

# MD 410 AT MD 195

MONTGOMERY COUNTY, MD

## INTERSECTION STUDY PHASE II

NOVEMBER 17<sup>TH</sup>, 2016



**PREPARED BY:**



800 KING FARM BOULEVARD  
4<sup>TH</sup> FLOOR  
ROCKVILLE, MD 20850

## INTRODUCTION

The following traffic study report is an update to the original report submitted to SHA District 3 on August 18, 2015. The City of Takoma Park (City) reviewed the report and after a meeting between the City, SHA, and AMT on October 9, 2015, the City requested that Options 1, 3, 5, and 7 be retained for further traffic operations analyses with updated traffic volumes and vehicle queues based upon AM and PM peak period field observations.

A. Morton Thomas & Associates, Inc. (AMT) conducted an updated traffic operations study for the intersection of Ethan Allen Avenue (MD 410) at Carroll Avenue (MD 195) based upon the previous finalized study dated August 18, 2015. The text of the previous report is included in Appendix A. This intersection is located in Takoma Park, between US 29 and MD 650 and south of the I-495 Beltway, as shown in Figure 1 below. The existing intersection consists of MD 195 to the north, MD 410 to the east and west, Grant Avenue to the northwest, and Sycamore Avenue to the south which is offset to the east by approximately 125 feet.



Figure 1: Intersection Vicinity Map

Based upon the previous study, the signalized intersection at MD 410 and MD 195 has been proposed for an alignment modification of the north leg of MD 195. A proposed concept plan had been developed realigning MD 195 opposite to Sycamore Avenue to create a more traditional three-legged and four-legged intersection with MD 410. Seven (7) proposed options along with the existing conditions were studied.

- Option 1: Existing (No-Build) conditions.
- Option 2: Existing (No-Build) conditions with Grant Avenue closed to traffic.

- Option 3: Existing (No-Build) conditions with Sycamore Avenue closed to traffic.
- Option 4: Existing (No-Build) conditions with Grant Avenue and Sycamore Avenue closed to traffic.
- Option 5: Re-align MD 195 opposite to Sycamore Avenue.
- Option 6: Re-align MD 195 opposite to Sycamore Avenue with Grant Avenue closed to traffic.
- Option 7: Re-align MD 195 opposite to Sycamore Avenue with Sycamore Avenue closed to traffic.
- Option 8: Re-align MD 195 opposite to Sycamore Avenue with Grant Avenue and Sycamore Avenue closed to traffic.



## SECTION I EXISTING CONDITIONS

### I-1 Existing Intersection Geometry

The existing intersection of MD 410 at MD 195 and Grant Avenue is a signalized 4-legged intersection. MD 410 (Ethan Allen Avenue) is generally a two (2) lane east/west roadway with an exclusive left-turn lane and a through lane on the eastbound approach at its intersection with Grant Avenue and MD 195. The westbound approach is a shared through/right-turn lane. The posted speed limit is 25 miles per hour (mph). MD 195 (Carroll Avenue) is generally a two (2) lane north/south roadway with an exclusive left-turn lane and an exclusive right-turn lane at its intersection with MD 410. The roadway is aligned northeast-southwest to MD 410. The posted speed limit is 25 mph. Grant Avenue is generally a one (1) lane roadway and it meets the MD 410/MD 195 intersection as a northwest-southeast roadway. Grant Avenue is a one-way street at this intersection with vehicles only allowed to enter the roadway but not exit at this intersection. The posted speed limit is 25 miles per hour (mph).



Eastbound MD 410



Westbound MD 410



Southbound MD 195



Northbound Grant Avenue



There are two bus-stops near the intersection near the eastbound and westbound approaches. There are crosswalks across MD 195, the east leg of MD 410 and Grant Avenue. There are pedestrian signals across MD 195 and the east leg of MD 410. There are sidewalks on all approaches. There are bike lanes and on-street parking on MD 195. Street lights are provided at the intersection. The western leg of MD 410 is commercial, the eastern leg of MD 410 is residential, Grant Avenue is residential and MD 195 is a mix of residential and commercial.

The intersection of MD 410 at Sycamore Avenue is offset to the right of the MD 410 at MD 195 and Grant Avenue intersection by approximately 125 feet. Sycamore Avenue is generally a two (2) lane north/south roadway with a shared left/right turn-lane at the intersection with MD 410. The speed limit on the road is 25 miles per hour (mph). There is a crosswalk across Sycamore Avenue, however there is no pedestrian signal. Sycamore Avenue is residential with 5 mph speed humps and sidewalks. The east leg of MD 410 is residential with sidewalk on one side. The west leg of MD 410 is integrated with the MD 410/MD 195 intersection. Lighting is provided at the intersection by a street lamp on the sidewalk on the west leg of MD 410. Eastbound and westbound MD 410 are one lane through the intersection and the intersection is signalized. Due to the close proximity of the two intersections, the signals at these two intersections are interconnected.



Eastbound MD 410 east of Sycamore Ave



Westbound MD 410 east of Sycamore Ave



Northbound Sycamore Avenue

The existing conditions diagram (including turn lane lengths, signage, pavement markings, and signalization) is included in Appendix B.

## 1-2 Option I: Existing (No-Build) Conditions

Existing condition level of service (LOS) and delays were determined at the study intersections based on the existing traffic control and lane use, the existing signal timings/phasing provided by SHA, and the Synchro/SimTraffic Version 9.1 software. The software package categorizes the LOS based on the HCM2000 and HCM2010 methodologies. Any intersection or approach with a LOS of E or F is considered substandard and may need solutions to improve the operational performance. The existing conditions Synchro models have been calibrated and validated to match the existing field conditions including queue lengths along certain approaches.

Table I below lists the existing conditions LOS/delay results from the Synchro analysis and the 95<sup>th</sup> percentile queue results from the SimTraffic simulations (seeded for 10 minutes, five 60-minute runs averaged). The detailed result reports for the existing conditions are included in Appendix C.

Location	Control	Levels of Service and Delay (sec/veh)		Approach/Movement	Storage Length (ft)	95th Percentile Queues (ft)	
		AM Peak Hour	PM Peak Hour			AM Peak Hour	PM Peak Hour
<b>MD 195 at MD 410 (Phila Ave)</b>	Signal						
Eastbound (MD 195)		C (20.6)	D (37.7)				
Eastbound Sh Left/Through		C (20.6)	D (37.7)	EBLT	780	290	833
Westbound (MD 195)		B (11.4)	C (29.3)				
Westbound Through		C (23.1)	D (43.0)	WBT	225	304	350
Westbound Right		A (0.2)	A (0.2)	WBR	225	34	98
Southbound (MD 410 Phila Ave)		C (28.3)	D (36.9)				
Southbound Shared Left/Right		C (28.3)	D (36.9)	SBLR	800	256	504
<b>Overall</b>		<b>B (16.5)</b>	<b>C (33.6)</b>				
<b>Grant Ave at MD 410/MD 195</b>	Signal						
Eastbound (MD 410)		B (15.6)	C (23.4)				
Eastbound Left		B (15.8)	C (31.9)	EBL	310	121	279
Eastbound Through		B (15.6)	B (19.4)	EBT	310	266	394
Westbound (MD 410)		A (0.6)	A (0.5)				
Westbound Sh Through/Right		A (0.6)	A (0.5)	WBTR	57	30	89
Southbound (MD 195)		D (49.7)	D (51.1)				
Southbound Left		E (64.9)	E (70.4)	SBL	300	84	214
Southbound Right		D (47.3)	D (42.7)	SBR		399	316
<b>Overall</b>		<b>C (20.7)</b>	<b>C (21.7)</b>				
<b>MD 410 at Sycamore Ave</b>	Signal						
Eastbound (MD 410)		A (0.1)	A (0.2)				
Eastbound Sh Th/Right		A (0.1)	A (0.2)	EBTR	57	23	19
Westbound (MD 410)		F (88.3)	F (115.4)				
Westbound Sh Left/Th		F (88.3)	F (115.4)	WBTR	>1000	450	955
Northbound (Sycamore Ave)		E (55.9)	E (69.0)				
Northbound Sh Left/Right		E (55.9)	E (69.0)	NBLR	>1000	82	132
<b>Overall</b>		<b>D (45.5)</b>	<b>D (52.5)</b>				

Notes: Based on the Synchro 9.1/SimTraffic methodology

Table I: Option I Existing (No-Build) Conditions Intersection LOS/Delay/95<sup>th</sup> Percentile Queue Summary

The results indicate that in the AM peak hour all study intersections are expected to operate at overall acceptable conditions. At the MD 195 at MD 410 (Philadelphia Avenue) intersection, queues on the westbound through approach are expected to spill back into the upstream intersection resulting in longer queues.

In the PM peak hour, all study intersections are expected to operate at overall acceptable conditions. At the MD 195 at MD 410 (Philadelphia Avenue) intersection the eastbound queues along MD 410 are observed to extend all the way to Park Avenue which is approximately 800 feet from the intersection. The queues on the westbound through approach are expected to spill back into the upstream intersection as during the AM peak hour. The southbound queues along Philadelphia Avenue were observed to be around 500 feet. At the MD 410 at Sycamore Avenue intersection, the westbound queues are observed to extend all the way to Jackson Avenue which is approximately 950 feet from the intersection.

## SECTION 2 PROPOSED IMPROVEMENT SCENARIOS

To perform a traffic operations and safety study based upon the proposed concept plan of realigning MD 195 opposite to Sycamore Avenue, the following options were analyzed:

- Option 3: Existing (No-Build) conditions with Sycamore Avenue closed to traffic.
- Option 5: Re-align MD 195 opposite to Sycamore Avenue.
- Option 7: Re-align MD 195 opposite to Sycamore Avenue with Sycamore Avenue closed to traffic.

The proposed conditions diagrams (including turn lane lengths, signage, pavement markings, and signalization) are included in Appendix D.

### 2-1 Option 3: Existing (No-Build) conditions with Sycamore Avenue closed to traffic

In this option, Sycamore Avenue is closed to traffic. The signal at MD 410 and Sycamore Avenue intersection is removed. Traffic entering and exiting Sycamore Avenue is rerouted under the following scenarios:

- Eastbound right turning vehicles along MD 410 coming from west of MD 410/MD 195 intersection and entering Sycamore Avenue are detoured to Columbia Avenue to access Sycamore Avenue. The eastbound right turning vehicles entering Sycamore Avenue and coming southbound along MD 195 continue through the intersection and turn right at Woodland Avenue and another right at Beech Avenue. The traffic detoured from MD 410 and MD 195 onto Columbia Avenue and Woodland Avenue is based upon existing traffic distribution, to Sycamore Avenue.
- Westbound left turning vehicles from MD 410 entering Sycamore Avenue are detoured to Woodland Avenue and Beech Avenue.
- Northbound right turning vehicles exiting Sycamore Avenue are detoured to Woodland Avenue via Beech Avenue.
- Northbound left turning vehicles exiting Sycamore Avenue are detoured to Columbia Avenue.

Table 2 below lists the Option 3 conditions LOS/delay results from the Synchro analysis and the 95<sup>th</sup> percentile queue results from the SimTraffic simulations (seeded for 10 minutes, five 60-minute runs averaged). The detailed result reports for the Option 3 conditions are included in Appendix E.



Location	Control	Levels of Service and Delay (sec/veh)		Approach/Movement	Storage Length (ft)	95th Percentile Queues (ft)	
		AM Peak Hour	PM Peak Hour			AM Peak Hour	PM Peak Hour
<b>MD 195 at MD 410 (Phila Ave)</b>	Signal						
Eastbound (MD 195)		B (12.9)	C (23.9)				
Eastbound Sh Left/Through		B (12.9)	C (23.9)	EBLT	780	116	793
Westbound (MD 195)		A (7.0)	B (18.5)				
Westbound Through		B (14.8)	C (28.8)	WBT	225	140	317
Westbound Right		A (0.3)	A (0.2)	WBR	225	14	32
Southbound (MD 410 Phila Ave)		C (31.1)	C (33.6)				
Southbound Shared Left/Right		C (31.1)	C (33.6)	SBLR	800	120	448
<b>Overall</b>		<b>B (13.0)</b>	<b>C (24.8)</b>				
<b>Grant Ave at MD 410/MD 195</b>	Signal						
Eastbound (MD 410)		B (14.5)	C (20.8)				
Eastbound Left		B (16.7)	C (22.9)	EBL	310	78	220
Eastbound Through		B (13.9)	B (19.8)	EBT	310	232	340
Westbound (MD 410)		B (19.2)	B (12.5)				
Westbound Sh Through/Right		B (19.2)	B (12.5)	WBTR	74	90	90
Southbound (MD 195)		D (35.4)	D (42.9)				
Southbound Left		D (54.5)	E (58.4)	SBL	300	154	155
Southbound Right		C (32.4)	D (37.2)	SBR		296	257
<b>Overall</b>		<b>C (22.6)</b>	<b>C (22.7)</b>				
<b>MD 410 at Sycamore Ave</b>	No Signal						
Eastbound (MD 410)		N/A	N/A				
Eastbound Sh Th/Right		N/A	N/A	EBTR	74	Free Flow	Free flow
Westbound (MD 410)		N/A	N/A				
Westbound Sh Left/Th		N/A	N/A	WBTR	>1000	182	253
Northbound (Sycamore Ave)		N/A	N/A				
Northbound Sh Left/Right		N/A	N/A	NBLR	>1000	N/A	N/A
<b>Overall</b>		<b>N/A</b>	<b>N/A</b>				

Notes: Based on the Synchro 9.1/SimTraffic methodology

**Table 2: Proposed Option 3 Intersection LOS/Delay/95<sup>th</sup> Percentile Queue Summary**

The Option 3 analysis results indicate that in the AM peak hour, all study intersections are expected to operate at overall acceptable conditions. At MD 410/MD 195 at Grant Avenue intersection, queues along the westbound approach are expected to spill back into the next intersection. The signal on MD 410 at Sycamore Avenue intersection is removed and hence, there is no queue on the eastbound approach. The queues observed on the westbound approach is because of the spillback from the westbound approach on MD 410/MD 195 at Grant Avenue intersection.

In the PM peak hour, all study intersections are expected to operate at overall acceptable conditions. The queues along all approaches at the MD 195 at MD 410 (Philadelphia Avenue) intersection are estimated to be similar to the Option 1 No-Build conditions. Since the signal at MD 410 at Sycamore Avenue intersection is removed, there is no delay at the intersection. The westbound through queue observed at the intersection is the spillover from the westbound queue at the Grant Avenue/MD 195 intersection which is estimated to be a

lot lower than what was observed for Option 1 No-Build conditions. Pending public support to NOT realign MD 195, this option is recommended.

### 3-4 Option 5: Realign MD 195 opposite to Sycamore Avenue

In this option, MD 195 is realigned opposite to Sycamore Avenue to create a more traditional four-legged intersection with MD 410. All roads are open to traffic as under existing conditions.

Table 3 below lists the Option 5 conditions LOS/delay results from the Synchro analysis and the 95<sup>th</sup> percentile queue results from the SimTraffic simulations (seeded for 10 minutes, five 60-minute runs averaged). The detailed result reports for the Option 5 conditions are included in Appendix E.

Location	Control	Levels of Service and Delay (sec/veh)		Approach/Movement	Storage Length (ft)	95th Percentile Queues (ft)	
		AM Peak Hour	PM Peak Hour			AM Peak Hour	PM Peak Hour
<b>MD 195 at MD 410 (Phila Ave)</b>	Signal						
Eastbound (MD 195)		F (83.1)	F (277.0)				
Eastbound Sh Left/Through		F (83.1)	F (277.0)	EBLT	780	541	2958
Westbound (MD 195)		D (42.7)	E (71.9)				
Westbound Through		F (87.5)	F (105.6)	WBT	225	378	384
Westbound Right		A (0.1)	A (0.4)	WBR	225	24	56
Southbound (MD 410 Phila Ave)		B (17.6)	D (42.5)				
Southbound Shared Left/Right		B (17.6)	D (42.5)	SBLR	800	365	3249
<b>Overall</b>		<b>D (46.1)</b>	<b>F (110.4)</b>				
<b>Grant Ave at MD 410</b>	Signal						
Eastbound (MD 410)		C (20.3)	F (97.4)				
Eastbound Left		B (13.4)	C (25.2)	EBL	310	11	25
Eastbound Through		C (20.4)	F (98.2)	EBT	310	364	316
Westbound (MD 410)		B (11.2)	B (15.6)				
Westbound Shared Through/Right		B (11.2)	B (15.6)	WBTR	105	123	124
<b>Overall</b>		<b>B (14.8)</b>	<b>E (63.7)</b>				
<b>MD 410 at Sycamore Ave/MD 195</b>	Signal						
Eastbound (MD 410)		A (0.1)	B (16.4)				
Eastbound Left		A (0.1)	D (48.1)	EBL	105	129	148
Eastbound Sh Th/Right		A (0.1)	A (0.0)	EBTR	105	8	15
Westbound (MD 410)		C (29.1)	E (72.3)				
Westbound Sh Left/Th/Right		C (29.1)	E (72.3)	WBLTR	>1000	764	3068
Northbound (Sycamore Ave)		E (78.9)	F (93.1)				
Northbound Sh Left/Through/Right		E (78.9)	F (93.1)	NBLTR	>1000	659	716
Southbound (MD 195 Carroll Ave)		E (55.7)	E (59.7)				
Southbound Shared Left/Through		E (64.0)	E (73.9)	SBLT	300	412	522
Southbound Right		D (54.4)	D (53.6)	SBR		1760	525
<b>Overall</b>		<b>C (28.9)</b>	<b>D (44.5)</b>				

Notes: Based on the Synchro 9.1/SimTraffic methodology

Table 3: Proposed Option 5 Intersection LOS/Delay/95<sup>th</sup> Percentile Queue Summary

The Option 5 traffic analysis results indicate that in the AM peak hour all study intersection are expected to operate at overall acceptable conditions. At MD 195 at MD 410 (Philadelphia Avenue) intersection, the eastbound approach operates at unacceptable conditions and queues are expected to be approximately 541 feet. The westbound through queues are expected to spill back into the next intersection. At MD 410 at Grant Avenue intersection, queues along eastbound and westbound approaches are expected to be longer than available storage and are expected to spillback into the next intersection.

In the PM peak hour, MD 195 at MD 410 (Philadelphia Avenue) is expected to operate at unacceptable conditions primarily due to the eastbound approach which is expected to operate at unacceptable conditions with eastbound queues expected to be close to 3000 feet. At the re-aligned 4-legged intersection of MD 410 at MD 195/Sycamore Avenue, the northbound and southbound approaches operate below acceptable conditions. This is primarily due to longer wait times and increasing delays with more green time being provided to the eastbound and westbound approaches. However, this green time is not enough and westbound queues at the MD 410 at Sycamore Avenue/MD 195 intersection are expected to be approximately 3068 feet. At the realigned MD 195 approach, the southbound queues are expected to be approximately 522 feet.

This option is not recommended due to the above mentioned reasons.

### **3-6     Option 7: Realign MD 195 opposite to Sycamore Avenue with Sycamore Avenue closed**

In this option, MD 195 is realigned opposite to Sycamore Avenue to create a more traditional four-legged intersection with MD 410 with Sycamore Avenue closed to traffic. Traffic entering and exiting Sycamore Avenue is rerouted in the same way as described under Option 3.

Table 4 below lists the Option 7 conditions LOS/delay results from the Synchro analysis and the 95<sup>th</sup> percentile queue results from the SimTraffic simulations (seeded for 10 minutes, five 60-minute runs averaged). The detailed result reports for the Option 7 conditions are included in Appendix E.

Location	Control	Levels of Service and Delay (sec/veh)		Approach/Movement	Storage Length (ft)	95th Percentile Queues (ft)	
		AM Peak Hour	PM Peak Hour			AM Peak Hour	PM Peak Hour
<b>MD 195 at MD 410 (Phila Ave)</b>	Signal						
Eastbound (MD 195)		C (21.5)	D (37.5)				
Eastbound Sh Left/Through		C (21.5)	D (37.5)	EBLT	780	208	3021
Westbound (MD 195)		B (16.2)	D (39.4)				
Westbound Through		C (34.4)	E (60.7)	WBT	225	343	338
Westbound Right		A (0.3)	A (0.2)	WBR	225	21	12
Southbound (MD 410 Phila Ave)		B (13.6)	C (31.6)				
Southbound Shared Left/Right		B (13.6)	C (31.6)	SBLR	800	191	669
<b>Overall</b>		<b>B (16.7)</b>	<b>D (36.4)</b>				
<b>Grant Ave at MD 410</b>	Signal						
Eastbound (MD 410)		B (15.0)	D (50.9)				
Eastbound Left		B (11.9)	B (19.2)	EBL	310	17	29
Eastbound Through		B (15.1)	D (51.3)	EBT	310	260	333
Westbound (MD 410)		A (7.1)	A (3.2)				
Westbound Shared Through/Right		A (7.1)	A (3.2)	WBTR	105	121	151
<b>Overall</b>		<b>B (10.2)</b>	<b>C (32.0)</b>				
<b>MD 410 at Sycamore Ave/MD 195</b>	Signal						
Eastbound (MD 410)		A (0.1)	D (35.0)				
Eastbound Left		A (0.2)	F (98.0)	EBL	105	83	137
Eastbound Sh Th/Right		A (0.1)	A (0.0)	EBTR	105	9	9
Westbound (MD 410)		C (27.4)	D (49.1)				
Westbound Sh Left/Th/Right		C (27.4)	D (49.1)	WBLTR	>1000	390	698
Northbound (Sycamore Ave)		N/A	N/A				
Northbound Sh Left/Through/Right		N/A	N/A	NBLTR	>1000	N/A	N/A
Southbound (MD 195 Carroll Ave)		D (35.3)	D (42.1)				
Southbound Left		D (42.3)	D (52.3)	SBL	300	146	154
Southbound Right		C (34.2)	D (37.9)	SBR		244	237
<b>Overall</b>		<b>C (20.7)</b>	<b>D (40.9)</b>				

Notes: Based on the Synchro 9.1/SimTraffic methodology

**Table 4: Proposed Option 7 Intersection LOS/Delay/95<sup>th</sup> Percentile Queue Summary**

The Option 7 traffic analysis results indicate that in the AM peak hour all study intersections are expected to operate at overall acceptable conditions as well as individual approaches. At MD 195 at MD 410 (Philadelphia Avenue) intersection, queues along the westbound approach are expected to be longer than the available storage resulting in spillback into the next intersection. At the MD 410 at Grant Avenue westbound intersection, westbound queues are expected to continue to spill back into the next intersection. Queues along the westbound approach at MD 410 at Sycamore Avenue/MD 195 intersection, queues are expected to be approximately 390 feet.



In the PM peak hour, all intersections are expected to operate at overall acceptable conditions as well as at individual approaches. However, similar to Option 5 the eastbound queue at MD 195 at MD 410 (Philadelphia Avenue) is expected to be approximately 3021 feet. The southbound queue along MD 410 (Philadelphia Avenue) is approximately around 669 feet.

Although significant queues will be observed specially on the eastbound approaches during the PM peak hour, the queues are expected to be lower and the intersections are expected to perform better overall when compared to Option 5. If public support is to realign MD 195, then Option 7 is the preferred option over Option 5.

## SECTION 4 CONCLUSIONS & RECOMMENDATIONS

The conclusions and recommendations of the intersection study conducted for the intersection of MD 410 at MD 195 are as follows:

- During the Existing (No-Build) conditions in the AM peak hour, all study intersections are expected to operate at overall acceptable conditions. At the MD 195 at MD 410 (Philadelphia Avenue) intersection, queues on the westbound through approach are expected to spill back into the upstream intersection resulting in longer queues. In the PM peak hour, all study intersections are expected to operate at overall acceptable conditions. At the MD 195 at MD 410 (Philadelphia Avenue) intersection the eastbound queues along MD 410 are observed to extend all the way to Park Avenue which is approximately 800 feet from the intersection. The queues on the westbound through approach are expected to spill back into the upstream intersection as during the AM peak hour. The southbound queues along Philadelphia Avenue were observed to be around 500 feet. At the MD 410 at Sycamore Avenue intersection, the westbound queues are observed to extend all the way to Jackson Avenue which is approximately 950 feet from the intersection. This was studied as Option I.
- During the various field reconnaissance efforts, observations were noted for the MD 410 at MD 195/Grant Avenue and MD 410 at Sycamore Avenue intersections:
  - At the MD 410 at MD 195/Grant Avenue intersection, queuing southbound right turning vehicles were observed. An average of 7-8 vehicles were observed queueing per cycle and would spill back beyond S Manor Circle. Few vehicles (3 were noticed during the PM peak hour) attempting to make a left turn from S Manor Circle and continue southbound on MD 195 found it difficult to access.
  - At the MD 410 at Sycamore Avenue, westbound vehicles on MD 410 wanting to make a left turn onto Sycamore Avenue often had to wait between 7-10 seconds to find gaps within the eastbound through traffic. Since westbound MD 410 is a shared left/through lane, if a left turning vehicle waits in the front of the queue to turn left, through vehicles are queued up behind. Only 3 vehicles were observed to make a left turn onto Sycamore Avenue during the PM peak hour.
- To perform a traffic operations and safety study based upon the proposed concept plan of realigning MD 195 opposite to Sycamore Avenue, the following options were analyzed:
  - Option 3: Existing (No-Build) conditions with Sycamore Avenue closed to traffic
  - Option 5: Realign MD 195 opposite to Sycamore Avenue and all roads open to traffic
  - Option 7: Realign MD 195 opposite to Sycamore Avenue with Sycamore Avenue closed to traffic
- The Option 3 traffic analysis results indicate that in the AM peak hour, all study intersections are expected to operate at overall acceptable conditions. At MD 410/MD 195 at Grant Avenue intersection, queues along the westbound approach are expected to spill back into the next intersection. The signal on MD 410 at Sycamore Avenue intersection is removed and hence, there is no queue on the eastbound approach. The queues observed on the westbound approach is because of the spillback from the westbound approach on MD 410/MD 195 at Grant Avenue intersection. In the PM peak hour, all study intersections are expected to operate at overall acceptable conditions. The queues along all approaches at the MD 195 at MD 410 (Philadelphia Avenue) intersection are estimated to be similar to the Option I No-Build conditions. Since the signal at MD 410 at Sycamore

Avenue intersection is removed, there is no delay at the intersection. The westbound through queue observed at the intersection is the spillover from the westbound queue at the Grant Avenue/MD 195 intersection which is estimated to be a lot lower than what was observed for Option 1 No-Build conditions. Pending public support to NOT realign MD 195, this option is recommended.

- The Option 5 traffic analysis results indicate that in the AM peak hour all study intersection are expected to operate at overall acceptable conditions. At MD 195 at MD 410 (Philadelphia Avenue) intersection, the eastbound approach operates at unacceptable conditions and queues are expected to be approximately 541 feet. The westbound through queues are expected to spill back into the next intersection. At MD 410 at Grant Avenue intersection, queues along eastbound and westbound approaches are expected to be longer than available storage and are expected to spillback into the next intersection. In the PM peak hour, MD 195 at MD 410 (Philadelphia Avenue) is expected to operate at unacceptable conditions primarily due to the eastbound approach which is expected to operate at unacceptable conditions with eastbound queues expected to be close to 3000 feet. At the re-aligned 4-legged intersection of MD 410 at MD 195/Sycamore Avenue, the northbound and southbound approaches operate below acceptable conditions. This is primarily due to longer wait times and increasing delays with more green time being provided to the eastbound and westbound approaches. However, this green time is not enough and westbound queues at the MD 410 at Sycamore Avenue/MD 195 intersection are expected to be approximately 3068 feet. At the realigned MD 195 approach, the southbound queues are expected to be approximately 522 feet. This option is not recommended due to the above mentioned reasons.
- The Option 7 traffic analysis results indicate that in the AM peak hour all study intersections are expected to operate at overall acceptable conditions as well as individual approaches. At MD 195 at MD 410 (Philadelphia Avenue) intersection, queues along the westbound approach are expected to be longer than the available storage resulting in spillback into the next intersection. At the MD 410 at Grant Avenue westbound intersection, westbound queues are expected to continue to spill back into the next intersection. Queues along the westbound approach at MD 410 at Sycamore Avenue/MD 195 intersection, queues are expected to be approximately 390 feet. In the PM peak hour, all intersections are expected to operate at overall acceptable conditions as well as at individual approaches. However, similar to Option 5 the eastbound queue at MD 195 at MD 410 (Philadelphia Avenue) is expected to be approximately 3021 feet. The southbound queue along MD 410 (Philadelphia Avenue) is approximately around 669 feet. Although significant queues will be observed specially on the eastbound approaches during the PM peak hour, the queues are expected to be lower and the intersections are expected to perform better overall when compared to Option 5. If public support is to realign MD 195, then Option 7 is the preferred option over Option 5.
- **AMT recommends two (2) study options depending on the public support or non-support to realign MD 195.**
- **If there is public support to NOT realign MD 195, then we recommend Option 3 where Sycamore Avenue is closed to traffic to be implemented. This option provides minimum traffic detour with maximum improvement to LOS/Delay. Moreover, no geometric realignment is required for MD 195.**
- **If there is public support to realign MD 195, then we recommend Option 7 over Option 5 where MD 195 is realigned with Sycamore Avenue and Sycamore Avenue is closed to traffic. The queues are expected to be shorter and the intersections are expected to perform better overall when compared to Option 5.**