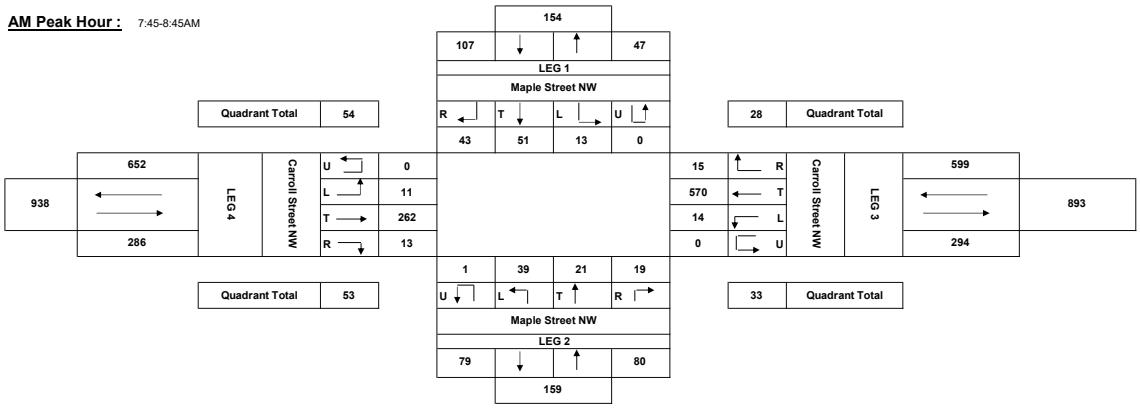
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	1072				17:00	18:00	1043		

Turning Movement Summary:

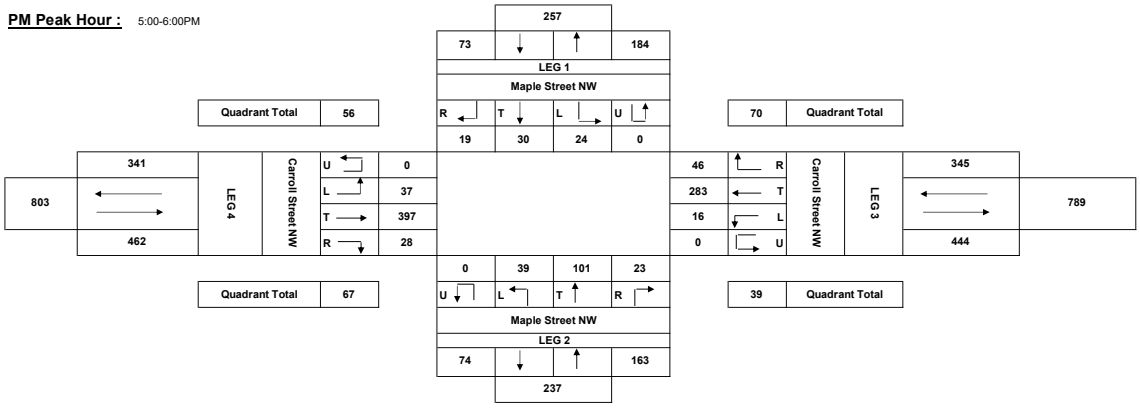


Comments:

AM Peak Hour : 7:45-8:45AM



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



Job No.:

Location: Carroll Street at Maple Street
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	838		

Street Name-->	Maple Street NW					Maple Street NW					Carroll Street NW					Carroll Street NW					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
11:15	1	4	8	4	17	0	10	8	6	24	0	5	65	5	75	0	3	64	4	71	187
11:30	0	4	12	4	20	0	11	8	6	25	0	3	58	7	68	0	6	78	5	89	202
11:45	0	5	12	2	19	0	11	9	10	30	1	4	71	9	85	0	4	72	6	82	216
12:00	0	3	10	5	18	0	9	13	2	24	0	1	78	6	85	0	8	65	6	79	206
12:15	0	6	10	5	21	0	11	9	10	30	0	8	64	7	79	0	1	55	6	62	192
12:30	0	5	10	5	20	0	7	9	4	20	0	4	59	6	69	0	6	74	5	85	194
12:45	0	6	11	4	21	0	12	11	5	28	0	5	74	11	90	0	2	87	8	97	236
13:00	0	3	9	4	16	0	7	6	8	21	0	4	87	9	100	0	7	66	6	79	216
TOTAL	**1**	**36**	**82**	**33**	**152**	**0**	**78**	**73**	**51**	**202**	**1**	**34**	**556**	**60**	**651**	**0**	**37**	**561**	**46**	**644**	**1649**
Peak Vol	0	20	40	18	78	0	37	35	27	99	0	21	284	33	338	0	16	282	25	323	838

Job No.:

Location: Carroll Street at Maple Street
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	838		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour	From North			From South			From East			From West		
	Maple Street NW			Maple Street NW			Carroll Street NW			Carroll Street NW		
Ending	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	57	1	0	42	4	0	9	0	0	22	0
11:30	0	48	2	0	42	1	0	17	0	0	9	1
11:45	0	47	1	0	32	3	0	13	1	0	20	0
12:00	0	77	2	0	50	0	0	12	0	0	9	0
12:15	0	68	1	0	24	0	0	16	0	0	11	0
12:30	0	63	0	0	47	0	0	14	0	0	18	0
12:45	0	60	3	0	27	0	0	5	0	0	15	0
13:00	0	58	1	0	23	3	0	11	0	0	13	0
TOTAL	**0**	**478**	**11**	**0**	**287**	**11**	**0**	**97**	**1**	**0**	**117**	**1**
Peak Vol	0	249	5	0	121	3	0	46	0	0	57	0

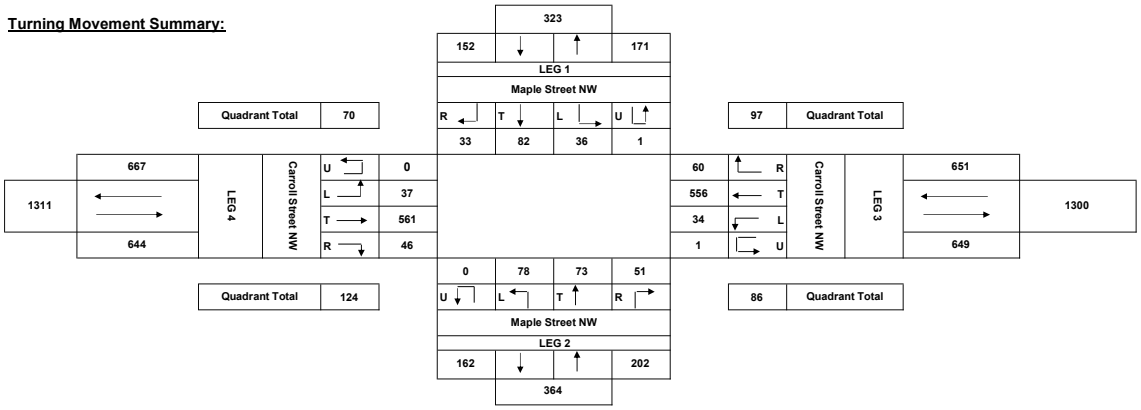
Job No.:

Location: Carroll Street at Maple Street
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

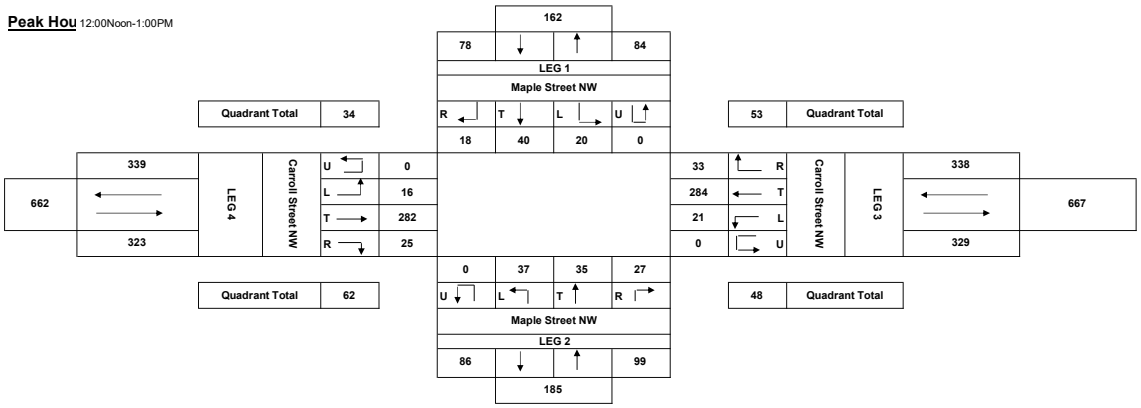
	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	838		

Turning Movement Summary:



Comments:

Peak Hou 12:00Noon-1:00PM



Appendix A – Turning Movement Counts

Job No.:

Location: Columbia Avenue at Pine Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		08:00	09:00	158				17:00	18:00	224		

Street Name-->						Pine Avenue					Columbia Avenue					Columbia Avenue					
HOUR	From North					From South					From East					From West					GRAND
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	TOTAL
07:15	0	0	0	0	0	0	11	0	0	11	0	0	8	0	8	0	0	1	5	6	25
07:30	0	0	0	0	0	0	13	0	0	13	0	0	4	0	4	0	0	3	3	6	23
07:45	0	0	0	0	0	0	5	0	0	5	0	0	5	0	5	0	0	1	1	2	12
08:00	0	0	0	0	0	0	12	0	0	12	0	0	5	0	5	0	0	4	5	9	26
08:15	0	0	0	0	0	0	20	0	0	20	0	0	11	0	11	0	0	6	6	12	43
08:30	0	0	0	0	0	0	20	0	1	21	0	2	3	0	5	0	0	2	8	10	36
08:45	0	0	0	0	0	0	15	0	0	15	0	0	9	0	9	0	0	5	8	13	37
09:00	0	0	0	0	0	0	19	0	1	20	0	2	8	0	10	0	0	1	11	12	42
16:15	0	0	0	0	0	0	17	0	0	17	0	0	5	0	5	0	0	6	7	13	35
16:30	0	0	0	0	0	0	13	0	0	13	0	0	7	0	7	0	0	7	9	16	36
16:45	0	0	0	0	0	0	14	0	1	15	0	2	6	0	8	0	0	6	7	13	36
17:00	0	0	0	0	0	0	20	0	2	22	0	1	15	0	16	0	0	4	8	12	50
17:15	0	0	0	0	0	0	25	0	4	29	0	2	7	0	9	0	0	10	17	27	65
17:30	0	0	0	0	0	0	30	0	1	31	0	3	6	0	9	0	0	4	10	14	54
17:45	0	0	0	0	0	0	25	0	1	26	0	0	10	0	10	0	0	5	12	17	53
18:00	0	0	0	0	0	0	22	0	1	23	0	2	4	0	6	0	0	10	13	23	52
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**281**	**0**	**12**	**293**	**0**	**14**	**113**	**0**	**127**	**0**	**0**	**75**	**130**	**205**	**625**
AM Peak Vol	0	0	0	0	0	0	74	0	2	76	0	4	31	0	35	0	0	14	33	47	158
PM Peak Vol	0	0	0	0	0	0	102	0	7	109	0	7	27	0	34	0	0	29	52	81	224

Job No.:

Location: Columbia Avenue at Pine Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		08:00	09:00	158				17:00	18:00	224		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North 0			From South Pine Avenue			From East Columbia Avenue			From West Columbia Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	0	0	0	3	0	0	2	0	0	0	0
07:30	0	0	0	0	2	0	0	0	0	0	1	0
07:45	0	0	0	0	8	0	0	3	0	0	1	0
08:00	0	0	0	0	2	0	0	2	0	0	1	0
08:15	0	0	0	0	7	0	0	0	0	0	2	0
08:30	0	0	0	0	3	0	0	2	0	0	3	0
08:45	0	0	0	0	11	0	0	1	0	0	5	0
09:00	0	0	0	0	5	0	0	4	0	0	3	1
16:15	0	0	0	0	4	0	0	2	0	0	3	0
16:30	0	0	0	0	7	0	0	1	0	0	1	0
16:45	0	0	0	0	6	0	0	5	0	0	0	0
17:00	0	0	0	0	3	1	0	0	0	0	0	0
17:15	0	0	0	0	3	0	0	2	0	0	0	0
17:30	0	0	0	0	5	0	0	0	0	0	1	0
17:45	0	0	0	0	9	0	0	1	0	0	5	0
18:00	0	0	0	0	4	0	0	0	0	0	1	0
TOTAL	**0**	**0**	**0**	**0**	**82**	**1**	**0**	**25**	**0**	**0**	**27**	**1**
AM Peak Vol	0	0	0	0	26	0	0	7	0	0	13	1
PM Peak Vol	0	0	0	0	21	0	0	3	0	0	7	0

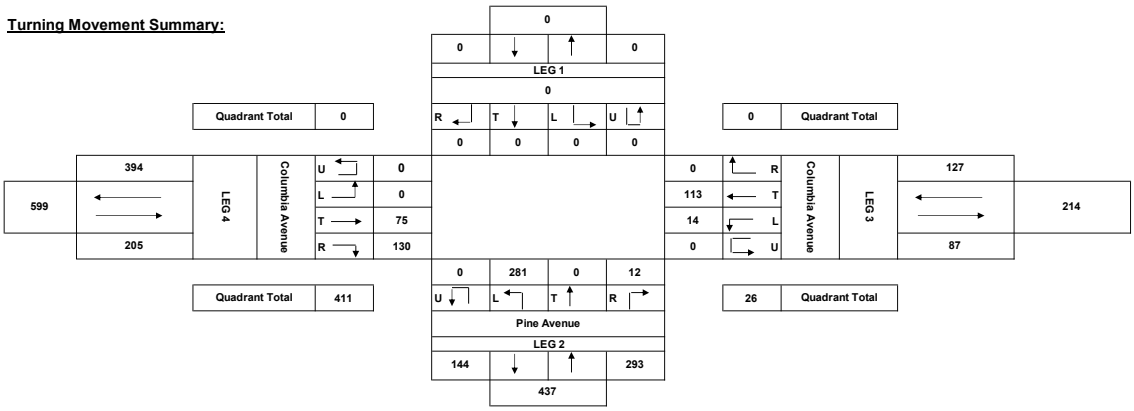
Job No.:

Location: Columbia Avenue at Pine Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

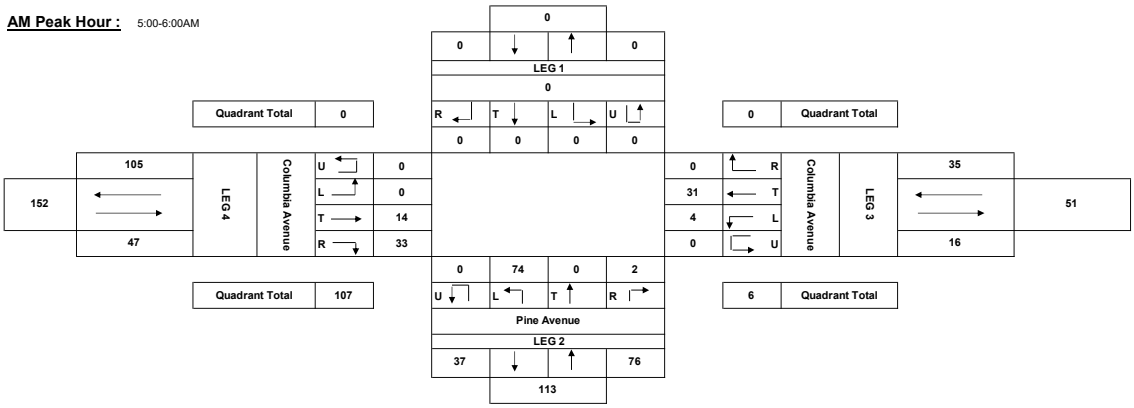
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		08:00	09:00	158				17:00	18:00	224		

Turning Movement Summary:

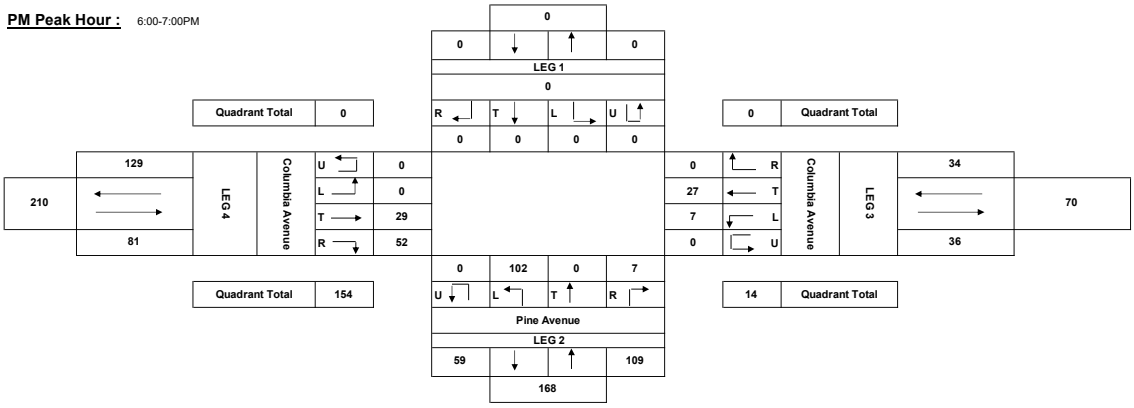


Comments:

AM Peak Hour : 5:00-6:00AM



PM Peak Hour : 6:00-7:00PM



Appendix A – Turning Movement Counts

Job No.:

Location: Columbia Avenue at Pine Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:30	12:30	152		

Street Name-->						Pine Avenue					Columbia Avenue					Columbia Avenue					
HOUR	From North					From South					From East					From West					GRAND
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	TOTAL
11:15	0	0	0	0	0	0	16	0	0	16	0	1	2	0	3	0	0	5	8	13	32
11:30	0	0	0	0	0	0	21	0	1	22	0	0	2	0	2	0	0	1	8	9	33
11:45	0	0	0	0	0	0	18	0	0	18	0	2	6	0	8	0	0	3	4	7	33
12:00	0	0	0	0	0	0	16	0	1	17	0	1	9	0	10	1	0	5	8	14	41
12:15	0	0	0	0	0	0	17	0	1	18	0	0	5	0	5	0	0	3	14	17	40
12:30	0	0	0	0	0	0	13	0	0	13	0	2	5	0	7	1	0	6	11	18	38
12:45	0	0	0	0	0	0	13	0	1	14	0	1	7	0	8	0	0	6	3	9	31
13:00	0	0	0	0	0	0	17	0	0	17	0	1	3	0	4	0	0	4	4	8	29
TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**131**	**0**	**4**	**135**	**0**	**8**	**39**	**0**	**47**	**2**	**0**	**33**	**60**	**95**	**277**
Peak Vol	0	0	0	0	0	0	64	0	2	66	0	5	25	0	30	2	0	17	37	56	152

Job No.:

Location: Columbia Avenue at Pine Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:30	12:30	152		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North 0			From South Pine Avenue			From East Columbia Avenue			From West Columbia Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	0	0	0	6	1	0	0	0	0	1	0
11:30	0	0	0	0	13	0	0	0	2	0	1	0
11:45	0	0	0	0	13	0	0	1	0	0	6	0
12:00	0	0	0	0	7	0	0	0	0	0	1	0
12:15	0	0	0	0	13	0	0	0	0	0	0	0
12:30	0	0	0	0	8	1	0	1	0	0	0	0
12:45	0	0	0	0	15	0	0	0	0	0	0	0
13:00	0	0	0	0	5	0	0	0	1	0	0	0
TOTAL	**0**	**0**	**0**	**0**	**80**	**2**	**0**	**2**	**3**	**0**	**9**	**0**
Peak Vol	0	0	0	0	41	1	0	2	0	0	7	0

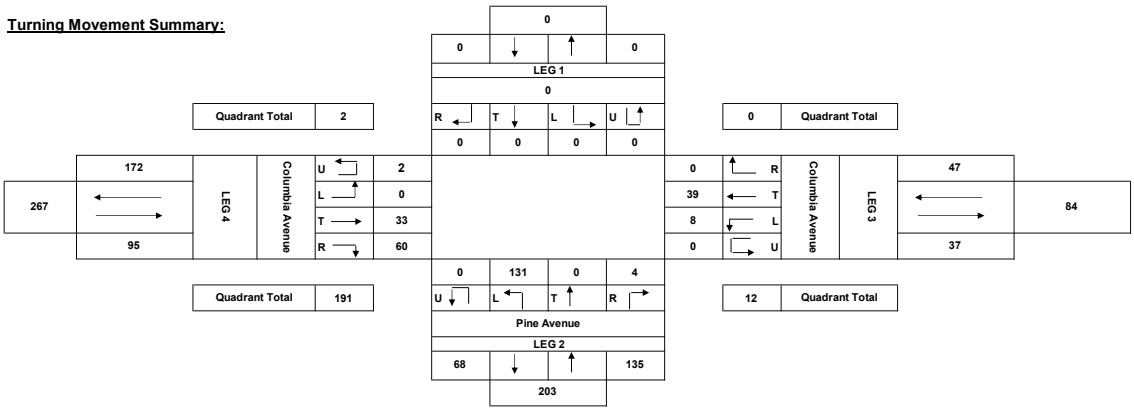
Job No.:

Location: Columbia Avenue at Pine Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

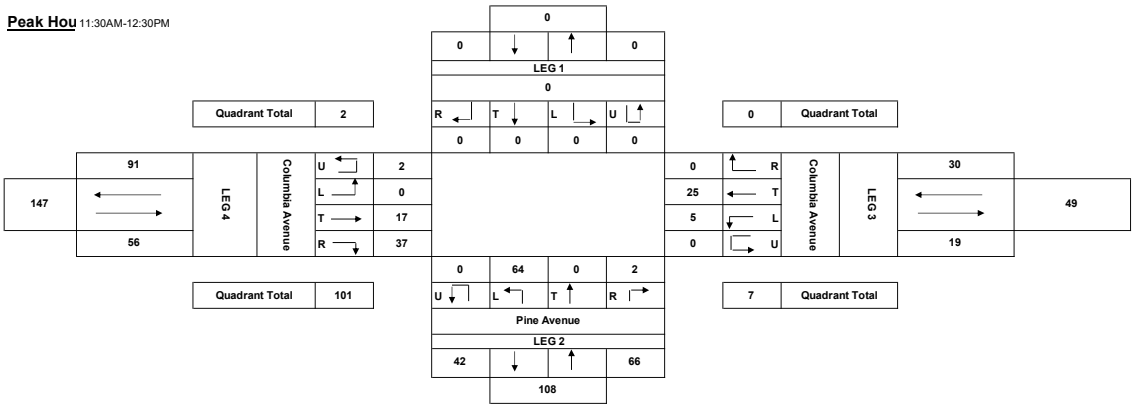
	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:30	12:30	152		

Turning Movement Summary:



Comments:

Peak Hou 11:30AM-12:30PM



TAKOMA PARK LAUREL AVENUE TRAFFIC STUDY
Appendix A – Turning Movement Counts

Job No.:

Location: Eastern Avenue at Laurel Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD	Start	End	Volume	LOS	V/C	PM PERIOD	Start	End	Volume	LOS	V/C
	6:00AM-12:00PM	07:45	08:45	928			12:00PM-7:00PM	17:00	18:00	826		

Street Name-->	Laurel Avenue					Laurel Street NW					Eastern Avenue NW					Eastern Avenue NW					GRAND
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	TOTAL
07:15	0	4	14	0	18	0	1	0	7	8	0	13	72	0	85	0	0	26	2	28	139
07:30	0	10	23	2	35	1	1	0	9	11	0	18	91	0	109	0	0	38	0	38	193
07:45	0	5	33	2	40	0	3	0	4	7	0	20	97	0	117	0	0	45	1	46	210
08:00	0	5	41	1	47	0	3	0	8	11	0	25	90	0	115	0	0	45	4	49	222
08:15	0	10	39	0	49	0	3	0	10	13	0	21	84	0	105	0	0	55	4	59	226
08:30	0	13	36	0	49	0	7	0	21	28	0	23	82	0	105	0	0	53	4	57	239
08:45	0	10	22	0	32	0	9	0	20	29	0	13	100	0	113	0	0	61	6	67	241
09:00	0	6	13	1	20	0	4	0	15	19	0	29	79	0	108	0	0	52	4	56	203
16:15	0	9	12	3	24	0	7	0	39	46	0	10	49	0	59	0	0	69	5	74	203
16:30	0	6	6	4	16	0	7	0	32	39	0	8	45	0	53	0	0	93	0	93	201
16:45	0	10	10	2	22	0	5	0	25	30	0	5	57	0	62	0	0	66	1	67	181
17:00	0	12	10	2	24	0	7	0	25	32	0	10	56	0	66	0	0	66	4	70	192
17:15	0	4	16	2	22	0	5	0	38	43	0	16	62	0	78	0	0	75	5	80	223
17:30	0	8	11	2	21	0	3	0	32	35	0	9	57	0	66	0	0	75	2	77	199
17:45	0	5	9	0	14	0	6	0	36	42	0	12	65	0	77	0	0	71	7	78	211
18:00	0	11	7	3	21	0	2	0	27	29	1	14	63	0	78	0	0	61	4	65	193
TOTAL	**0**	**128**	**302**	**24**	**454**	**1**	**73**	**0**	**348**	**422**	**1**	**246**	**1149**	**0**	**1396**	**0**	**0**	**951**	**53**	**1004**	**3276**
AM Peak Vol	0	38	138	1	177	0	22	0	59	81	0	82	356	0	438	0	0	214	18	232	928
PM Peak Vol	0	28	43	7	78	0	16	0	133	149	1	51	247	0	299	0	0	282	18	300	826

Job No.:

Location: Eastern Avenue at Laurel Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	928				17:00	18:00	826		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North: Laurel Avenue			From South: Laurel Street NW			From East: Eastern Avenue NW			From West: Eastern Avenue NW		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	6	0	0	1	1	0	5	0	0	0	0
07:30	0	6	0	0	2	0	0	8	0	0	1	0
07:45	0	12	0	0	3	0	0	13	1	0	2	1
08:00	0	17	0	0	9	0	0	15	0	0	1	3
08:15	0	10	1	0	0	0	0	13	0	0	1	2
08:30	0	9	0	0	2	0	0	7	0	0	0	2
08:45	0	16	0	0	0	1	0	20	0	0	0	0
09:00	0	9	0	0	0	0	0	12	1	0	0	1
16:15	0	24	0	0	9	1	0	23	1	0	4	0
16:30	0	14	1	0	9	0	0	25	0	0	0	1
16:45	0	21	0	0	2	0	0	27	1	0	1	0
17:00	0	12	1	0	5	0	0	20	1	0	6	0
17:15	0	11	0	0	3	0	0	13	2	0	2	1
17:30	0	8	1	0	2	0	0	16	2	0	0	0
17:45	0	14	0	0	3	0	0	12	2	0	1	1
18:00	0	6	0	0	1	1	0	7	4	0	0	0
TOTAL	**0**	**195**	**4**	**0**	**51**	**4**	**0**	**236**	**15**	**0**	**19**	**12**
AM Peak Vol	0	52	1	0	11	1	0	55	0	0	2	7
PM Peak Vol	0	39	1	0	9	1	0	48	10	0	3	2

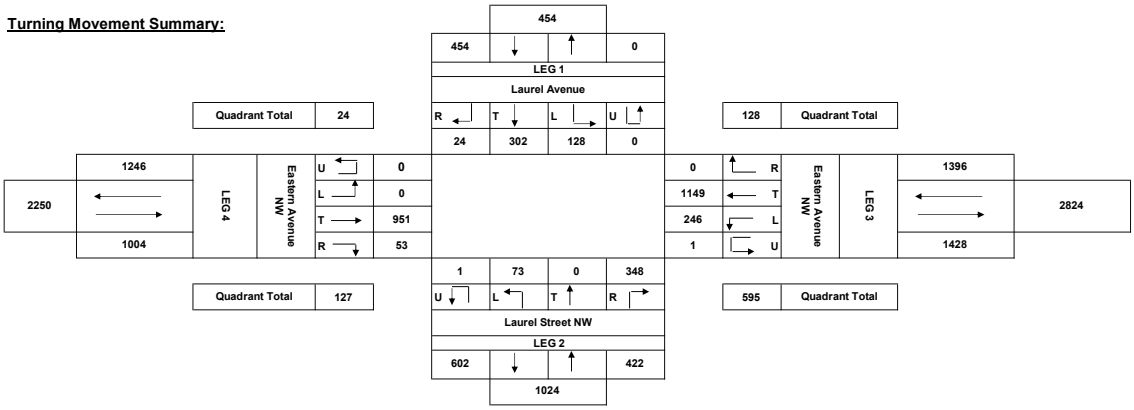
Job No.:

Location: Eastern Avenue at Laurel Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

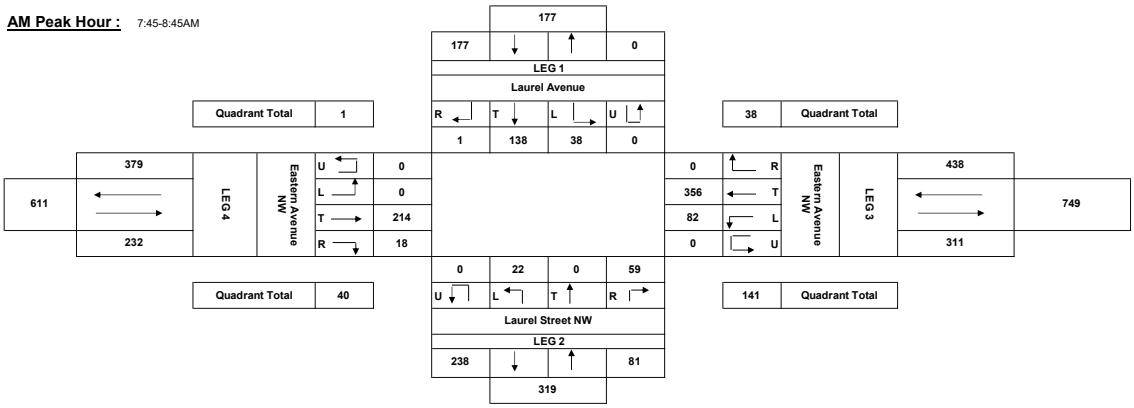
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	928				17:00	18:00	826		

Turning Movement Summary:

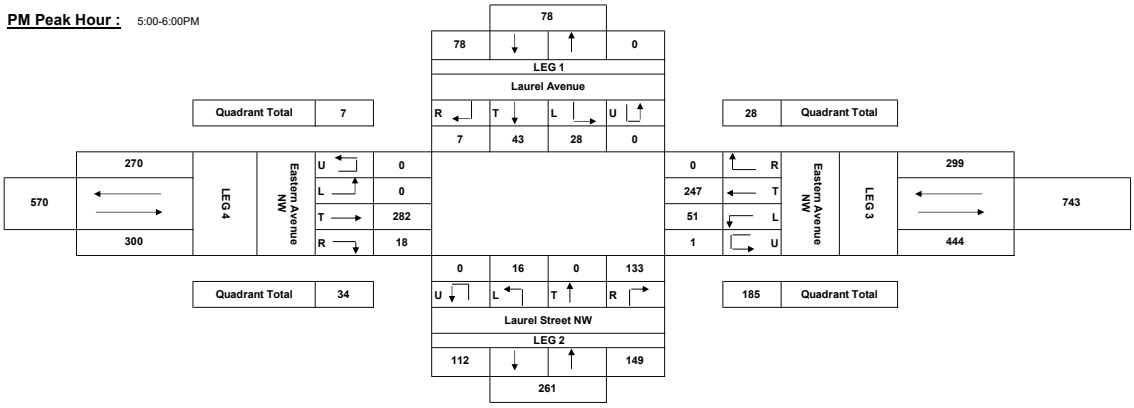


Comments:

AM Peak Hour : 7:45-8:45AM



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



TAKOMA PARK LAUREL AVENUE TRAFFIC STUDY
Appendix A – Turning Movement Counts

Job No.:

Location: Eastern Avenue at Laurel Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	**663**		

Street Name-->	Laurel Avenue					Laurel Street NW					Eastern Avenue NW					Eastern Avenue NW					GRAND
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	TOTAL
11:15	0	3	14	3	20	0	11	0	15	26	0	6	50	0	56	0	0	36	13	49	151
11:30	0	11	12	2	25	0	8	0	23	31	0	3	47	0	50	1	0	46	11	58	164
11:45	0	10	8	5	23	0	13	0	17	30	0	9	52	0	61	0	0	49	6	55	169
12:00	0	6	10	3	19	0	7	0	18	25	0	12	54	0	66	0	0	38	5	43	153
12:15	0	8	8	3	19	0	10	0	17	27	0	8	38	0	46	1	0	48	3	52	144
12:30	0	13	9	4	26	0	8	0	16	24	0	14	48	0	62	0	0	46	5	51	163
12:45	0	14	5	5	24	0	9	0	25	34	0	11	56	0	67	0	0	58	5	63	188
13:00	0	6	5	2	13	0	4	0	21	25	0	10	66	0	76	0	0	47	7	54	168
TOTAL	**0**	**71**	**71**	**27**	**169**	**0**	**70**	**0**	**152**	**222**	**0**	**73**	**411**	**0**	**484**	**2**	**0**	**368**	**55**	**425**	**1300**
Peak Vol	0	41	27	14	82	0	31	0	79	110	0	43	208	0	251	1	0	199	20	220	663

Job No.:

Location: Eastern Avenue at Laurel Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	663		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Laurel Avenue			From South – Laurel Street NW			From East – Eastern Avenue NW			From West – Eastern Avenue NW		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	23	2	0	1	1	0	65	7	0	1	0
11:30	0	26	0	0	0	0	0	74	0	0	0	1
11:45	0	27	0	0	0	1	0	65	2	0	4	0
12:00	0	25	0	0	1	1	0	74	1	0	1	4
12:15	0	58	0	0	2	0	0	86	1	0	0	0
12:30	0	82	0	0	1	0	0	105	0	0	2	1
12:45	0	35	0	0	0	0	0	72	3	0	1	1
13:00	0	25	0	0	0	0	0	58	2	0	0	1
TOTAL	**0**	**301**	**2**	**0**	**5**	**3**	**0**	**599**	**16**	**0**	**9**	**8**
Peak Vol	0	200	0	0	3	0	0	321	6	0	3	3

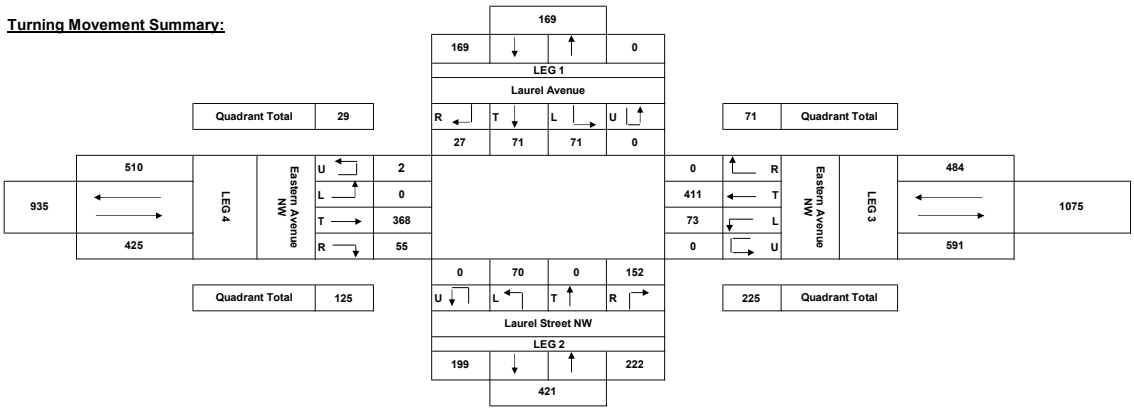
Job No.:

Location: Eastern Avenue at Laurel Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

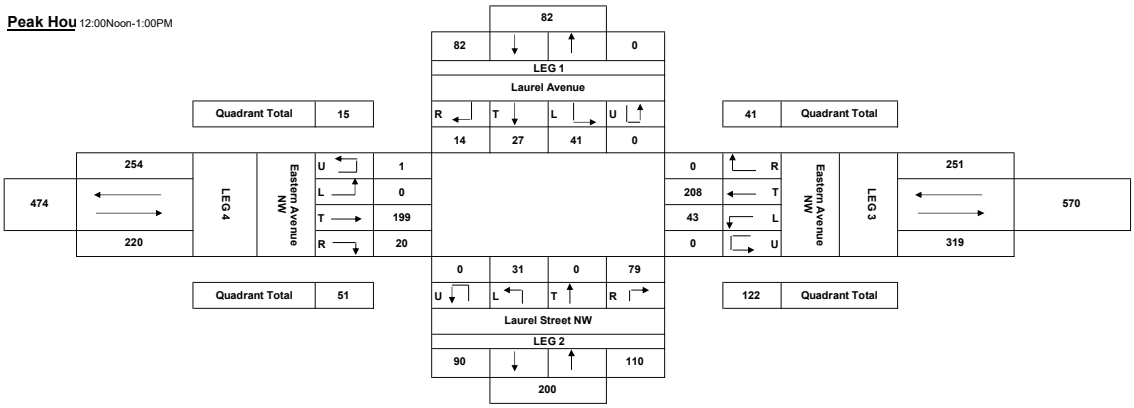
	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	663		

Turning Movement Summary:



Comments:

Peak Hou 12:00Noon-1:00PM



Job No.:

Location: Eastern Avenue at Walnut Street
Date: 10/18/2023 Wednesday
Recorder: DCI
Interval (dd) : 15 (In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS		Start	End	Volume	LOS		V/C		Start	End		Volume	LOS	V/C
AM PERIOD	6:00AM-12:00PM	07:45	08:45	895				PM PERIOD 12:00PM-7:00PM	16:45	17:45		885		

Street Name-->	Eastern Avenue NW						Eastern Avenue NW						Eastern Avenue Service Road						Walnut Avenue						Walnut Street NW						GRAND
HOUR	From North						From South						From South						From East						From West						
ENDING	U turn	Left	Through (To Eastern Avenue Service Road)	Through (To Eastern Avenue NW)	Right	Total	U turn	Left	Through	Right (To Walnut Avenue)	Hard Right (To Eastern Avenue Service Road)	Total	U turn	Hard Left (To Eastern Avenue NW)	Left (To Walnut Street NW)	Through	Right	Total	U turn	Left (To Eastern Avenue Service Road)	Left (To Eastern Avenue NW)	Through	Right	Total	U turn	Left	Through	Right (To Eastern Avenue Service Road)	Right (To Eastern Avenue NW)	Total	TOTAL
07:15	0	0	0	38	0	38	0	7	80	1	0	88	0	0	0	2	0	2	0	0	3	3	5	11	0	0	0	0	2	2	141
07:30	0	1	0	53	0	54	0	5	103	5	0	113	0	1	0	0	0	1	0	0	8	2	4	14	0	0	0	0	1	1	183
07:45	0	0	0	55	0	55	0	8	116	3	0	127	0	1	0	0	0	1	0	0	1	11	2	14	0	1	1	0	2	4	201
08:00	0	4	0	56	2	62	0	13	116	4	0	133	0	0	1	1	0	2	0	0	6	4	8	18	0	0	2	0	0	2	217
08:15	0	5	1	67	1	74	0	16	98	5	0	119	0	0	0	0	2	2	0	0	4	11	6	21	0	0	0	0	1	1	217
08:30	0	5	0	83	1	89	0	8	90	9	0	107	0	0	0	2	1	3	0	0	6	6	9	21	0	0	3	0	1	4	224
08:45	0	4	0	82	1	87	0	9	110	5	0	124	0	0	1	0	3	4	0	0	3	9	6	18	0	0	0	0	4	4	237
09:00	0	7	1	69	1	78	0	2	95	12	1	110	0	1	1	0	2	4	0	1	3	3	5	12	0	0	2	0	2	4	208
16:15	0	16	1	103	0	120	0	1	48	6	0	55	0	0	0	0	1	1	0	0	3	1	2	6	0	2	7	0	4	13	195
16:30	0	19	2	111	0	132	0	0	47	16	0	63	0	0	2	0	1	3	0	0	4	2	0	6	0	0	6	0	3	9	213
16:45	0	11	1	97	1	110	0	1	53	11	0	65	0	1	0	0	0	1	0	0	5	2	2	9	0	0	3	0	0	3	188
17:00	0	19	1	86	0	106	0	0	62	22	0	84	0	0	1	0	0	1	0	0	3	2	2	7	0	0	7	0	2	9	207
17:15	0	24	0	96	1	121	0	0	69	23	0	92	0	0	0	0	0	0	0	1	7	0	2	10	0	0	4	0	1	5	228
17:30	0	22	0	94	0	116	0	3	59	25	1	88	0	1	1	0	0	2	0	0	3	1	3	7	0	0	11	0	1	12	225
17:45	0	15	0	97	0	112	0	2	63	25	0	90	0	1	0	0	0	1	0	0	7	2	5	14	0	0	6	0	2	8	225
18:00	0	13	1	79	2	95	0	3	75	11	0	89	0	1	0	2	0	3	0	1	4	0	3	8	0	0	6	0	2	8	203
TOTAL	0	165	8	1266	10	1449	0	78	1284	183	2	1547	0	7	7	7	10	31	0	3	70	59	64	196	0	3	58	0	28	89	3312
AM Peak Vol	0	18	1	288	5	312	0	46	414	23	0	483	0	0	2	3	6	11	0	0	19	30	29	78	0	0	5	0	6	11	895
PM Peak Vol	0	80	1	373	1	455	0	5	253	95	1	354	0	2	2	0	0	4	0	1	20	5	12	38	0	0	28	0	6	34	885

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North Eastern Avenue NW			From South Eastern Avenue NW			From South Eastern Avenue Service Road			From East Walnut Avenue			From West Walnut Street NW		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	1	0	0	0	0	0	0	0	0	1	1	0	2	0
07:30	0	2	1	0	0	0	0	0	0	0	1	0	0	5	0
07:45	0	3	1	0	0	0	0	0	0	0	2	0	0	4	0
08:00	0	2	1	0	0	0	0	0	0	0	1	0	0	4	0
08:15	0	6	0	0	0	0	0	0	0	0	3	0	0	9	0
08:30	0	8	0	0	0	0	0	0	0	0	3	0	0	9	0
08:45	0	7	0	0	0	0	0	0	0	0	1	0	0	6	1
09:00	0	1	0	0	1	0	0	1	0	0	2	0	0	2	0
16:15	0	2	0	0	0	0	0	0	0	0	4	0	0	3	1
16:30	0	2	0	0	1	0	0	1	0	0	2	0	0	4	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
17:00	0	5	0	0	0	0	0	0	0	0	1	0	0	5	0
17:15	0	3	0	0	0	0	0	0	0	0	0	2	0	7	0
17:30	0	7	0	0	0	0	0	0	0	0	1	0	0	6	0
17:45	0	3	1	0	0	0	0	0	0	0	1	0	0	6	0
18:00	0	1	0	0	0	0	0	1	0	0	3	0	0	3	0
TOTAL	0	53	4	0	2	0	0	3	0	0	26	3	0	85	2
AM Peak Vol	0	23	1	0	0	0	0	0	0	0	8	0	0	28	1
PM Peak Vol	0	18	1	0	0	0	0	0	0	0	3	2	0	24	0

10-18-23

Job No.:

Location: Eastern Avenue at Walnut Street
Date: 10/22/2023 Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		12:00	13:00	**702**		

Street Name-->	Eastern Avenue NW						Eastern Avenue NW						Eastern Avenue Service Road						Walnut Avenue						Walnut Street NW						GRAND
HOUR	From North						From South						From South						From East						From West						
ENDING	**U turn**	**Left**	**Through (To Eastern Avenue Service Road)**	**Through (To Eastern Avenue NW)**	**Right**	**Total**	**U turn**	**Left**	**Through**	**Right (To Walnut Avenue)**	**Hard Right (To Eastern Avenue Service Road)**	**Total**	**U turn**	**Hard Left (To Eastern Avenue NW)**	**Left (To Walnut Street NW)**	**Through**	**Right**	**Total**	**U turn**	**Left (To Eastern Avenue Service Road)**	**Left (To Eastern Avenue NW)**	**Through**	**Right**	**Total**	**U turn**	**Left**	**Through**	**Right (To Eastern Avenue Service Road)**	**Right (To Eastern Avenue NW)**	**Total**	**TOTAL**
11:15	0	7	0	46	8	61	0	1	51	6	0	58	0	0	0	3	0	3	0	0	3	0	5	8	0	1	1	0	0	2	132
11:30	0	16	0	55	2	73	0	2	50	14	1	67	0	0	0	0	0	0	0	0	4	2	2	8	0	0	5	0	0	5	153
11:45	0	15	1	68	2	86	0	3	58	15	0	76	0	0	0	0	1	1	0	1	3	3	3	10	0	1	3	0	0	4	177
12:00	0	9	0	62	2	73	0	2	59	7	0	68	0	0	0	0	0	0	0	0	2	3	7	12	0	0	5	0	2	7	160
12:15	1	3	0	69	2	75	0	0	41	8	1	50	0	0	0	0	0	0	0	0	3	1	5	9	0	2	3	0	2	7	141
12:30	0	10	0	69	4	83	0	1	61	6	0	68	0	0	0	1	1	2	0	2	7	1	3	13	0	1	5	0	4	10	176
12:45	0	7	2	87	4	100	0	0	59	16	0	75	0	0	0	2	2	4	0	1	5	3	5	14	0	0	4	0	5	9	202
13:00	0	13	0	65	3	81	0	3	74	10	0	87	0	0	1	1	1	3	0	0	2	2	5	9	0	1	2	0	0	3	183
TOTAL	1	80	3	521	27	632	0	12	453	82	2	549	0	0	1	7	5	13	0	4	29	15	35	83	0	6	28	0	13	47	1324
Peak Vol	1	33	2	290	13	339	0	4	235	40	1	280	0	0	1	4	4	9	0	3	17	7	18	45	0	4	14	0	11	29	702

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North Eastern Avenue NW			From South Eastern Avenue NW			From South Eastern Avenue Service Road			From East Walnut Avenue			From West Walnut Street NW		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	8	1	0	0	0	0	0	0	0	6	1	0	11	0
11:30	0	7	0	0	0	0	0	0	0	0	6	0	0	4	0
11:45	0	7	0	0	0	0	0	0	0	0	3	0	0	2	0
12:00	0	5	1	0	0	0	0	0	0	0	2	1	0	5	0
12:15	0	5	0	0	0	0	0	0	0	0	4	0	0	5	0
12:30	0	5	0	0	0	0	0	0	0	0	3	0	0	5	1
12:45	0	11	0	0	0	0	0	0	0	0	1	0	0	4	0
13:00	0	7	0	0	0	0	0	0	0	0	2	0	0	8	0
TOTAL	0	55	2	0	0	0	0	0	0	0	27	2	0	44	1
Peak Vol	0	28	0	0	0	0	0	0	0	0	10	0	0	22	1

10-22-23

Job No.:

Location: Westmoreland Avenue at Elm Avenue and Walnut Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start 07:45	End 08:45	Volume 163	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start 16:45	End 17:45	Volume 286	LOS	V/C

Street Name-->	Westmoreland Avenue					Westmoreland Avenue					Elm Avenue					Walnut Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
07:15	0	0	1	1	2	0	2	2	2	6	0	2	8	0	10	0	1	1	0	2	20
07:30	0	0	1	0	1	0	1	0	2	3	0	0	13	2	15	0	2	3	1	6	25
07:45	0	0	1	0	1	0	0	0	0	0	0	0	14	1	15	0	1	3	0	4	20
08:00	0	1	0	0	1	0	0	3	1	4	0	0	18	6	24	0	1	8	0	9	38
08:15	0	2	2	2	6	0	2	2	0	4	0	1	17	2	20	0	6	7	1	14	44
08:30	0	0	0	0	0	0	2	1	0	3	0	0	22	2	24	0	4	14	0	18	45
08:45	0	0	1	0	1	0	2	2	1	5	0	0	14	4	18	0	2	9	1	12	36
09:00	0	1	0	0	1	0	1	0	0	1	0	0	10	4	14	0	9	13	0	22	38
16:15	0	2	0	1	3	0	0	2	0	2	0	0	5	0	5	0	2	25	2	29	39
16:30	0	3	1	1	5	0	0	0	1	1	0	0	4	2	6	0	12	31	0	43	55
16:45	0	3	0	1	4	0	0	0	1	1	0	1	7	2	10	0	8	19	0	27	42
17:00	0	3	1	0	4	0	0	2	0	2	0	1	7	0	8	0	7	36	1	44	58
17:15	0	1	3	0	4	0	1	3	4	8	0	0	10	0	10	0	9	42	1	52	74
17:30	0	3	1	0	4	0	1	0	2	3	0	2	6	8	16	0	9	50	2	61	84
17:45	0	2	0	1	3	0	1	1	2	4	0	1	11	3	15	0	12	36	0	48	70
18:00	0	6	1	1	8	0	0	1	1	2	0	2	7	3	12	0	5	24	1	30	52
TOTAL	**0**	**27**	**13**	**8**	**48**	**0**	**13**	**19**	**17**	**49**	**0**	**10**	**173**	**39**	**222**	**0**	**90**	**321**	**10**	**421**	**740**
AM Peak Vol	0	3	3	2	8	0	6	8	2	16	0	1	71	14	86	0	13	38	2	53	163
PM Peak Vol	0	9	5	1	15	0	3	6	8	17	0	4	34	11	49	0	37	164	4	205	286

Job No.:

Location: Westmoreland Avenue at Elm Avenue and Walnut Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	163				16:45	17:45	286		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Westmoreland Avenue			From South – Westmoreland Avenue			From East – Elm Avenue			From West – Walnut Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
07:15	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	2	0	0	1	0	0	0	0	0	1	0
07:45	0	1	0	0	2	0	0	2	0	0	1	1
08:00	0	1	0	0	1	0	0	2	0	0	1	0
08:15	0	2	0	0	0	0	0	0	0	0	5	1
08:30	0	5	0	0	1	0	0	0	0	0	4	0
08:45	0	3	1	0	2	0	0	6	0	0	5	0
09:00	0	3	0	0	2	1	0	2	3	0	8	0
16:15	0	2	0	0	2	0	0	1	0	0	3	3
16:30	0	4	0	0	1	0	0	1	0	0	6	0
16:45	0	0	0	0	0	0	0	3	0	0	0	1
17:00	0	2	0	0	0	0	0	2	0	0	3	0
17:15	0	7	0	0	0	0	0	2	0	0	2	0
17:30	0	5	0	0	1	1	0	0	0	0	3	2
17:45	0	3	1	0	2	0	0	0	0	0	5	1
18:00	0	5	0	0	0	1	0	2	0	0	7	0
TOTAL	**0**	**45**	**2**	**0**	**15**	**3**	**0**	**23**	**3**	**0**	**54**	**9**
AM Peak Vol	0	11	1	0	4	0	0	8	0	0	15	1
PM Peak Vol	0	17	1	0	3	1	0	4	0	0	13	3

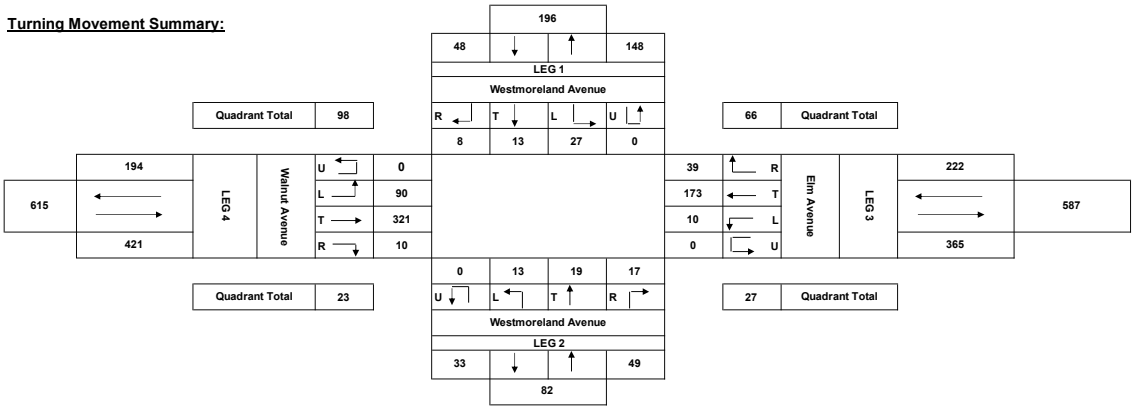
Job No.:

Location: Westmoreland Avenue at Elm Avenue and Walnut Avenue
Date: ######## Wednesday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

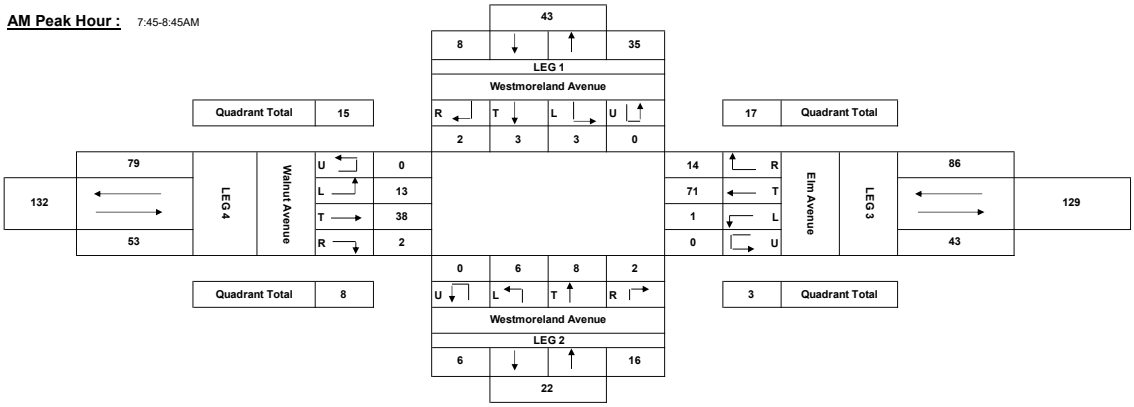
PEAK HOURS	AM PERIOD 6:00AM-12:00PM	Start	End	Volume	LOS	V/C	PM PERIOD 12:00PM-7:00PM	Start	End	Volume	LOS	V/C
		07:45	08:45	163				16:45	17:45	286		

Turning Movement Summary:

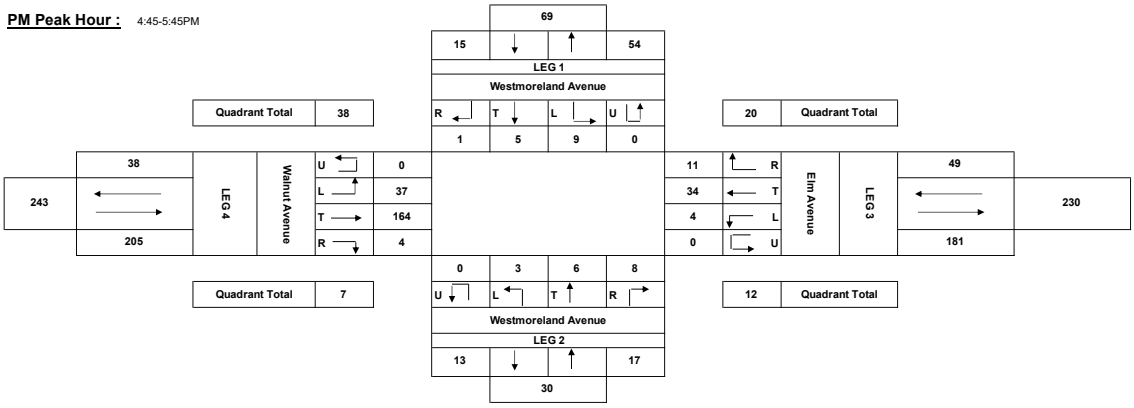


Comments:

AM Peak Hour : 7:45-8:45AM



PM Peak Hour : 4:45-5:45PM



Appendix A – Turning Movement Counts

Job No.:

Location: Westmoreland Avenue at Elm Avenue and Walnut Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:15	12:15	194		

Street Name-->	Westmoreland Avenue					Westmoreland Avenue					Elm Avenue					Walnut Avenue					GRAND TOTAL
HOUR	From North					From South					From East					From West					
ENDING	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	U turn	Left	Through	Right	Total	
11:15	0	1	0	3	4	0	1	1	2	4	0	1	2	5	8	0	4	10	0	14	30
11:30	0	3	0	4	7	0	0	0	2	2	0	1	6	0	7	0	7	27	0	34	50
11:45	0	6	1	6	13	0	0	2	1	3	0	1	6	4	11	0	14	17	2	33	60
12:00	0	2	1	4	7	0	0	0	1	1	0	0	6	2	8	0	9	10	1	20	36
12:15	1	6	1	3	11	0	1	3	3	7	0	1	6	7	14	0	6	9	1	16	48
12:30	0	3	0	7	10	0	0	3	0	3	0	1	6	4	11	0	3	18	2	23	47
12:45	0	2	1	7	10	0	0	0	1	1	0	1	7	2	10	0	10	13	2	25	46
13:00	0	3	1	6	10	0	0	0	3	3	0	2	4	2	8	0	9	19	1	29	50
TOTAL	**1**	**26**	**5**	**40**	**72**	**0**	**2**	**9**	**13**	**24**	**0**	**8**	**43**	**26**	**77**	**0**	**62**	**123**	**9**	**194**	**367**
Peak Vol	1	17	3	17	38	0	1	5	7	13	0	3	24	13	40	0	36	63	4	103	194

Job No.:

Location: Westmoreland Avenue at Elm Avenue and Walnut Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:15	12:15	194		

SCHOOL CHILDREN, PEDESTRIANS & BICYCLES

Hour Ending	From North – Westmoreland Avenue			From South – Westmoreland Avenue			From East – Elm Avenue			From West – Walnut Avenue		
	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles	School Children	Pedestrians	Bicycles
11:15	0	2	1	0	0	0	0	2	0	0	5	0
11:30	0	0	0	0	1	0	0	2	0	0	6	0
11:45	0	6	0	0	2	0	0	1	0	0	15	2
12:00	0	0	0	0	1	1	0	0	0	0	13	0
12:15	0	0	0	0	6	0	0	1	0	0	9	0
12:30	0	3	0	0	3	0	0	5	0	0	4	0
12:45	0	2	0	0	1	0	0	5	0	0	4	0
13:00	0	5	0	0	0	1	0	0	0	0	4	0
TOTAL	**0**	**18**	**1**	**0**	**14**	**2**	**0**	**16**	**0**	**0**	**60**	**2**
Peak Vol	0	6	0	0	10	1	0	4	0	0	43	2

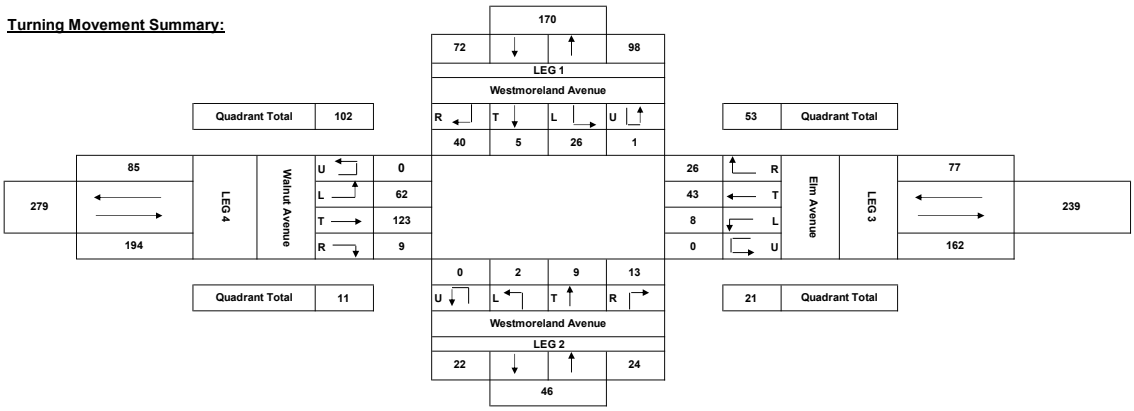
Job No.:

Location: Westmoreland Avenue at Elm Avenue and Walnut Avenue
Date: ######## Sunday
Recorder: DCI
Interval (dd) : 15
(In Minutes)

County: Montgomery
Town: Takoma Park
Weather: Clear

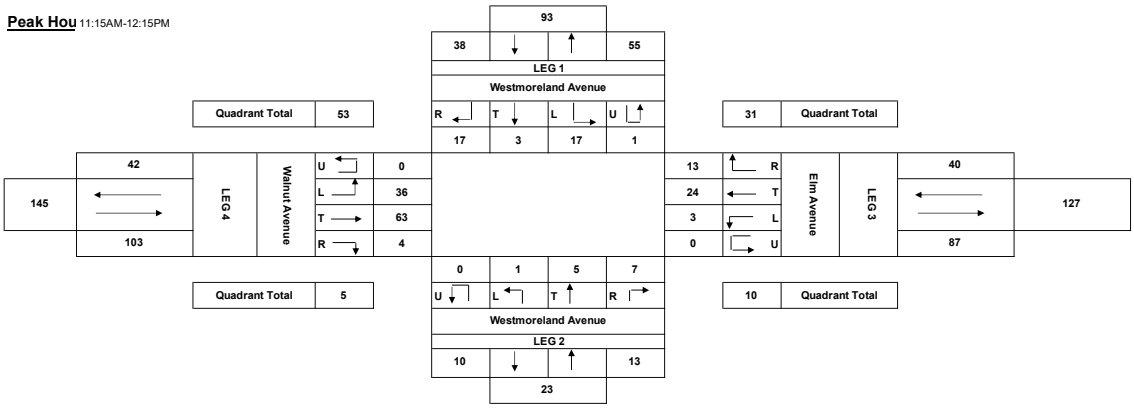
	PEAK HOUR	Start	End	Volume	LOS	V/C
		11:15	12:15	194		

Turning Movement Summary:



Comments:

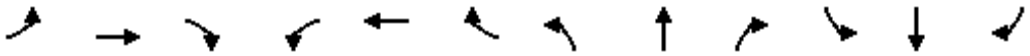
Peak Hou 11:15AM-12:15PM



APPENDIX B – SYNCHRO REPORTS

HCM Signalized Intersection Capacity Analysis
1: Maple Street NW & Carroll Street NW

12/27/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	260	15	15	570	20	40	20	20	15	50	45
Future Volume (vph)	10	260	15	15	570	20	40	20	20	15	50	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.98			0.97			0.95	
Flpb, ped/bikes		1.00			0.99			0.97			0.99	
Frt		0.99			1.00			0.97			0.94	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1799			1810			1641			1633	
Flt Permitted		0.98			0.99			0.80			0.96	
Satd. Flow (perm)		1757			1792			1343			1571	
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)	11	283	16	16	620	22	43	22	22	16	54	49
RTOR Reduction (vph)	0	2	0	0	1	0	0	10	0	0	21	0
Lane Group Flow (vph)	0	308	0	0	657	0	0	77	0	0	98	0
Confl. Peds. (#/hr)	106		62	62		106	21		25	25		21
Confl. Bikes (#/hr)			1			4			1			9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		79.2			79.4			23.2			23.2	
Effective Green, g (s)		79.2			79.4			23.2			23.2	
Actuated g/C Ratio		0.66			0.66			0.19			0.19	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		1.0			1.0			1.0			1.0	
Lane Grp Cap (vph)		1159			1185			259			303	
v/s Ratio Prot												
v/s Ratio Perm		0.18			c0.37			0.06			c0.06	
v/c Ratio		0.27			0.55			0.30			0.32	
Uniform Delay, d1		8.4			10.8			41.4			41.6	
Progression Factor		1.00			1.42			1.00			1.00	
Incremental Delay, d2		0.6			1.5			2.9			2.8	
Delay (s)		9.0			16.9			44.4			44.5	
Level of Service		A			B			D			D	
Approach Delay (s)		9.0			16.9			44.4			44.5	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
1: Maple Street NW & Carroll Street NW

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM Signalized Intersection Capacity Analysis
2: Willow Street NW & Eastern Avenue & Carroll Street NW

12/27/2023

Movement	EBT	EBR	EBR2	WBL2	WBL	WBT	NBL2	NBL	NBR	NEL	NER	NER2
Lane Configurations												
Traffic Volume (vph)	80	200	15	5	25	210	15	350	10	45	15	30
Future Volume (vph)	80	200	15	5	25	210	15	350	10	45	15	30
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		6.0		
Lane Util. Factor	1.00					1.00		1.00		1.00		
Frpb, ped/bikes	0.92					1.00		1.00		0.82		
Flpb, ped/bikes	1.00					0.99		0.90		1.00		
Frt	0.90					1.00		1.00		0.93		
Flt Protected	1.00					0.99		0.95		0.98		
Satd. Flow (prot)	1553					1828		1581		1384		
Flt Permitted	1.00					0.91		0.95		0.98		
Satd. Flow (perm)	1553					1672		1581		1384		
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)	87	217	16	5	27	228	16	380	11	49	16	33
RTOR Reduction (vph)	1	0	0	0	0	0	0	0	0	86	0	0
Lane Group Flow (vph)	319	0	0	0	0	260	0	407	0	12	0	0
Confl. Peds. (#/hr)		35	22	22	35		22	1	29	1	29	35
Confl. Bikes (#/hr)		1							1		1	1
Turn Type	NA			Perm	Perm	NA	Perm	Prot		Prot		
Protected Phases	2					6		4		3		
Permitted Phases				6	6		4					
Actuated Green, G (s)	40.6					40.6		45.0		14.4		
Effective Green, g (s)	40.6					40.6		45.0		14.4		
Actuated g/C Ratio	0.34					0.34		0.38		0.12		
Clearance Time (s)	7.0					7.0		7.0		6.0		
Vehicle Extension (s)	3.0					3.0		3.0		3.0		
Lane Grp Cap (vph)	525					565		592		166		
v/s Ratio Prot	c0.21									c0.01		
v/s Ratio Perm						0.16		0.26				
v/c Ratio	0.61					0.46		0.69		0.07		
Uniform Delay, d1	33.1					31.1		31.6		46.9		
Progression Factor	1.24					1.00		1.00		1.00		
Incremental Delay, d2	5.0					2.7		6.4		0.8		
Delay (s)	46.1					33.8		38.0		47.7		
Level of Service	D					C		D		D		
Approach Delay (s)	46.1					33.8		38.0		47.7		
Approach LOS	D					C		D		D		

Intersection Summary			
HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Willow Street NW & Eastern Avenue & Carroll Street NW 12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM Signalized Intersection Capacity Analysis
3: Laurel Avenue & Carroll Street NW & Carroll Avenue

12/27/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Volume (vph)	95	0	10	0	0	0	0	0	195	240
Future Volume (vph)	95	0	10	0	0	0	0	0	195	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0							5.5	
Lane Util. Factor		1.00							1.00	
Frt		0.99							0.93	
Flt Protected		0.96							0.98	
Satd. Flow (prot)		1759							1686	
Flt Permitted		0.96							0.98	
Satd. Flow (perm)		1759							1686	
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)	103	0	11	0	0	0	0	0	212	261
RTOR Reduction (vph)	0	59	0	0	0	0	0	0	44	0
Lane Group Flow (vph)	0	55	0	0	0	0	0	0	429	0
Turn Type	Perm	NA							Prot	
Protected Phases		3							2	
Permitted Phases	3									
Actuated Green, G (s)		20.5							35.4	
Effective Green, g (s)		20.5							35.4	
Actuated g/C Ratio		0.25							0.43	
Clearance Time (s)		5.0							5.5	
Vehicle Extension (s)		6.0							7.0	
Lane Grp Cap (vph)		439							726	
v/s Ratio Prot									c0.25	
v/s Ratio Perm		0.03								
v/c Ratio		0.13							0.59	
Uniform Delay, d1		23.9							17.8	
Progression Factor		1.00							1.00	
Incremental Delay, d2		0.6							3.5	
Delay (s)		24.5							21.3	
Level of Service		C							C	
Approach Delay (s)		24.5			0.0		0.0		21.3	
Approach LOS		C			A		A		C	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
3: Laurel Avenue & Carroll Street NW & Carroll Avenue 12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM 6th TWSC
4: Carroll Avenue & Westmoreland Avenue

12/27/2023

Intersection	
Int Delay, s/veh	0.9

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	20	20	90	5	10	415
Future Vol, veh/h	20	20	90	5	10	415
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	22	98	5	11	451

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	574	101	0	0	103	0
Stage 1	101	-	-	-	-	-
Stage 2	473	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	480	954	-	-	1489	-
Stage 1	923	-	-	-	-	-
Stage 2	627	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	475	954	-	-	1489	-
Mov Cap-2 Maneuver	475	-	-	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	621	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11.1	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	634	1489	-
HCM Lane V/C Ratio	-	-	0.069	0.007	-
HCM Control Delay (s)	-	-	11.1	7.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

HCM Signalized Intersection Capacity Analysis
5: Carroll Avenue/Carrol Avenue & Tulip Avenue

12/27/2023

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	15	25	5	105	400	95
Future Volume (vph)	15	25	5	105	400	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			5.5	5.5	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.97			1.00	0.98	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.92			1.00	0.97	
Flt Protected	0.98			1.00	1.00	
Satd. Flow (prot)	1623			1857	1785	
Flt Permitted	0.98			0.98	1.00	
Satd. Flow (perm)	1623			1830	1785	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	27	5	114	435	103
RTOR Reduction (vph)	24	0	0	0	8	0
Lane Group Flow (vph)	19	0	0	119	530	0
Confl. Peds. (#/hr)	4	21	37			37
Confl. Bikes (#/hr)						14
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			6	2	
Permitted Phases			6			
Actuated Green, G (s)	5.3			39.1	39.1	
Effective Green, g (s)	5.3			39.1	39.1	
Actuated g/C Ratio	0.10			0.72	0.72	
Clearance Time (s)	4.5			5.5	5.5	
Vehicle Extension (s)	5.0			7.0	7.0	
Lane Grp Cap (vph)	158			1315	1282	
v/s Ratio Prot	c0.01				c0.30	
v/s Ratio Perm				0.07		
v/c Ratio	0.12			0.09	0.41	
Uniform Delay, d1	22.4			2.3	3.1	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.7			0.1	1.0	
Delay (s)	23.1			2.4	4.0	
Level of Service	C			A	A	
Approach Delay (s)	23.1			2.4	4.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	54.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
5: Carroll Avenue/Carrol Avenue & Tulip Avenue

12/27/2023

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	15	25	5	105	400	95
Future Volume (veh/h)	15	25	5	105	400	95
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	0.91	0.99			0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	16	27	5	114	435	103
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	55	93	100	1231	973	230
Arrive On Green	0.10	0.10	0.67	0.67	0.67	0.67
Sat Flow, veh/h	566	955	21	1826	1444	342
Grp Volume(v), veh/h	44	0	119	0	0	538
Grp Sat Flow(s),veh/h/ln	1556	0	1846	0	0	1786
Q Serve(g_s), s	1.1	0.0	0.0	0.0	0.0	6.1
Cycle Q Clear(g_c), s	1.1	0.0	1.0	0.0	0.0	6.1
Prop In Lane	0.36	0.61	0.04			0.19
Lane Grp Cap(c), veh/h	151	0	1330	0	0	1204
V/C Ratio(X)	0.29	0.00	0.09	0.00	0.00	0.45
Avail Cap(c_a), veh/h	729	0	1330	0	0	1204
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	2.5	0.0	0.0	3.3
Incr Delay (d2), s/veh	2.2	0.0	0.1	0.0	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.2	0.0	0.0	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.6	0.0	2.6	0.0	0.0	4.5
LnGrp LOS	C	A	A	A	A	A
Approach Vol, veh/h	44			119	538	
Approach Delay, s/veh	20.6			2.6	4.5	
Approach LOS	C			A	A	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		35.0		8.8		35.0
Change Period (Y+Rc), s		5.5		4.5		5.5
Max Green Setting (Gmax), s		29.5		20.5		29.5
Max Q Clear Time (g_c+I1), s		8.1		3.1		3.0
Green Ext Time (p_c), s		9.6		0.2		1.8

Intersection Summary	
HCM 6th Ctrl Delay	5.2
HCM 6th LOS	A

HCM 6th TWSC
6: Carrol Avenue & Columbia Avenue

12/27/2023

Intersection	
Int Delay, s/veh	2.5

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	70	30	110	10	35	425
Future Vol, veh/h	70	30	110	10	35	425
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	76	33	120	11	38	462

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	664	126	0	0	131	0
Stage 1	126	-	-	-	-	-
Stage 2	538	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	426	924	-	-	1454	-
Stage 1	900	-	-	-	-	-
Stage 2	585	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	411	924	-	-	1454	-
Mov Cap-2 Maneuver	411	-	-	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	565	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	14.4	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	493	1454	-
HCM Lane V/C Ratio	-	-	0.22	0.026	-
HCM Control Delay (s)	-	-	14.4	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

HCM 6th TWSC
7: Pine Avenue & Columbia Avenue 12/27/2023

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	15	30	5	30	70	0
Future Vol, veh/h	15	30	5	30	70	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	33	5	33	76	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	49	0	76	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	43	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1558	-	927	1041
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	979	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1558	-	924	1041
Mov Cap-2 Maneuver	-	-	-	-	924	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	976	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	924	-	-	1558	-
HCM Lane V/C Ratio	0.082	-	-	0.003	-
HCM Control Delay (s)	9.2	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 6th AWSC
8: Westmoreland Avenue & Walnut Avenue/Elm Avenue

12/27/2023

Intersection	
Intersection Delay, s/veh	7.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	40	0	0	70	5	5	10	0	5	5	5
Future Vol, veh/h	25	40	0	0	70	5	5	10	0	5	5	5
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	43	0	0	76	5	5	11	0	5	5	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.5	7.4	7.4	7.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	38%	0%	33%
Vol Thru, %	67%	62%	93%	33%
Vol Right, %	0%	0%	7%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	15	65	75	15
LT Vol	5	25	0	5
Through Vol	10	40	70	5
RT Vol	0	0	5	5
Lane Flow Rate	16	71	82	16
Geometry Grp	1	1	1	1
Degree of Util (X)	0.019	0.081	0.091	0.018
Departure Headway (Hd)	4.275	4.127	4.002	4.074
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	828	866	893	868
Service Time	2.349	2.161	2.035	2.15
HCM Lane V/C Ratio	0.019	0.082	0.092	0.018
HCM Control Delay	7.4	7.5	7.4	7.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.3	0.3	0.1

HCM 6th TWSC
9: Eastern Avenue & Walnut Street NW/Walnut Avenue 12/27/2023

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↱			↕	
Traffic Vol, veh/h	0	5	5	20	30	30	20	290	5	45	405	40
Future Vol, veh/h	0	5	5	20	30	30	20	290	5	45	405	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	5	22	33	33	22	315	5	49	440	43

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	955	943	318	927	924	462	483	0	0	320	0	0
Stage 1	362	362	-	560	560	-	-	-	-	-	-	-
Stage 2	593	581	-	367	364	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	238	263	723	249	269	600	1080	-	-	1240	-	-
Stage 1	657	625	-	513	511	-	-	-	-	-	-	-
Stage 2	492	500	-	653	624	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	191	242	723	229	248	600	1080	-	-	1240	-	-
Mov Cap-2 Maneuver	191	242	-	229	248	-	-	-	-	-	-	-
Stage 1	641	609	-	500	483	-	-	-	-	-	-	-
Stage 2	410	473	-	626	608	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	15.2	21.1	0.5	0.7
HCM LOS	C	C		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	SEL	SET	SER
Capacity (veh/h)	1240	-	-	363	310	1080	-	-
HCM Lane V/C Ratio	0.039	-	-	0.03	0.281	0.02	-	-
HCM Control Delay (s)	8	0	-	15.2	21.1	8.4	-	-
HCM Lane LOS	A	A	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	1.1	0.1	-	-

HCM 6th AWSC
10: Laurel Avenue & Eastern Avenue

12/27/2023

Intersection	
Intersection Delay, s/veh	15.8
Intersection LOS	C

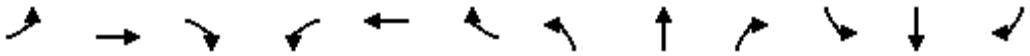
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	20	0	60	40	165	0	0	215	20	80	355	0
Future Vol, veh/h	20	0	60	40	165	0	0	215	20	80	355	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	0	65	43	179	0	0	234	22	87	386	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	NB	SB	SE	NW
Opposing Approach	SB	NB	NW	SE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SE	NW	SB	NB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NW	SE	NB	SB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.1	12.8	12.3	20.1
HCM LOS	B	B	B	C

Lane	NBLn1	NWLn1	SELn1	SBLn1
Vol Left, %	25%	18%	0%	20%
Vol Thru, %	0%	82%	91%	80%
Vol Right, %	75%	0%	9%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	80	435	235	205
LT Vol	20	80	0	40
Through Vol	0	355	215	165
RT Vol	60	0	20	0
Lane Flow Rate	87	473	255	223
Geometry Grp	1	1	1	1
Degree of Util (X)	0.145	0.702	0.396	0.377
Departure Headway (Hd)	5.992	5.343	5.583	6.093
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	593	676	641	588
Service Time	4.08	3.398	3.649	4.164
HCM Lane V/C Ratio	0.147	0.7	0.398	0.379
HCM Control Delay	10.1	20.1	12.3	12.8
HCM Lane LOS	B	C	B	B
HCM 95th-tile Q	0.5	5.7	1.9	1.7

HCM Signalized Intersection Capacity Analysis
1: Maple Street NW & Carroll Street NW

12/27/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	405	30	15	285	55	40	100	25	25	30	20
Future Volume (vph)	35	405	30	15	285	55	40	100	25	25	30	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.97			0.91			0.98			0.94	
Flpb, ped/bikes		0.98			0.99			0.96			0.98	
Frt		0.99			0.98			0.98			0.96	
Flt Protected		1.00			1.00			0.99			0.98	
Satd. Flow (prot)		1744			1648			1683			1619	
Flt Permitted		0.95			0.97			0.91			0.83	
Satd. Flow (perm)		1660			1607			1546			1373	
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)	38	440	33	16	310	60	43	109	27	27	33	22
RTOR Reduction (vph)	0	2	0	0	6	0	0	6	0	0	10	0
Lane Group Flow (vph)	0	509	0	0	380	0	0	173	0	0	72	0
Confl. Peds. (#/hr)	149		86	86		149	48		28	28		48
Confl. Bikes (#/hr)			1			6			8			
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		79.2			79.2			23.0			23.2	
Effective Green, g (s)		79.2			79.2			23.0			23.2	
Actuated g/C Ratio		0.66			0.66			0.19			0.19	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		1.0			1.0			1.0			1.0	
Lane Grp Cap (vph)		1095			1060			296			265	
v/s Ratio Prot												
v/s Ratio Perm		c0.31			0.24			c0.11			0.05	
v/c Ratio		0.46			0.36			0.59			0.27	
Uniform Delay, d1		10.0			9.1			44.2			41.2	
Progression Factor		1.00			1.63			1.00			1.00	
Incremental Delay, d2		1.4			0.4			8.2			2.5	
Delay (s)		11.4			15.2			52.4			43.7	
Level of Service		B			B			D			D	
Approach Delay (s)		11.4			15.2			52.4			43.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
1: Maple Street NW & Carroll Street NW

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM Signalized Intersection Capacity Analysis
2: Willow Street NW & Eastern Avenue & Carroll Street NW

12/27/2023

Movement	EBT	EBR	EBR2	WBL2	WBL	WBT	NBL2	NBL	NBR	NEL	NER	NER2
Lane Configurations												
Traffic Volume (vph)	165	260	30	5	15	120	20	205	35	30	105	35
Future Volume (vph)	165	260	30	5	15	120	20	205	35	30	105	35
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		6.0		
Lane Util. Factor	1.00					1.00		1.00		1.00		
Frpb, ped/bikes	0.89					1.00		0.98		0.57		
Flpb, ped/bikes	1.00					1.00		0.66		1.00		
Frt	0.91					1.00		0.98		0.89		
Flt Protected	1.00					0.99		0.96		0.99		
Satd. Flow (prot)	1515					1850		1124		930		
Flt Permitted	1.00					0.91		0.96		0.99		
Satd. Flow (perm)	1515					1687		1124		930		
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)	179	283	33	5	16	130	22	223	38	33	114	38
RTOR Reduction (vph)	2	0	0	0	0	0	0	0	0	100	0	0
Lane Group Flow (vph)	493	0	0	0	0	151	0	283	0	85	0	0
Confl. Peds. (#/hr)		71	73	73	71		73	13	33	13	33	71
Confl. Bikes (#/hr)		1							3		3	1
Turn Type	NA			Perm	Perm	NA	Perm	Prot		Prot		
Protected Phases	2					6		4		3		
Permitted Phases				6	6		4					
Actuated Green, G (s)	55.8					55.8		23.0		18.8		
Effective Green, g (s)	55.8					55.8		23.0		18.8		
Actuated g/C Ratio	0.46					0.46		0.19		0.16		
Clearance Time (s)	7.0					7.0		7.0		6.0		
Vehicle Extension (s)	3.0					3.0		3.0		3.0		
Lane Grp Cap (vph)	704					784		215		145		
v/s Ratio Prot	c0.33									c0.09		
v/s Ratio Perm						0.09		0.25				
v/c Ratio	0.70					0.19		1.32		0.59		
Uniform Delay, d1	25.5					18.9		48.5		47.0		
Progression Factor	0.70					1.00		1.00		1.00		
Incremental Delay, d2	5.2					0.5		171.3		16.4		
Delay (s)	23.1					19.4		219.8		63.4		
Level of Service	C					B		F		E		
Approach Delay (s)	23.1					19.4		219.8		63.4		
Approach LOS	C					B		F		E		

Intersection Summary			
HCM 2000 Control Delay	79.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Willow Street NW & Eastern Avenue & Carroll Street NW

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM Signalized Intersection Capacity Analysis
3: Laurel Avenue & Carroll Street NW & Carroll Avenue

12/27/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Volume (vph)	290	0	15	0	0	0	0	0	95	140
Future Volume (vph)	290	0	15	0	0	0	0	0	95	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0							5.5	
Lane Util. Factor		1.00							1.00	
Frt		0.99							0.92	
Flt Protected		0.95							0.98	
Satd. Flow (prot)		1767							1679	
Flt Permitted		0.95							0.98	
Satd. Flow (perm)		1767							1679	
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)	315	0	16	0	0	0	0	0	103	152
RTOR Reduction (vph)	0	61	0	0	0	0	0	0	58	0
Lane Group Flow (vph)	0	270	0	0	0	0	0	0	197	0
Turn Type	Perm	NA							Prot	
Protected Phases		3							2	
Permitted Phases	3									
Actuated Green, G (s)		20.0							34.5	
Effective Green, g (s)		20.0							34.5	
Actuated g/C Ratio		0.22							0.38	
Clearance Time (s)		5.0							5.5	
Vehicle Extension (s)		6.0							7.0	
Lane Grp Cap (vph)		388							636	
v/s Ratio Prot									c0.12	
v/s Ratio Perm		0.15								
v/c Ratio		0.70							0.31	
Uniform Delay, d1		32.7							19.9	
Progression Factor		1.00							1.00	
Incremental Delay, d2		9.9							1.3	
Delay (s)		42.6							21.1	
Level of Service		D							C	
Approach Delay (s)		42.6			0.0		0.0		21.1	
Approach LOS		D			A		A		C	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
3: Laurel Avenue & Carroll Street NW & Carroll Avenue

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM 6th TWSC
4: Carroll Avenue & Westmoreland Avenue

12/27/2023

Intersection	
Int Delay, s/veh	1.5

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	25	35	270	20	20	210
Future Vol, veh/h	25	35	270	20	20	210
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	38	293	22	22	228

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	576	304	0	0	315	0
Stage 1	304	-	-	-	-	-
Stage 2	272	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	479	736	-	-	1245	-
Stage 1	748	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	469	736	-	-	1245	-
Mov Cap-2 Maneuver	469	-	-	-	-	-
Stage 1	748	-	-	-	-	-
Stage 2	759	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11.8	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	595	1245	-
HCM Lane V/C Ratio	-	-	0.11	0.017	-
HCM Control Delay (s)	-	-	11.8	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

HCM Signalized Intersection Capacity Analysis
5: Carroll Avenue/Carrol Avenue & Tulip Avenue

12/27/2023

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	35	20	5	300	210	35
Future Volume (vph)	35	20	5	300	210	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			5.5	5.5	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.97			1.00	0.99	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.95			1.00	0.98	
Flt Protected	0.97			1.00	1.00	
Satd. Flow (prot)	1670			1860	1804	
Flt Permitted	0.97			1.00	1.00	
Satd. Flow (perm)	1670			1855	1804	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	22	5	326	228	38
RTOR Reduction (vph)	20	0	0	0	6	0
Lane Group Flow (vph)	40	0	0	331	260	0
Confl. Peds. (#/hr)	2	40	41			41
Confl. Bikes (#/hr)						6
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			6	2	
Permitted Phases			6			
Actuated Green, G (s)	5.4			38.3	38.3	
Effective Green, g (s)	5.4			38.3	38.3	
Actuated g/C Ratio	0.10			0.71	0.71	
Clearance Time (s)	4.5			5.5	5.5	
Vehicle Extension (s)	5.0			7.0	7.0	
Lane Grp Cap (vph)	167			1323	1286	
v/s Ratio Prot	c0.02				0.14	
v/s Ratio Perm				c0.18		
v/c Ratio	0.24			0.25	0.20	
Uniform Delay, d1	22.3			2.7	2.6	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	1.6			0.5	0.4	
Delay (s)	23.8			3.1	2.9	
Level of Service	C			A	A	
Approach Delay (s)	23.8			3.1	2.9	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	53.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
5: Carroll Avenue/Carrol Avenue & Tulip Avenue

12/27/2023

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	35	20	5	300	210	35
Future Volume (veh/h)	35	20	5	300	210	35
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	0.86	0.98			0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	38	22	5	326	228	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	145	84	83	1188	989	165
Arrive On Green	0.14	0.14	0.64	0.64	0.64	0.64
Sat Flow, veh/h	1001	579	6	1860	1548	258
Grp Volume(v), veh/h	61	0	331	0	0	266
Grp Sat Flow(s),veh/h/ln	1607	0	1866	0	0	1806
Q Serve(g_s), s	1.6	0.0	0.0	0.0	0.0	2.9
Cycle Q Clear(g_c), s	1.6	0.0	3.6	0.0	0.0	2.9
Prop In Lane	0.62	0.36	0.02			0.14
Lane Grp Cap(c), veh/h	233	0	1271	0	0	1153
V/C Ratio(X)	0.26	0.00	0.26	0.00	0.00	0.23
Avail Cap(c_a), veh/h	713	0	1271	0	0	1153
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	17.6	0.0	3.7	0.0	0.0	3.5
Incr Delay (d2), s/veh	1.3	0.0	0.5	0.0	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.9	0.0	0.0	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.8	0.0	4.2	0.0	0.0	4.0
LnGrp LOS	B	A	A	A	A	A
Approach Vol, veh/h	61			331	266	
Approach Delay, s/veh	18.8			4.2	4.0	
Approach LOS	B			A	A	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		35.0		11.2		35.0
Change Period (Y+Rc), s		5.5		4.5		5.5
Max Green Setting (Gmax), s		29.5		20.5		29.5
Max Q Clear Time (g_c+I1), s		4.9		3.6		5.6
Green Ext Time (p_c), s		4.6		0.3		5.8

Intersection Summary	
HCM 6th Ctrl Delay	5.5
HCM 6th LOS	A

HCM 6th TWSC
6: Carrol Avenue & Columbia Avenue

12/27/2023

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	45	95	300	35	45	200
Future Vol, veh/h	45	95	300	35	45	200
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	103	326	38	49	217

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	660	345	0	0	364	0
Stage 1	345	-	-	-	-	-
Stage 2	315	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	428	698	-	-	1195	-
Stage 1	717	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	408	698	-	-	1195	-
Mov Cap-2 Maneuver	408	-	-	-	-	-
Stage 1	717	-	-	-	-	-
Stage 2	705	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	13.6	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	568	1195	-
HCM Lane V/C Ratio	-	-	0.268	0.041	-
HCM Control Delay (s)	-	-	13.6	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.1	-

HCM 6th TWSC
7: Pine Avenue & Columbia Avenue 12/27/2023

Intersection	
Int Delay, s/veh	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	30	50	5	40	100	5
Future Vol, veh/h	30	50	5	40	100	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	54	5	43	109	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	87	0	113	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	53	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1509	-	884	1005
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	970	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1509	-	881	1005
Mov Cap-2 Maneuver	-	-	-	-	881	-
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	967	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	886	-	-	1509	-
HCM Lane V/C Ratio	0.129	-	-	0.004	-
HCM Control Delay (s)	9.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

HCM 6th AWSC
8: Westmoreland Avenue & Walnut Avenue/Elm Avenue

12/27/2023

Intersection	
Intersection Delay, s/veh	8.3
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	165	5	5	35	10	5	10	10	10	25	5
Future Vol, veh/h	40	165	5	5	35	10	5	10	10	10	25	5
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	43	179	5	5	38	11	5	11	11	11	27	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.7	7.5	7.6	7.8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	19%	10%	25%
Vol Thru, %	40%	79%	70%	62%
Vol Right, %	40%	2%	20%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	25	210	50	40
LT Vol	5	40	5	10
Through Vol	10	165	35	25
RT Vol	10	5	10	5
Lane Flow Rate	27	228	54	43
Geometry Grp	1	1	1	1
Degree of Util (X)	0.033	0.261	0.064	0.055
Departure Headway (Hd)	4.407	4.122	4.233	4.563
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	816	863	851	789
Service Time	2.413	2.185	2.233	2.567
HCM Lane V/C Ratio	0.033	0.264	0.063	0.054
HCM Control Delay	7.6	8.7	7.5	7.8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	1	0.2	0.2

HCM 6th TWSC
9: Eastern Avenue & Walnut Street NW & Walnut Avenue

12/27/2023

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	SEL	SET	SER	NWL	NWT	NWR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	30	5	80	375	0	5	285	100	20	15
Future Vol, veh/h	30	5	80	375	0	5	285	100	20	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	-	None	-	-	None	-	-
Storage Length	0	-	-	-	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	33	5	87	408	0	5	310	109	22	16

Major/Minor	Minor1			Major1			Major2			Minor2	
Conflicting Flow All	970	408	419	0	0	408	0	0	976	365
Stage 1	582	-	-	-	-	-	-	-	375	-
Stage 2	388	-	-	-	-	-	-	-	601	-
Critical Hdwy	7.12	6.22	4.12	-	-	4.12	-	-	7.12	6.22
Critical Hdwy Stg 1	6.12	-	-	-	-	-	-	-	6.12	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-	-	-	6.12	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	2.218	-	-	3.518	3.318
Pot Cap-1 Maneuver	233	643	1140	-	-	1151	-	-	230	680
Stage 1	499	-	-	-	-	-	-	-	646	-
Stage 2	636	-	-	-	-	-	-	-	487	-
Platoon blocked, %				-	-		-	-		
Mov Cap-1 Maneuver	200	643	1140	-	-	1151	-	-	186	680
Mov Cap-2 Maneuver	200	-	-	-	-	-	-	-	186	-
Stage 1	450	-	-	-	-	-	-	-	582	-
Stage 2	606	-	-	-	-	-	-	-	404	-

Approach	EB	SE	NW	SW
HCM Control Delay, s	23	1.5	0.1	21.9
HCM LOS	C			C

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	SEL	SET	SER	SWLn1
Capacity (veh/h)	1151	-	-	238	1140	-	-	245
HCM Lane V/C Ratio	0.005	-	-	0.16	0.076	-	-	0.133
HCM Control Delay (s)	8.1	0	-	23	8.4	-	-	21.9
HCM Lane LOS	A	A	-	C	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	0.6	0.2	-	-	0.5

HCM 6th AWSC
10: Laurel Avenue & Eastern Avenue

12/27/2023

Intersection	
Intersection Delay, s/veh	12.1
Intersection LOS	B

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	15	0	135	40	65	5	0	280	20	55	240	0
Future Vol, veh/h	15	0	135	40	65	5	0	280	20	55	240	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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	0	147	43	71	5	0	304	22	60	261	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	NB	SB	SE	NW
Opposing Approach	SB	NB	NW	SE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SE	NW	SB	NB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NW	SE	NB	SB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.1	10.5	12.8	12.9
HCM LOS	B	B	B	B

Lane	NBLn1	NWLn1	SELn1	SBLn1
Vol Left, %	10%	19%	0%	36%
Vol Thru, %	0%	81%	93%	59%
Vol Right, %	90%	0%	7%	5%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	295	300	110
LT Vol	15	55	0	40
Through Vol	0	240	280	65
RT Vol	135	0	20	5
Lane Flow Rate	163	321	326	120
Geometry Grp	1	1	1	1
Degree of Util (X)	0.241	0.469	0.469	0.198
Departure Headway (Hd)	5.329	5.262	5.183	5.965
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	672	683	695	600
Service Time	3.379	3.302	3.223	4.018
HCM Lane V/C Ratio	0.243	0.47	0.469	0.2
HCM Control Delay	10.1	12.9	12.8	10.5
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	0.9	2.5	2.5	0.7

HCM Signalized Intersection Capacity Analysis
1: Maple Street NW & Carroll Street NW

12/27/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	280	25	20	285	35	35	35	25	20	40	20
Future Volume (vph)	15	280	25	20	285	35	35	35	25	20	40	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.96			0.93			0.95			0.94	
Flpb, ped/bikes		0.99			0.98			0.93			0.97	
Frt		0.99			0.99			0.96			0.97	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1736			1686			1562			1614	
Flt Permitted		0.98			0.97			0.86			0.91	
Satd. Flow (perm)		1701			1639			1363			1482	
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)	16	304	27	22	310	38	38	38	27	22	43	22
RTOR Reduction (vph)	0	3	0	0	4	0	0	13	0	0	12	0
Lane Group Flow (vph)	0	344	0	0	366	0	0	90	0	0	75	0
Confl. Peds. (#/hr)	249		121	121		249	57		46	46		57
Confl. Bikes (#/hr)			3			5						
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		63.2			63.4			19.0			19.2	
Effective Green, g (s)		63.2			63.4			19.0			19.2	
Actuated g/C Ratio		0.63			0.63			0.19			0.19	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		1.0			1.0			1.0			1.0	
Lane Grp Cap (vph)		1075			1039			258			284	
v/s Ratio Prot												
v/s Ratio Perm		0.20			c0.22			c0.07			0.05	
v/c Ratio		0.32			0.35			0.35			0.26	
Uniform Delay, d1		8.5			8.6			35.1			34.4	
Progression Factor		1.00			0.16			1.00			1.00	
Incremental Delay, d2		0.8			0.1			3.7			2.3	
Delay (s)		9.3			1.4			38.8			36.6	
Level of Service		A			A			D			D	
Approach Delay (s)		9.3			1.4			38.8			36.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
1: Maple Street NW & Carroll Street NW

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM Signalized Intersection Capacity Analysis
2: Willow Street NW & Eastern Avenue & Carroll Street NW

12/27/2023

Movement	EBT	EBR	EBR2	WBL2	WBL	WBT	NBL2	NBL	NBR	NEL	NER	NER2
Lane Configurations												
Traffic Volume (vph)	115	185	25	10	40	115	30	195	30	30	50	25
Future Volume (vph)	115	185	25	10	40	115	30	195	30	30	50	25
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		6.0		
Lane Util. Factor	1.00					1.00		1.00		1.00		
Frpb, ped/bikes	0.69					1.00		0.96		0.52		
Flpb, ped/bikes	1.00					0.91		0.51		1.00		
Frt	0.91					1.00		0.98		0.90		
Flt Protected	1.00					0.99		0.96		0.99		
Satd. Flow (prot)	1176					1666		864		863		
Flt Permitted	1.00					0.79		0.96		0.99		
Satd. Flow (perm)	1176					1341		864		863		
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)	125	201	27	11	43	125	33	212	33	33	54	27
RTOR Reduction (vph)	3	0	0	0	0	0	0	0	0	96	0	0
Lane Group Flow (vph)	350	0	0	0	0	179	0	278	0	18	0	0
Confl. Peds. (#/hr)		213	171	171	213		171	29	81	29	81	213
Confl. Bikes (#/hr)		1							1		1	1
Turn Type	NA			Perm	Perm	NA	Perm	Prot		Prot		
Protected Phases	2					6		4		3		
Permitted Phases				6	6		4					
Actuated Green, G (s)	41.2					41.2		20.0		16.2		
Effective Green, g (s)	41.2					41.2		20.0		16.2		
Actuated g/C Ratio	0.41					0.41		0.20		0.16		
Clearance Time (s)	7.0					7.0		7.0		6.0		
Vehicle Extension (s)	3.0					3.0		3.0		3.0		
Lane Grp Cap (vph)	484					552		172		139		
v/s Ratio Prot	c0.30									c0.02		
v/s Ratio Perm						0.13		0.32				
v/c Ratio	0.72					0.32		1.62		0.13		
Uniform Delay, d1	24.6					20.0		40.0		35.9		
Progression Factor	0.75					1.00		1.00		1.00		
Incremental Delay, d2	8.7					1.6		302.5		2.0		
Delay (s)	27.2					21.5		342.5		37.9		
Level of Service	C					C		F		D		
Approach Delay (s)	27.2					21.5		342.5		37.9		
Approach LOS	C					C		F		D		

Intersection Summary			
HCM 2000 Control Delay	122.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
2: Willow Street NW & Eastern Avenue & Carroll Street NW

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM Signalized Intersection Capacity Analysis
3: Laurel Avenue & Carroll Street NW & Carroll Avenue

12/27/2023

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Volume (vph)	175	0	20	0	0	0	0	0	70	165
Future Volume (vph)	175	0	20	0	0	0	0	0	70	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0							5.5	
Lane Util. Factor		1.00							1.00	
Frt		0.99							0.91	
Flt Protected		0.96							0.99	
Satd. Flow (prot)		1758							1661	
Flt Permitted		0.96							0.99	
Satd. Flow (perm)		1758							1661	
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)	190	0	22	0	0	0	0	0	76	179
RTOR Reduction (vph)	0	61	0	0	0	0	0	0	93	0
Lane Group Flow (vph)	0	151	0	0	0	0	0	0	162	0
Turn Type	Perm	NA							Prot	
Protected Phases		3							2	
Permitted Phases	3									
Actuated Green, G (s)		20.0							34.5	
Effective Green, g (s)		20.0							34.5	
Actuated g/C Ratio		0.22							0.38	
Clearance Time (s)		5.0							5.5	
Vehicle Extension (s)		6.0							7.0	
Lane Grp Cap (vph)		386							629	
v/s Ratio Prot									c0.10	
v/s Ratio Perm		0.09								
v/c Ratio		0.39							0.26	
Uniform Delay, d1		30.3							19.4	
Progression Factor		1.00							1.00	
Incremental Delay, d2		3.0							1.0	
Delay (s)		33.3							20.4	
Level of Service		C							C	
Approach Delay (s)		33.3			0.0		0.0		20.4	
Approach LOS		C			A		A		C	

Intersection Summary			
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	91.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
3: Laurel Avenue & Carroll Street NW & Carroll Avenue

12/27/2023

HCM 6th Edition methodology does not support exclusive ped or hold phases.

HCM 6th TWSC
4: Carroll Avenue & Westmoreland Avenue 12/27/2023

Intersection	
Int Delay, s/veh	1.9

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	30	30	155	20	30	205
Future Vol, veh/h	30	30	155	20	30	205
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	33	168	22	33	223

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	468	179	0	0	190	0
Stage 1	179	-	-	-	-	-
Stage 2	289	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	553	864	-	-	1384	-
Stage 1	852	-	-	-	-	-
Stage 2	760	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	538	864	-	-	1384	-
Mov Cap-2 Maneuver	538	-	-	-	-	-
Stage 1	852	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	663	1384	-
HCM Lane V/C Ratio	-	-	0.098	0.024	-
HCM Control Delay (s)	-	-	11	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

HCM Signalized Intersection Capacity Analysis
5: Carroll Avenue/Carrol Avenue & Tulip Avenue

12/27/2023

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	30	15	20	165	220	20
Future Volume (vph)	30	15	20	165	220	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			5.5	5.5	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.98			1.00	0.99	
Flpb, ped/bikes	1.00			0.99	1.00	
Frt	0.96			1.00	0.99	
Flt Protected	0.97			0.99	1.00	
Satd. Flow (prot)	1696			1834	1818	
Flt Permitted	0.97			0.96	1.00	
Satd. Flow (perm)	1696			1770	1818	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	16	22	179	239	22
RTOR Reduction (vph)	14	0	0	0	3	0
Lane Group Flow (vph)	35	0	0	201	258	0
Confl. Peds. (#/hr)	3	20	83			83
Confl. Bikes (#/hr)						6
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			6	2	
Permitted Phases			6			
Actuated Green, G (s)	5.4			38.9	38.9	
Effective Green, g (s)	5.4			38.9	38.9	
Actuated g/C Ratio	0.10			0.72	0.72	
Clearance Time (s)	4.5			5.5	5.5	
Vehicle Extension (s)	5.0			7.0	7.0	
Lane Grp Cap (vph)	168			1268	1302	
v/s Ratio Prot	c0.02				c0.14	
v/s Ratio Perm				0.11		
v/c Ratio	0.21			0.16	0.20	
Uniform Delay, d1	22.5			2.5	2.5	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	1.3			0.3	0.3	
Delay (s)	23.8			2.7	2.9	
Level of Service	C			A	A	
Approach Delay (s)	23.8			2.7	2.9	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	54.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
5: Carroll Avenue/Carrol Avenue & Tulip Avenue

12/27/2023

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	30	15	20	165	220	20
Future Volume (veh/h)	30	15	20	165	220	20
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	0.91	0.96			0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	16	22	179	239	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	109	53	161	1137	1125	104
Arrive On Green	0.10	0.10	0.67	0.67	0.67	0.67
Sat Flow, veh/h	1095	531	104	1690	1672	154
Grp Volume(v), veh/h	50	0	201	0	0	261
Grp Sat Flow(s),veh/h/ln	1660	0	1794	0	0	1826
Q Serve(g_s), s	1.2	0.0	0.0	0.0	0.0	2.4
Cycle Q Clear(g_c), s	1.2	0.0	1.7	0.0	0.0	2.4
Prop In Lane	0.66	0.32	0.11			0.08
Lane Grp Cap(c), veh/h	165	0	1298	0	0	1228
V/C Ratio(X)	0.30	0.00	0.15	0.00	0.00	0.21
Avail Cap(c_a), veh/h	776	0	1298	0	0	1228
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	2.6	0.0	0.0	2.7
Incr Delay (d2), s/veh	2.2	0.0	0.3	0.0	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.3	0.0	0.0	0.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.5	0.0	2.9	0.0	0.0	3.1
LnGrp LOS	C	A	A	A	A	A
Approach Vol, veh/h	50			201	261	
Approach Delay, s/veh	20.5			2.9	3.1	
Approach LOS	C			A	A	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		35.0		8.9		35.0
Change Period (Y+Rc), s		5.5		4.5		5.5
Max Green Setting (Gmax), s		29.5		20.5		29.5
Max Q Clear Time (g_c+I1), s		4.4		3.2		3.7
Green Ext Time (p_c), s		4.6		0.2		3.4

Intersection Summary	
HCM 6th Ctrl Delay	4.7
HCM 6th LOS	A

HCM 6th TWSC
6: Carrol Avenue & Columbia Avenue

12/27/2023

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	20	65	175	20	40	220
Future Vol, veh/h	20	65	175	20	40	220
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	71	190	22	43	239

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	526	201	0	0	212	0
Stage 1	201	-	-	-	-	-
Stage 2	325	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	512	840	-	-	1358	-
Stage 1	833	-	-	-	-	-
Stage 2	732	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	493	840	-	-	1358	-
Mov Cap-2 Maneuver	493	-	-	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	705	-	-	-	-	-

Approach	WB	NE	SW
HCM Control Delay, s	10.7	0	1.2
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	WBLn1	SWL	SWT
Capacity (veh/h)	-	-	721	1358	-
HCM Lane V/C Ratio	-	-	0.128	0.032	-
HCM Control Delay (s)	-	-	10.7	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

HCM 6th TWSC
7: Pine Avenue & Columbia Avenue

12/27/2023

Intersection	
Int Delay, s/veh	4.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	15	45	5	20	65	0
Future Vol, veh/h	15	45	5	20	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	49	5	22	71	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	65	0	73	41
Stage 1	-	-	-	-	41	-
Stage 2	-	-	-	-	32	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1537	-	931	1030
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	991	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1537	-	928	1030
Mov Cap-2 Maneuver	-	-	-	-	928	-
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	988	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	928	-	-	1537	-
HCM Lane V/C Ratio	0.076	-	-	0.004	-
HCM Control Delay (s)	9.2	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

HCM 6th AWSC
8: Westmoreland Avenue & Walnut Avenue/Elm Avenue

12/27/2023

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	55	5	5	25	15	0	10	5	20	10	20
Future Vol, veh/h	35	55	5	5	25	15	0	10	5	20	10	20
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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	60	5	5	27	16	0	11	5	22	11	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.7	7.2	7.2	7.4
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	37%	11%	40%
Vol Thru, %	67%	58%	56%	20%
Vol Right, %	33%	5%	33%	40%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	15	95	45	50
LT Vol	0	35	5	20
Through Vol	10	55	25	10
RT Vol	5	5	15	20
Lane Flow Rate	16	103	49	54
Geometry Grp	1	1	1	1
Degree of Util (X)	0.018	0.119	0.054	0.061
Departure Headway (Hd)	4.038	4.134	3.956	4.048
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	873	863	898	873
Service Time	2.124	2.177	2.013	2.125
HCM Lane V/C Ratio	0.018	0.119	0.055	0.062
HCM Control Delay	7.2	7.7	7.2	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.4	0.2	0.2

HCM 6th TWSC
9: Eastern Avenue & Walnut Street NW/Walnut Avenue

12/27/2023

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	5	15	10	20	5	20	35	290	5	5	230	45
Future Vol, veh/h	5	15	10	20	5	20	35	290	5	5	230	45
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	16	11	22	5	22	38	315	5	5	250	49

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	692	703	318	692	681	275	299	0	0	320	0	0
Stage 1	394	394	-	285	285	-	-	-	-	-	-	-
Stage 2	298	309	-	407	396	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	358	362	723	358	373	764	1262	-	-	1240	-	-
Stage 1	631	605	-	722	676	-	-	-	-	-	-	-
Stage 2	711	660	-	621	604	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	333	347	723	329	357	764	1262	-	-	1240	-	-
Mov Cap-2 Maneuver	333	347	-	329	357	-	-	-	-	-	-	-
Stage 1	608	583	-	695	673	-	-	-	-	-	-	-
Stage 2	682	657	-	573	582	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	14.4	14.1	0.8	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	SEL	SET	SER
Capacity (veh/h)	1240	-	-	416	446	1262	-	-
HCM Lane V/C Ratio	0.004	-	-	0.078	0.11	0.03	-	-
HCM Control Delay (s)	7.9	0	-	14.4	14.1	7.9	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.4	0.1	-	-

HCM 6th AWSC
10: Laurel Avenue & Eastern Avenue 12/27/2023

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	30	0	90	40	35	15	0	200	20	45	210	0
Future Vol, veh/h	30	0	90	40	35	15	0	200	20	45	210	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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	33	0	98	43	38	16	0	217	22	49	228	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	NB	SB	SE	NW
Opposing Approach	SB	NB	NW	SE
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SE	NW	SB	NB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NW	SE	NB	SB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9	9.3	10.1	10.8
HCM LOS	A	A	B	B

Lane	NBLn1	NWLn1	SELn1	SBLn1
Vol Left, %	25%	18%	0%	44%
Vol Thru, %	0%	82%	91%	39%
Vol Right, %	75%	0%	9%	17%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	120	255	220	90
LT Vol	30	45	0	40
Through Vol	0	210	200	35
RT Vol	90	0	20	15
Lane Flow Rate	130	277	239	98
Geometry Grp	1	1	1	1
Degree of Util (X)	0.177	0.372	0.318	0.145
Departure Headway (Hd)	4.893	4.829	4.789	5.323
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	725	740	744	666
Service Time	2.981	2.901	2.864	3.415
HCM Lane V/C Ratio	0.179	0.374	0.321	0.147
HCM Control Delay	9	10.8	10.1	9.3
HCM Lane LOS	A	B	B	A
HCM 95th-tile Q	0.6	1.7	1.4	0.5

APPENDIX C – EXISTING, TRANSITIONAL, AND REROUTED VEHICLE FLOWS

Figure C-1: Existing, Transitional, and Reroute Scenario Vehicle Flows from Philadelphia Avenue to Aspen St NW

Figure C- 2: Existing, Transitional, and Reroute Scenario Vehicle Flows from Philadelphia Ave to Eastern Ave NW

Figure C- 3: Existing and Reroute Scenario Vehicle Flows from Carroll Ave to Aspen St NW

Figure C- 4: Existing, Transitional, and Reroute Scenario Vehicle Flows from Carroll Ave to Eastern Avenue NW

Figure C- 5: Existing and Reroute Scenario Vehicle Flows from Ethan Allen Ave to Aspen St NW

Figure C- 6: Existing, Transitional, and Reroute Scenario Vehicle Flows from Ethan Allen Ave to Eastern Ave NW

Figure C- 7: Existing and Reroute Scenario Vehicle Flows from "Other" Origins and Destination

APPENDIX D – BASELINE, CHANGE, AND REROUTED TURNING MOVEMENT COUNTS

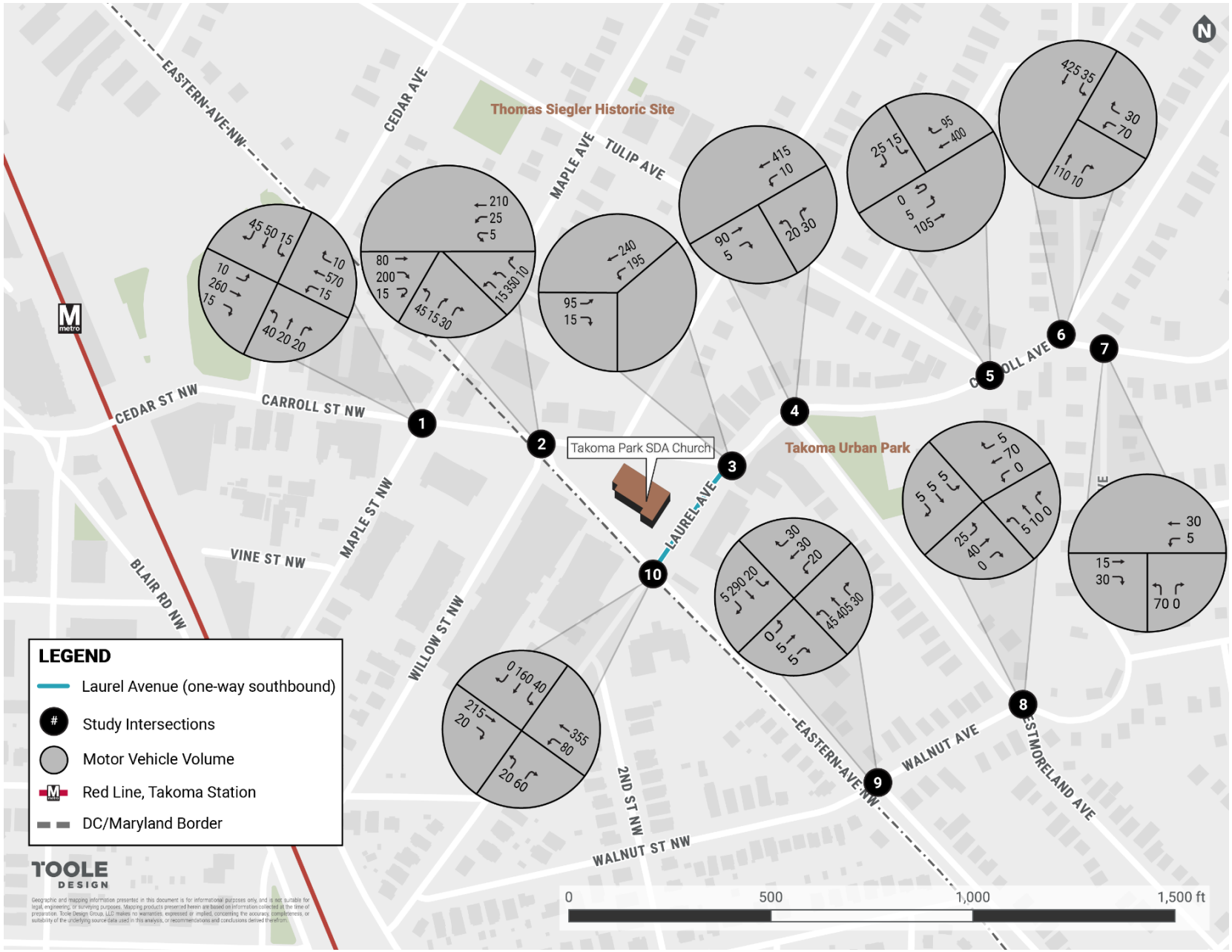


Figure D- 1: Baseline Turning Movement Counts – AM Peak

Figure D- 2: Change in Turning Movement Counts between Baseline and Reroute Scenario – AM Peak

Figure D- 3: Reroute Scenario Turning Movement Counts – AM Peak

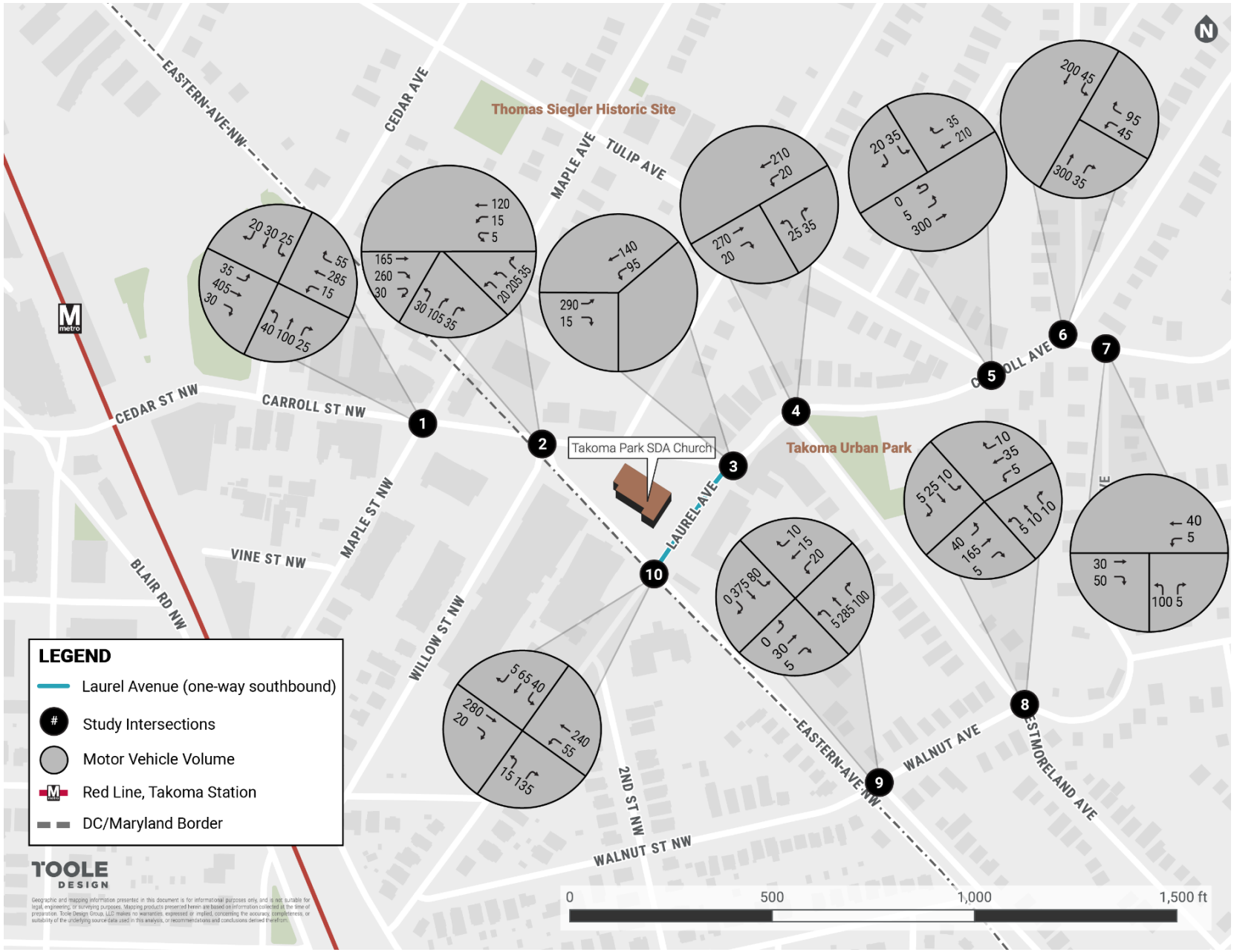


Figure D- 4: Baseline Turning Movement Counts – PM Peak

Figure D- 5: Change in Turning Movement Counts between Baseline and Reroute Scenario – PM Peak

Figure D- 6: Reroute Scenario Turning Movement Counts – PM Peak

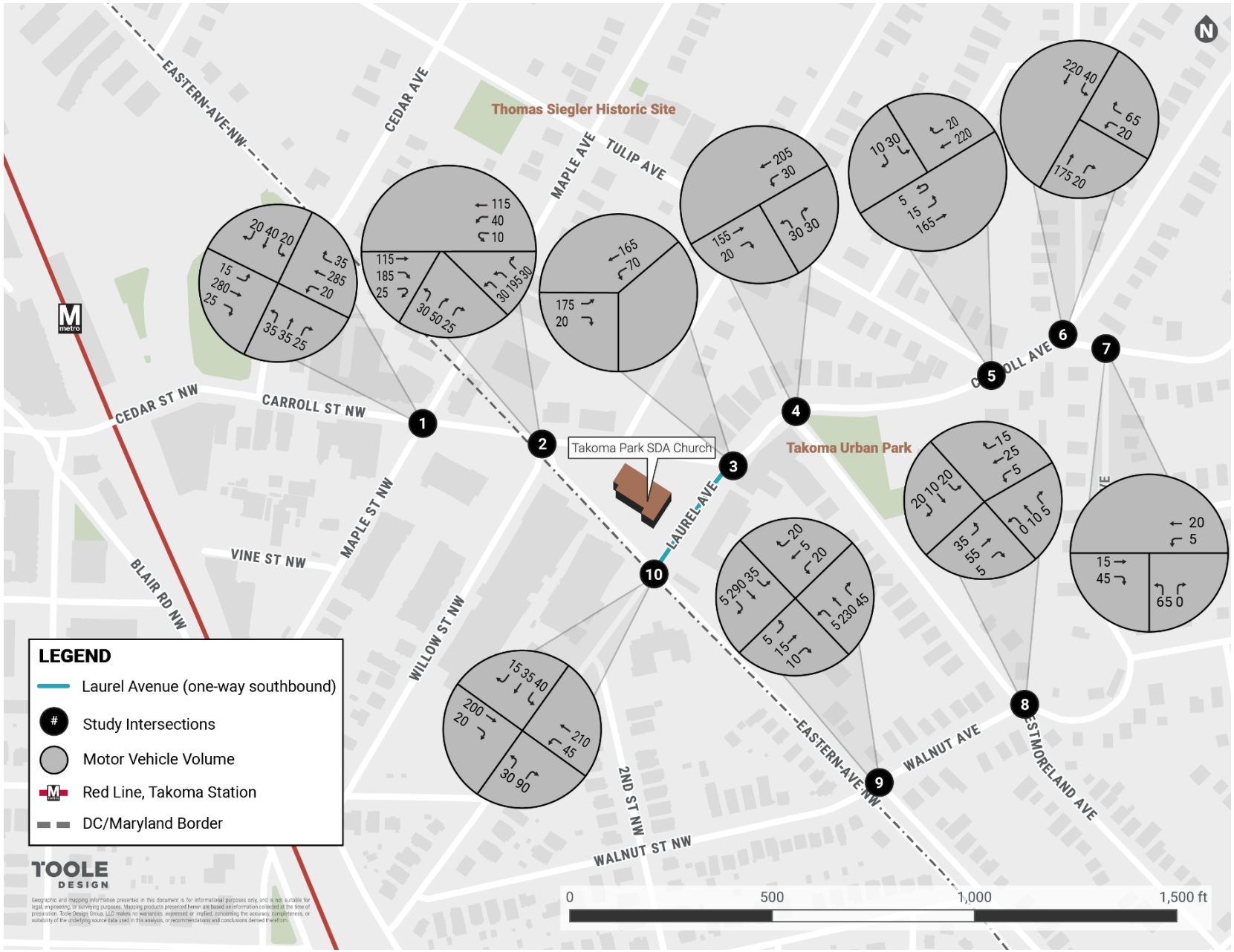


Figure D- 7: Baseline Turning Movement Counts – Sunday Peak

Figure D- 8: Change in Turning Movement Counts between Baseline and Reroute Scenario – Sunday Peak

Figure D- 9: Reroute Scenario Turning Movement Counts – Sunday Peak

APPENDIX E – ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
COVID-19	Coronavirus disease 2019
CTR	Comprehensive Transportation Review
D.C.	District of Columbia
DCI	Daniel Consultants, Inc.
DDOT	District Department of Transportation
EB	Eastbound
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LATR	Local Area Transportation Review
LOS	Level of Service
MCDOT	Montgomery County Department of Transportation
MDOT SHA	Maryland Department of Transportation State Highway Administration
mph	miles per hour
MUTCD	Manual of Uniform Traffic Control Devices
MWCOG	Metropolitan Washington Council of Governments
NB	Northbound
O-D	Origin-Destination (Pair)
SB	Southbound
TMC	Turning Movement Count
v/c	volume-to-capacity ratio
vpd	vehicles per day
WB	Westbound