

380 MAPLE AVENUE WEST

Traffic Impact Study

PREPARED FOR

J.D.A. CUSTOM HOMES

SEPTEMBER 20, 2018

UPDATED:

NOVEMBER 29, 2018

MARCH 18, 2019

Prepared By:

Kimley»Horn

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Prepared under the Supervision of:

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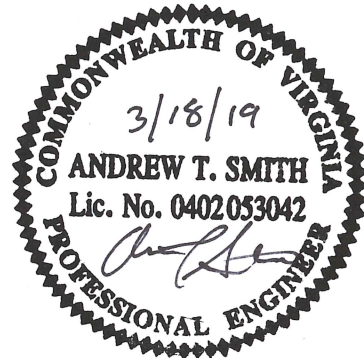
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EXECUTIVE SUMMARY

PURPOSE AND DESCRIPTION OF PROPOSED DEVELOPMENT

This report presents the results of a traffic impact study to support a rezoning application for a proposed mixed-use development at 380 Maple Avenue West in the Town of Vienna, Virginia. The proposed development is located on a 36,842-square foot site currently occupied by a 23,620-square foot office building.

The applicant proposes to rezone the site to the Maple Avenue Commercial (MAC) district and to re-develop with up to 8,500 square feet of retail and up to 42 multi-family residential units. Access to the site is planned to be provided by three access points, all along Wade Hampton Drive Southwest. Out of the three access points, the closest to Maple Avenue West (VA 123) will serve as the service vehicle loading/unloading access, while the other two access points will serve the retail and residential components on the site.

The proposed site will include 125 parking spaces divided among above- and below-grade garage parking to accommodate employees, visitors, patrons, and residents.

ANALYSIS PROCEDURE

Per the scoping document between the applicant and the Town of Vienna, a traffic impact study was conducted to describe the area transportation system, existing traffic volumes and analysis, the calculation of background traffic volumes and analysis, traffic generated by the proposed development, calculation of total future volumes and analysis, and vehicle queuing patterns.

Intersection capacity and queueing analyses were performed for the weekday AM and PM peak hours and for the Saturday midday peak hour at six study intersections. Per the scoping document, intersection capacity analyses are based on the 2010 Highway Capacity Manual (HCM).

CONCLUSIONS

Based on the intersection capacity analyses that were conducted, it is concluded that the proposed development will result in minimal traffic impacts to the area transportation network and that parking will be provided in accordance with the Town's Zoning Ordinance.

Under existing conditions, all signalized study intersections operate at or better than overall intersection LOS D during the AM, PM, and Saturday midday peak hours.

Under background conditions, both the intersection of Nutley Street Southwest and Courthouse Road Southwest and the intersection of Maple Avenue West and Nutley Street Southwest will operate at LOS E during the AM peak hour, which is below the intersection operation standard of LOS D identified in the scoping document.

These results suggest that the background traffic associated with regional growth and pipeline developments impact signalized intersection operations.

The delays at the signalized intersections also increase under the total future conditions, i.e. with the proposed development in place. It is noted, however, that all signalized intersections operate at the same LOS when compared to background conditions. This confirms that the traffic impacts on congestion and

delay associated with the proposed development will be minimal, specifically when compared to the traffic impacts of the regional growth and the traffic generated by pipeline developments.

Under total future conditions, the intersection of Nutley Street Southwest and Courthouse Road Southwest and the intersection of Maple Avenue West and Nutley Street Southwest will continue to operate at LOS E during the AM peak hour; this is below the intersection operation standard identified in the scoping document. It is noted, however, that the traffic generated by the proposed development only adds 0.2 seconds of overall intersection delay to the Nutley Street Southwest and Courthouse Road Southwest intersection during the AM peak hour. Similarly, the traffic generated by the proposed developments only adds 2.4 seconds of overall intersection delay to the Maple Avenue West and Nutley Street Southwest intersection during the AM peak hour.

Under total future conditions, significant delays are anticipated at the northbound approach of Wade Hampton Drive Southwest at Maple Avenue West. Traffic exiting the proposed site is anticipated to experience delays accessing Maple Avenue (particularly for those vehicles that are turning left). Due the heavy east-west traffic flows along Maple Avenue West during the peak hours, additional delays are experienced for vehicles turning from the minor streets along Maple Avenue West. It is noted that these delays are not uncommon or unexpected for unsignalized approaches to congested corridors. It is anticipated that motorists will find a balance between waiting out the delays at the northbound approach of Wade Hampton Drive Southwest and the extra travel time required to identify and use an alternate route.

To mitigate the impacts at the intersection of Wade Hampton Southwest at Maple Avenue West, the project will change the northbound approach from a single, left-through-right lane to one left-through lane and one right-turn only lane. This improvement provides a significant benefit for the approach by allowing right-turning vehicles their own lane so that they are not blocked by left-turning or through vehicles which experience heavier delay. This also allows vehicles that would normally turn left onto Maple Avenue West the option to easily turn right if they determine that the delay for the left-turn movement is long than they would prefer to wait.

The maximum northbound queueing at this location is approximately 3.5 vehicles waiting to turn onto Maple Avenue West. This is not anticipated to negatively impact access and egress to the proposed site or to impact the local neighborhood intersections and streets.

Realistically, there are few mitigation options to reduce the delay at the minor street approach; the traffic volumes do not warrant a signal (which is also precluded by intersection spacing along Maple Avenue West) and the east-west travel pattern along Maple Avenue is dependent on efficient intersection to intersection progression, which limits the number of gaps available for left turn movements from the minor streets. The separation of the northbound approach into a left-through lane and right-turn lane at this location provides a considerable benefit.

Should the Town determine that the real or forecasted delays at this intersection are too much to bear, potential mitigation options may include restricting certain turning movements during the peak hours or installing “do not block the intersection” signage and/or pavement markings to facilitate the creation of gaps in traffic during congested conditions. The developer has also expressed a desire to work with the Town and the community to develop strategies to minimize the impact of traffic on residential streets. One such strategy is the proposed prohibition of left turns exiting the site, which will reduce the possibility of site traffic driving through neighborhood streets.

Table E1: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
1. Nutley Street Southwest and Courthouse Road Southwest (signalized)										
Northbound (Nutley Street Southwest)	L	26.1 (C)	17.7 (B)	14.3 (B)	23.0 (C)	16.7 (B)	14.2 (B)	23.2 (C)	16.7 (B)	14.3 (B)
	T	40.9 (D)	22.5 (C)	20.2 (C)	36.9 (D)	24.6 (C)	1.5 (A)	37.4 (D)	24.9 (C)	1.6 (A)
	R	41.9 (D)	23.1 (C)	21.0 (C)	37.2 (D)	24.7 (C)	1.5 (A)	37.7 (D)	25.0 (C)	1.6 (A)
	Overall	40.3 (D)	21.8 (C)	20.0 (C)	36.1 (D)	23.2 (C)	2.6 (A)	36.5 (D)	23.4 (C)	2.7 (A)
Southbound (Nutley Street Southwest)	L	30.7 (C)	20.5 (C)	16.1 (B)	27.0 (C)	21.7 (C)	15.3 (B)	27.3 (C)	21.8 (C)	15.4 (B)
	T	33.8 (C)	25.3 (C)	18.4 (B)	23.3 (C)	2.4 (A)	0.9 (A)	23.6 (C)	2.4 (A)	0.9 (A)
	R	33.9 (C)	25.6 (C)	18.5 (B)	23.2 (C)	2.4 (A)	0.9 (A)	23.5 (C)	2.4 (A)	0.9 (A)
	Overall	33.7 (C)	25.4 (C)	18.3 (B)	23.4 (C)	2.8 (A)	1.7 (A)	23.7 (C)	2.8 (A)	1.7 (A)
Eastbound (Courthouse Road Southwest)	L	43.1 (D)	53.5 (D)	47.4 (D)	53.8 (D)	76.5 (E)	63.1 (E)	53.8 (D)	76.5 (E)	63.1 (E)
	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	R	65.2 (E)	55.8 (E)	49.7 (D)	155.4 (F)	92.4 (F)	69.5 (E)	155.4 (F)	92.4 (F)	69.5 (E)
	Overall	56.1 (E)	54.6 (D)	48.6 (D)	113.6 (F)	84.3 (F)	66.3 (E)	113.6 (F)	84.3 (F)	66.3 (E)
Westbound (Courthouse Road Southwest)	L	63.1 (E)	49.7 (D)	48.3 (D)	73.8 (E)	72.6 (E)	69.7 (E)	74.3 (E)	73.1 (E)	70.0 (E)
	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	R	56.5 (E)	52.5 (D)	43.9 (D)	56.4 (E)	86.9 (F)	57.0 (E)	56.1 (E)	86.9 (F)	56.7 (E)
	Overall	61.2 (E)	51.1 (D)	46.6 (D)	68.7 (E)	80.5 (F)	64.9 (E)	69.1 (E)	80.7 (F)	65.0 (E)
Overall Intersection		45.3 (D)	31.4 (C)	27.8 (C)	56.4 (E)	34.3 (C)	20.1 (C)	56.6 (E)	34.4 (C)	20.1 (C)
2. Nutley Street Southwest and Maple Avenue West (signalized)										
Northbound (Nutley Street Southwest)	L	62.0 (E)	73.1 (E)	53.7 (D)	72.6 (E)	116.0 (F)	57.4 (E)	72.8 (E)	116.0 (F)	57.4 (E)
	T	54.9 (D)	75.2 (E)	56.6 (E)	56.0 (E)	111.9 (F)	59.6 (E)	56.3 (E)	112.0 (F)	59.7 (E)
	R	37.7 (D)	38.0 (D)	32.5 (C)	20.2 (C)	51.1 (D)	5.4 (A)	20.4 (C)	48.3 (D)	4.7 (A)
	Overall	49.1 (D)	58.9 (E)	41.7 (D)	45.7 (D)	88.4 (F)	29.1 (C)	45.9 (D)	88.8 (F)	28.5 (C)
Southbound (Nutley Street Southwest)	L	47.9 (D)	59.1 (E)	52.7 (D)	51.3 (D)	62.5 (E)	56.6 (E)	51.4 (D)	62.8 (E)	56.9 (E)
	T	73.4 (E)	74.1 (E)	57.9 (E)	99.6 (F)	89.8 (F)	65.7 (E)	99.6 (F)	89.8 (F)	65.7 (E)
	R	-	-	-	-	-	-	-	-	-
	Overall	68.4 (E)	70.6 (E)	56.4 (E)	87.6 (F)	82.2 (F)	62.5 (E)	87.5 (F)	82.0 (F)	62.5 (E)
Eastbound (Maple Avenue West)	L	23.7 (C)	27.5 (C)	22.0 (C)	30.6 (C)	35.5 (D)	30.8 (C)	31.1 (C)	35.8 (D)	31.5 (C)
	T	48.3 (D)	36.2 (D)	40.1 (D)	84.5 (F)	43.3 (D)	79.7 (E)	91.5 (F)	43.8 (D)	91.3 (F)
	R	-	-	-	-	-	-	-	-	-
	Overall	47.8 (D)	35.9 (D)	39.4 (D)	83.2 (F)	43.0 (D)	77.4 (E)	90.1 (F)	43.5 (D)	88.5 (F)
Westbound (Maple Avenue West)	L	39.2 (D)	23.0 (C)	26.7 (C)	89.5 (F)	45.2 (D)	64.2 (E)	90.0 (F)	49.1 (D)	62.2 (E)
	T	29.4 (C)	35.0 (C)	24.0 (C)	27.2 (C)	23.3 (C)	14.4 (B)	27.6 (C)	24.3 (C)	14.4 (B)
	R	-	-	-	-	-	-	-	-	-
	Overall	31.4 (C)	32.9 (C)	24.7 (C)	40.3 (D)	27.2 (C)	27.6 (C)	41.0 (D)	28.7 (C)	27.1 (C)
Overall Intersection		46.7 (D)	43.3 (D)	36.2 (D)	62.8 (E)	50.5 (D)	47.3 (D)	65.2 (E)	50.9 (D)	50.6 (D)
3. Wade Hampton Drive/Lewis Street N and Maple Avenue (unsignalized)										
Northbound (Wade Hampton Drive/Lewis St North)	L	50.5 (F)	34.8 (D)	15.9 (C)	99.3 (F)	20.6 (C)	40.4 (E)	314.2 (F)	83.4 (F)	483.6 (F)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	12.6 (B)	10.5 (B)	13.2 (B)
	Overall	50.5 (F)	34.8 (D)	15.9 (C)	99.3 (F)	20.6 (C)	40.4 (E)	168.8 (F)	31.9 (D)	172.4 (F)

Table E1: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Southbound (Wade Hampton Drive/Lewis St North)	L	13.2 (B)	42.9 (E)	21.1 (C)	17.2 (C)	22.9 (C)	44.2 (E)	17.8 (C)	29.1 (D)	49.5 (E)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	13.2 (B)	42.9 (E)	21.1 (C)	17.2 (C)	22.9 (C)	44.2 (E)	17.8 (C)	29.1 (D)	49.5 (E)
Eastbound (Maple Avenue West)	L	9.4 (A)	15.0 (C)	10.8 (B)	8.2 (A)	11.1 (B)	8.9 (A)	8.2 (A)	11.1 (B)	8.9 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	0.6 (A)	1.3 (A)	0.5 (A)	0.5 (A)	0.9 (A)	0.4 (A)	0.5 (A)	0.9 (A)	0.4 (A)
Westbound (Maple Avenue West)	L	9.5 (A)	8.5 (A)	9.6 (A)	9.7 (A)	8.5 (A)	10.1 (B)	9.7 (A)	8.5 (A)	10.2 (B)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	0.1 (A)	0.0 (A)	0.2 (B)	0.1 (A)	0.0 (A)	0.2 (B)	0.1 (A)	0.1 (A)	0.3 (B)
Overall Intersection		-	-	-	-	-	-	-	-	-
4. Pleasant Street Northwest and Maple Avenue (unsignalized)										
Northbound (Pleasant Street Northwest)	L	588.1 (F)	39.7 (E)	75.0 (F)	26.9 (D)	22.6 (C)	328.6 (F)	18.6 (C)	24.8 (C)	372.8 (F)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	588.1 (F)	39.7 (E)	75.0 (F)	26.9 (D)	22.6 (C)	328.6 (F)	18.6 (C)	24.8 (C)	372.8 (F)
Southbound (Pleasant Street Northwest)	L	63.7 (F)	17.1 (C)	30.9 (D)	20.4 (C)	16.3 (C)	56.4 (F)	14.2 (C)	16.4 (C)	61.0 (F)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	63.7 (F)	17.1 (C)	30.9 (D)	20.4 (C)	16.3 (C)	56.4 (F)	14.2 (C)	16.4 (C)	61.0 (F)
Eastbound (Maple Avenue W)	L	8.9 (A)	10.1 (B)	8.8 (A)	8.7 (A)	10.6 (B)	9.1 (A)	8.3 (A)	10.6 (B)	9.1 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	1.0 (A)	0.3 (A)	0.3 (A)	0.9 (A)	0.3 (A)	0.3 (A)	0.3 (A)	0.3 (A)	0.3 (A)
Westbound (Maple Avenue W)	L	12.0 (B)	10.0 (A)	11.4 (B)	9.1 (A)	8.4 (A)	9.5 (A)	9.1 (A)	8.4 (A)	9.5 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	0.2 (A)	0.1 (A)	0.3 (A)	0.2 (A)	0.1 (A)	0.2 (A)	0.2 (A)	0.1 (A)	0.2 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-
5. Glen Avenue SW and Courthouse Road SW (unsignalized)										
Northbound (Glen Avenue SW)	L	17.7 (C)	12.7 (B)	14.9 (B)	17.7 (C)	12.8 (B)	15.2 (C)	17.8 (C)	12.9 (B)	15.4 (C)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	17.7 (C)	12.7 (B)	14.9 (B)	17.7 (C)	12.8 (B)	15.2 (C)	17.8 (C)	12.9 (B)	15.4 (C)

Table E1: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection	Existing (2018)				Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Southbound (Glen Avenue SW)	L	14.2 (B)	15.6 (C)	15.8 (C)	14.2 (B)	15.8 (C)	16.2 (C)	14.3 (B)	16.0 (C)	16.5 (C)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	14.2 (B)	15.6 (C)	15.8 (C)	14.2 (B)	15.8 (C)	16.2 (C)	14.3 (B)	16.0 (C)	16.5 (C)
Eastbound (Courthouse Road SW)	L	7.7 (A)	8.4 (A)	8.0 (A)	7.7 (A)	8.5 (A)	8.1 (A)	7.7 (A)	8.5 (A)	8.1 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	0.1 (A)	0.3 (A)	0.3 (A)	0.1 (A)	0.3 (A)	0.3 (A)	0.2 (A)	0.4 (A)	0.4 (A)
Westbound (Courthouse Road SW)	L	8.5 (A)	8.0 (A)	8.1 (A)	8.5 (A)	8.0 (A)	8.1 (A)	8.5 (A)	8.0 (A)	8.0 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court (unsignalized)										
Northbound (Wade Hampton Drive SW)	L	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	0.3 (A)	0.2 (A)	0.5 (A)	0.3 (A)	0.2 (A)	0.5 (A)	0.3 (A)	0.2 (A)	0.5 (A)
Southbound (Wade Hampton Drive SW)	L	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	2.8 (A)	2.8 (A)	4.5 (A)	2.8 (A)	2.8 (A)	4.5 (A)	2.8 (A)	2.8 (A)	4.5 (A)
Eastbound (Glen Avenue SW/Millwood Court SW)	L	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)
Westbound (Glen Avenue SW/Millwood Court SW)	L	8.5 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	8.5 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-
7. Wade Hampton Drive SW and Site DW (unsignalized)										
Northbound (Wade Hampton Drive SW)	L	-	-	-	-	-	-	-	-	-
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	-	-	-	-	-	-	0.0 (A)	0.0 (A)	0.0 (A)

Table E1: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Southbound (Wade Hampton Drive SW)	L	-	-	-	-	-	-	7.3 (A)	7.4 (A)	7.3 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	-	-	-	-	-	-	5.5 (A)	4.9 (A)	3.7 (A)
Westbound (Site Driveway)	L	-	-	-	-	-	-	-	-	-
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	8.6 (A)	8.8 (A)	8.6 (A)
	Overall	-	-	-	-	-	-	8.6 (A)	8.8 (A)	8.6 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-

Table E2: Summary of 2020 Total Future 95 TH Percentile Queues (Feet)											
Intersection			Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Movement	Storage	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
1. Nutley Street SW and Courthouse Road SW (signalized)											
Northbound (Nutley Street SW)	NBL	115	85	208	74	36	120	84	36	120	84
	NBTR	N/A	607	551	418	267	618	352	271	631	356
Southbound (Nutley Street SW)	SBL	45	38	20	38	13	13	26	13	13	26
	SBTR	N/A	330	287	252	188	385	273	193	386	275
Eastbound (Courthouse Road SW)	EBLT	225	386	224	205	347	218	199	347	218	199
	EBR	N/A	137	66	62	353	59	50	359	59	50
Westbound (Courthouse Road SW)	WBL	N/A	305	322	282	278	312	276	283	316	280
	WBTR	70	104	384	166	94	378	161	93	379	160
2. Nutley Street SW and Maple Avenue W (signalized)											
Northbound (Nutley Street SW)	NBL	220	314	353	162	384	448	142	384	448	142
	NBLT	n/a	280	382	209	237	451	158	237	451	158
	NBR	n/a	178	112	153	87	233	10	91	248	10
Southbound (Nutley Street SW)	SBL	200	111	116	104	152	152	146	153	159	151
	SBTR	n/a	444	333	215	502	384	234	502	384	234
Eastbound (Maple Avenue W)	EBL	90	25	31	39	32	39	54	32	39	54
	EBTR	N/A	632	355	590	722	424	783	726	433	793
Westbound (Maple Avenue W)	WBL	285	185	219	272	272	259	445	287	281	459
	WBTR	n/a	283	712	365	322	724	391	335	763	400
3. Wade Hampton Drive/Lewis Street N and Maple Avenue (unsignalized)											
Northbound (Wade Hampton Drive/Lewis St North)	NBLTR	N/A	20	23	8	35	13	23	-	-	-
	NBL	N/A	-	-	-	-	-	-	83	25	75
	NBR	67	-	-	-	-	-	-	5	5	8

Table E2: Summary of 2020 Total Future 95 TH Percentile Queues (Feet)												
Intersection			Existing (2018)			Background (2020)			Total Future (2020)			
Approach	Movement	Storage	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT	
Southbound (Wade Hampton Drive/Lewis St North)	SBLTR	N/A	13	30	13	18	15	28	20	20	30	
Eastbound (Maple Avenue W)	EBL	120	8	20	8	5	13	5	5	13	5	
	EBTR	N/A	0	0	0	0	0	0	0	0	0	
Westbound (Maple Avenue W)	WBL	95	0	0	3	0	0	3	3	3	3	
	WBTR	N/A	0	0	0	0	0	0	0	0	0	
4. Pleasant Street Northwest and Maple Avenue (unsignalized)												
Northbound (Pleasant Street Northwest)	NBLTR	N/A	143	30	55	20	15	118	13	18	123	
Southbound (Pleasant Street Northwest)	SBLTR	N/A	35	5	23	10	5	43	5	5	45	
Eastbound (Maple Avenue W)	EBL	55	13	3	3	10	3	3	3	3	3	
	EBTR	N/A	0	0	0	0	0	0	0	0	0	
Westbound (Maple Avenue W)	WBL	70	3	3	3	3	3	3	3	3	3	
	WBTR	N/A	0	0	0	0	0	0	0	0	0	
5. Glen Avenue SW and Courthouse Road SW (unsignalized)												
Northbound (Glen Avenue SW)	NBLTR	N/A	3	5	8	3	3	3	3	8	3	
Southbound (Glen Avenue SW)	SBLTR	N/A	5	3	8	5	3	5	5	8	5	
Eastbound (Courthouse Road SW)	EBLTR	N/A	0	0	0	0	0	0	3	0	0	
Westbound (Courthouse Road SW)	WBLTR	N/A	0	0	0	0	0	0	0	0	0	
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court (unsignalized)												
Northbound (Wade Hampton Drive SW)	NBLTR	N/A	0	0	0	0	0	0	0	0	0	
Southbound (Wade Hampton Drive SW)	SBLTR	N/A	0	0	0	0	0	0	0	0	0	
Eastbound (Glen Avenue SW/Millwood Court SW)	EBLTR	N/A	0	0	0	0	0	0	0	0	0	
Westbound (Glen Avenue SW/Millwood Court SW)	WBLTR	N/A	0	3	3	0	3	3	0	3	3	
7. Wade Hampton Drive and Site Driveway (unsignalized)												
Northbound (Wade Hampton Drive)	NBTR	N/A	-	-	-	-	-	-	0	3	3	
Southbound (Wade Hampton Drive)	SBLT	N/A	-	-	-	-	-	-	3	3	3	
Westbound (Site Driveway)	WBLR	N/A	-	-	-	-	-	-	3	5	3	

INTRODUCTION

This report presents the results of a traffic impact study to support a rezoning application for a proposed mixed-use development at 380 Maple Avenue West in the Town of Vienna, Virginia. The proposed development will be located on a 36,842-square foot site currently occupied by a 23,620-square foot office building.

The applicant proposes to rezone the site to the Maple Avenue Commercial (MAC) district and to redevelop with up to 8,500 square feet of retail and up to 42 multi-family residential units. Access to the site is planned to be provided by three access points, all along Wade Hampton Drive Southwest. Out of the three access points, the closest to Maple Avenue (VA 123) will allow for service vehicle loading/unloading access, while the other two access points will serve the retail and residential components on the site. The general site plan detail for the proposed development is included in **Appendix A**.

This study was prepared in accordance with scoping agreement with the Town of Vienna. A copy of this agreement is included in **Appendix B**. This study describes the area transportation system, existing traffic volumes and analysis, the calculation of background traffic volumes and analysis, traffic generated by the proposed development, calculation of total future volumes and analysis, and vehicle queuing patterns. It was determined that intersection capacity and queueing analyses be performed during the weekday AM and PM peak hours and Saturday midday peak hour at six study intersections. The build-out year for this project is 2020.

It is noted that since project scoping, the development program has matured, in large part due to collaboration and coordination with the community and Town staff. As such, the current residential unit count and retail square footage are slightly lower compared to the values described in the scoping document. The values in the scoping document were used as the basis for this study and result in a more conservative analysis of traffic impacts (i.e. this study considers slightly more trips and a slightly larger traffic impact than would likely be generated under the updated site plan).

SITE LOCATION AND STUDY AREA

The mixed-use development of 380 Maple Avenue West is located in the Town of Vienna, Virginia in the southeast quadrant of the intersection of Maple Avenue West and Wade Hampton Drive Southwest. The property is currently occupied by 23,620-square foot office building. The site is identified on Fairfax County Tax Maps as GPIN 0383-02-0147. The site is currently zoned Local Commercial (C-1). Access to the site is currently provided by three full movement driveways along Wade Hampton Drive Southwest and one full movement driveway along Maple Avenue. The proposed development will remove the access along Maple Avenue West and consolidate/relocate the accesses along Wade Hampton Drive Southwest.

EXISTING AREA ROADWAYS

The proposed site is located along Maple Avenue West. This is a principal arterial roadway that runs northeast-southwest through the study area. The speed limit is 30 mph and it carries approximately 30,000 vehicles per day between Nutley Street SW and Follin Lane, based on 2017 Virginia Department of Transportation Annual Average Daily Traffic (AADT) reports. The study area boundary streets are Pleasant Street Southwest, Nutley Street, Glen Avenue Southwest, and Maple Avenue West.

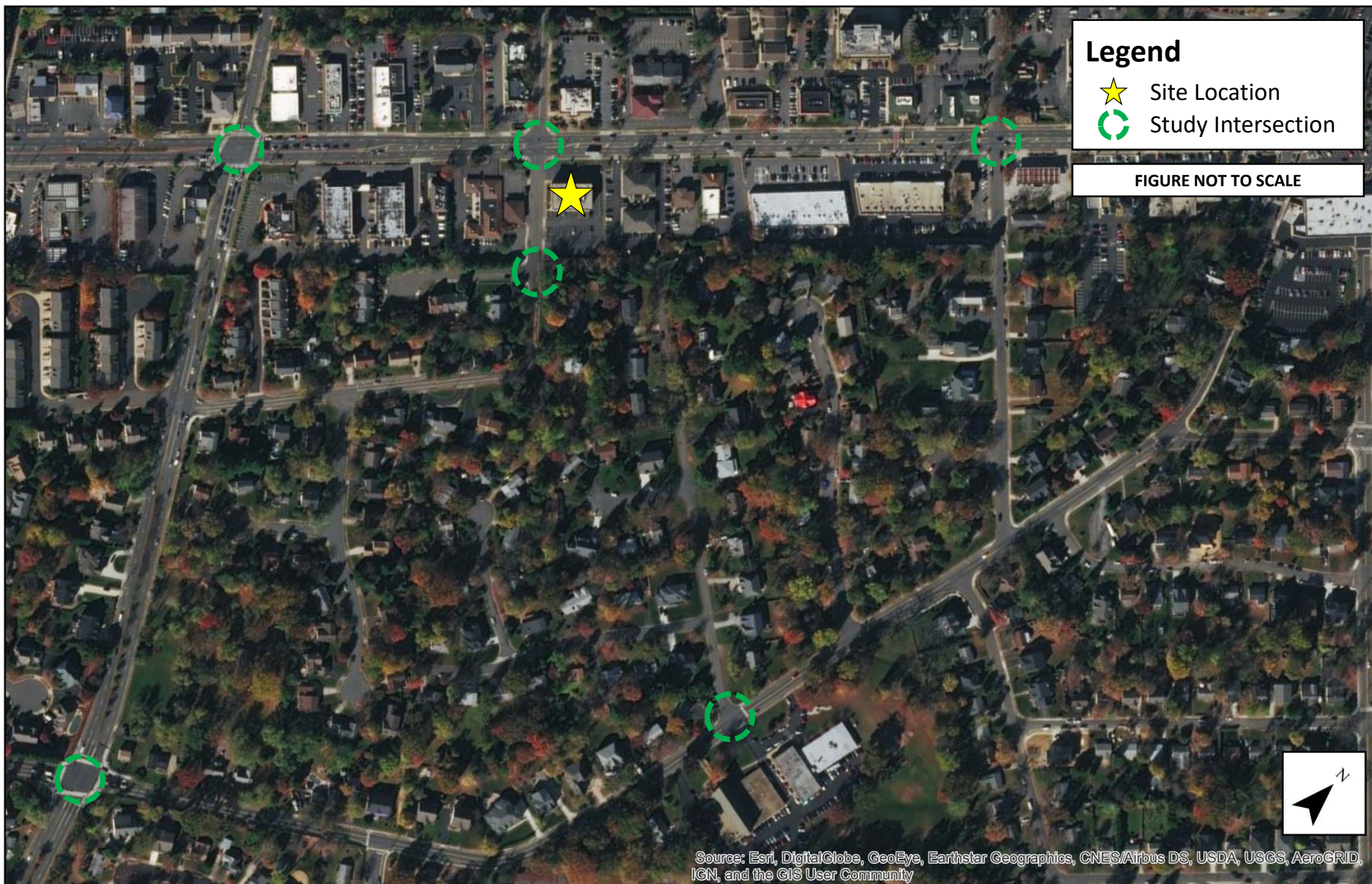
The following existing intersections were identified for study:

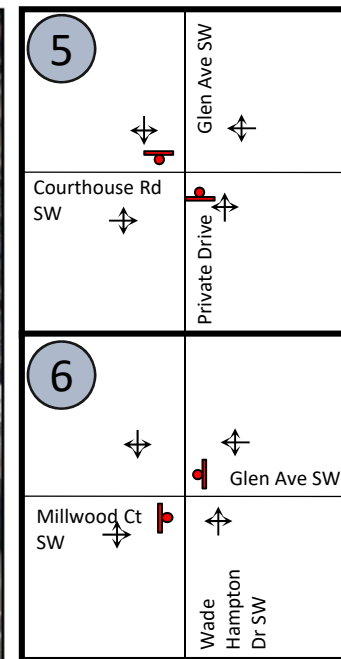
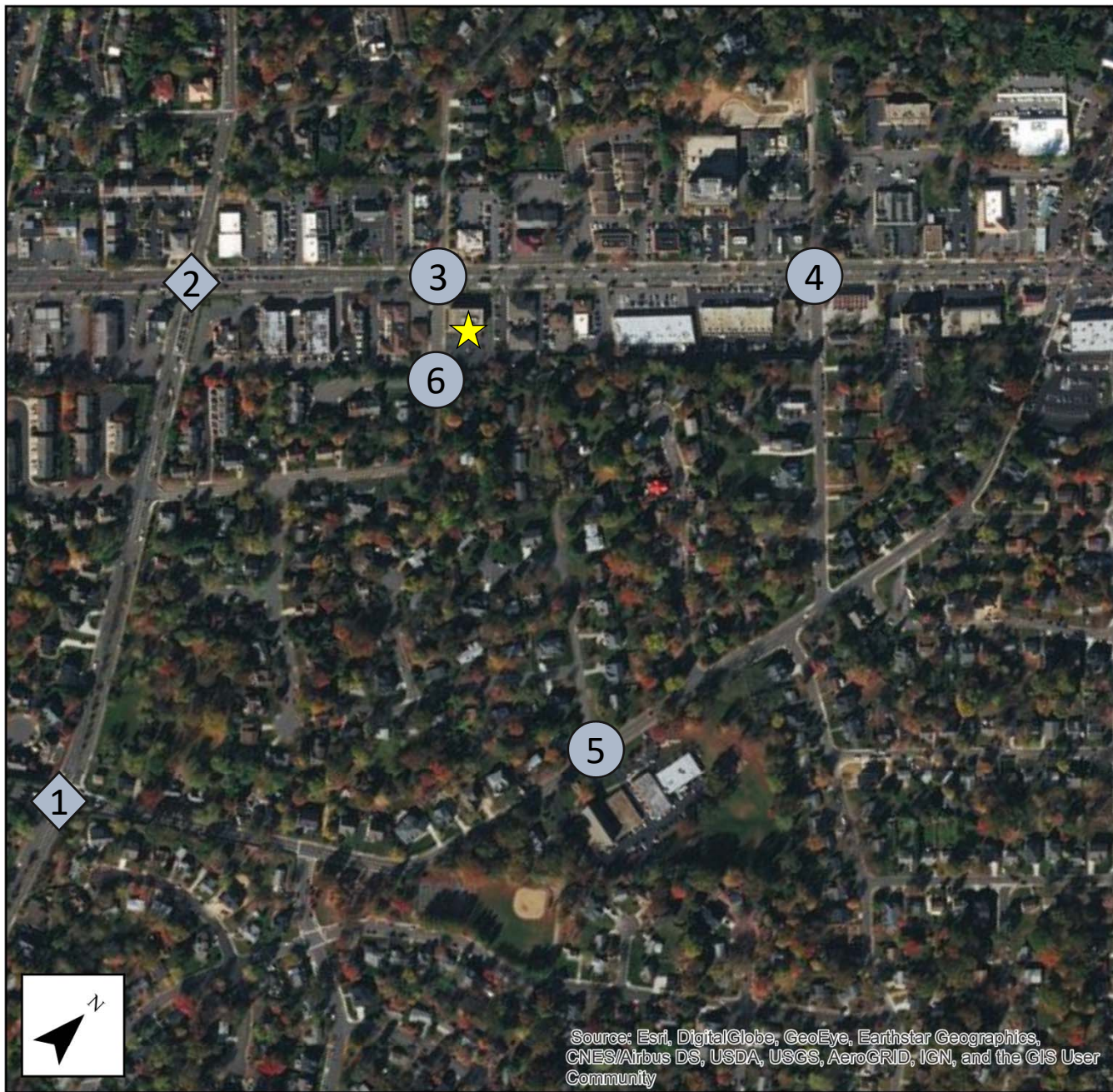
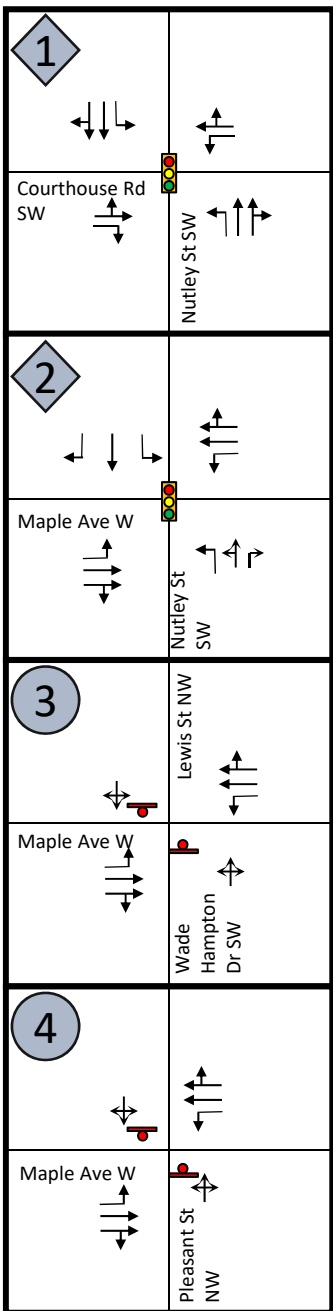
- Nutley Street Southwest and Courthouse Road Southwest (signalized)
- Maple Avenue West and Nutley Street Southwest (signalized)
- Maple Avenue West and Wade Hampton Drive Southwest (unsignalized)
- Maple Avenue West and Pleasant Street Southwest (unsignalized)
- Wade Hampton Drive Southwest and Glen Avenue/Millwood Court Southwest (unsignalized)
- Glen Avenue Southwest and Courthouse Road (unsignalized)

For the purposes of this report, Maple Avenue West and all streets parallel to Maple Avenue West will be referred to as running east-west (instead of northeast-southwest), while Nutley Street Southwest and all roads parallel to Nutley Street Southwest will be referred to as running north-south (instead of northwest-southeast). Study area streets are described:

- Maple Avenue West (VA Route 123) is a five-lane Urban Principal Arterial with two lanes in each direction and a center two way left turn lane (TWTL) east of Nutley Street Southwest. Maple Avenue West (VA Route 123) is a four-lane divided Urban Principal Arterial with two lanes in each direction and a center two way left turn lane (TWTL) west of Nutley Street Southwest. The posted speed limit adjacent to the site is 30 miles per hour (mph). Maple Avenue in the vicinity of the site carries 30,000 vehicles per day (vpd). The intersection of Maple Avenue West and Nutley Street Southwest is signalized.
- Nutley Street Southwest (VA Route 243) is a four-lane, divided, Urban Minor Arterial with two lanes in each direction, and a center raised median with a posted speed limit of 30 mph south of Maple Avenue West. This section of Nutley Street carries 17,000 vpd. Nutley Street Northwest is a two-lane, undivided, Urban Collector with a speed limit of 30 mph to the north of the Maple Avenue West. This section of Nutlet Street carries 5,700 vpd. The intersections of Maple Avenue West with Nutley Street Southwest and Nutley Street Southwest with Courthouse Road SW are signalized.
- Courthouse Road Southwest (VA Route 6648) is a two-lane, undivided, Urban Minor Arterial with one lane in each direction with a posted speed limit of 25 mph. Courthouse Road carries 7,500 vpd south of Maple Avenue West.
- Wade Hampton Drive Southwest is a two-lane, undivided, local street with a posted speed limit of 25 mph. AADTs are not reported for this street.
- Pleasant Street Southwest is a two-lane, undivided, local street with a posted speed limit of 25 mph. AADTs are not reported for this street.
- Glen Avenue/Millwood Court Southwest are two-lane, undivided, local streets with posted speed limits of 25 mph. AADTs are not reported for these streets.

The site location, study area, and study intersections are shown in **Figure 1**. The existing lane designations and traffic control at the study intersections are shown in **Figure 2**.





Legend

- Site Location
- Signalized Intersection
- Unsignalized Intersection
- Stop Control
- Traffic Signal
- Lane Designation

TRANSIT FACILITIES

The proposed site is located approximately 1.15 miles from the Vienna/Fairfax- GMU Metrorail station. The station is the final stop of the Orange Line in Virginia. The station opens at 4:50 AM Monday – Friday, 6:50 AM Saturday, and 7:50 AM Sunday. The last trains depart for New Carrollton 10:48 PM Monday to Friday, 12:18 AM Saturday, and 10:18 PM Sunday.

The immediate area is served by Fairfax Connector bus routes 461 (Flint Hill-Vienna), 463 (Maple Avenue-Vienna), and 466 (Vienna-Oakton). Connector bus stops are currently located along the south sides Maple Avenue West and Nutley Street Southwest. **Figure 3** shows transit routes in the study area. A description of the transit routes serving the site and the surrounding area is provided below:

Fairfax Connector 461 (Flint Hill-Vienna). Fairfax Connector 461 provides weekday rush hour service circulating between Vienna Metro Station, Nutley Street, Flint Hill Road, James Madison High School, Park Street, and Tapawingo Road. Headways are typically 20 to 30 minutes. Additional route information is provided in **Appendix D**.

Fairfax Connector 463 (Maple Avenue - Vienna). Fairfax Connector 463 provides weekday, Saturday and Sunday service between Vienna Metro Station (north side) and Tysons Corner Metro Station (south side), circulating between Nutley Street, Maple Avenue, Chain Bridge Road, and Gosnell Road. Headways are typically 20 to 30 minutes. Additional route information is provided in **Appendix D**.

Fairfax Connector 466 (Vienna - Oakton). Fairfax Connector 466 provides weekday service circulating between Vienna Metro Station, Chain Bridge Road/James Madison Drive, Blake Lane, Nutley Street, and Oakton high School. Headways are typically 30 to 40 minutes. Additional route information is provided in **Appendix D**.

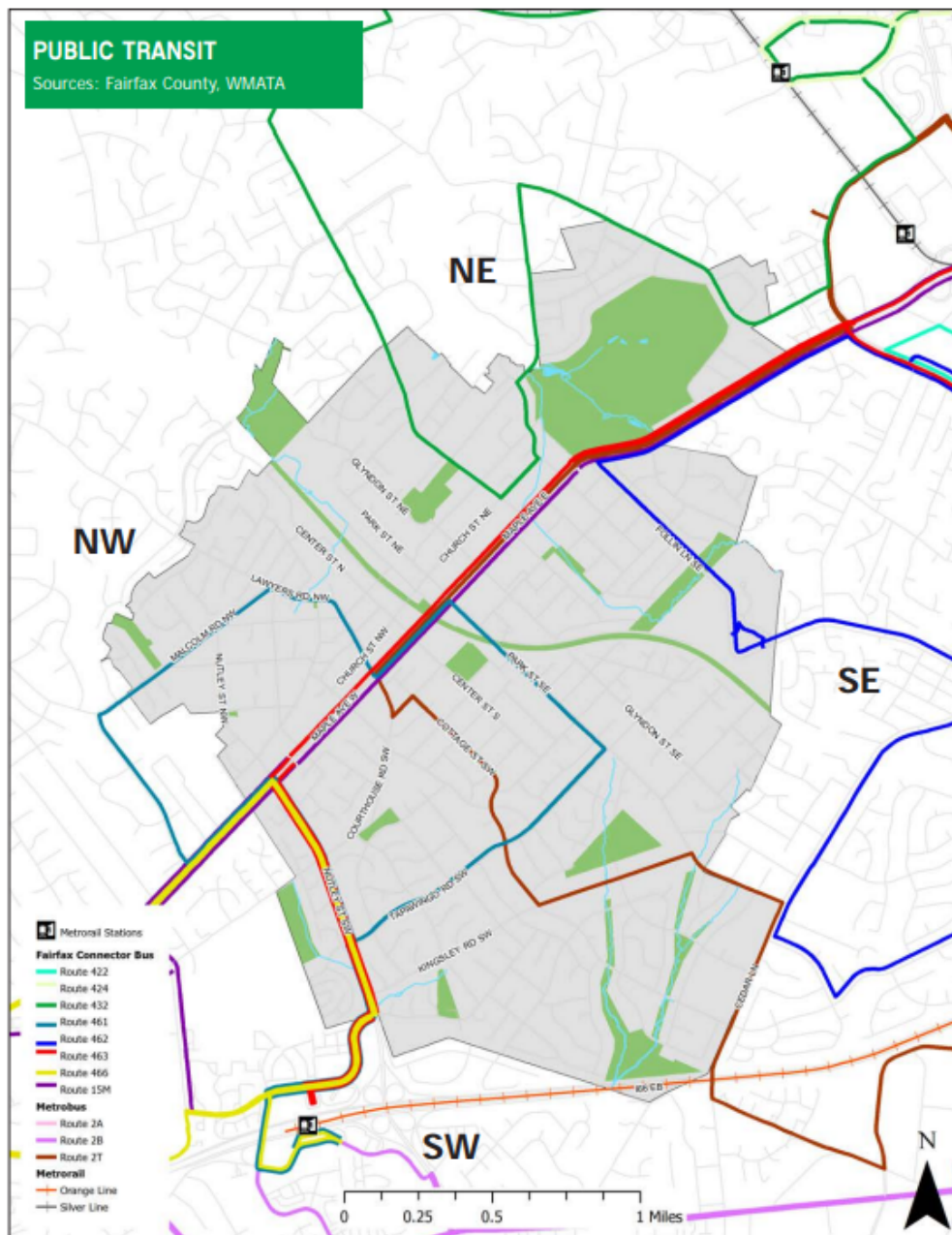
PEDESTRIAN AND BICYCLE FACILITIES

The study area generally has a well-defined pedestrian sidewalk network along both sides of most study area streets.

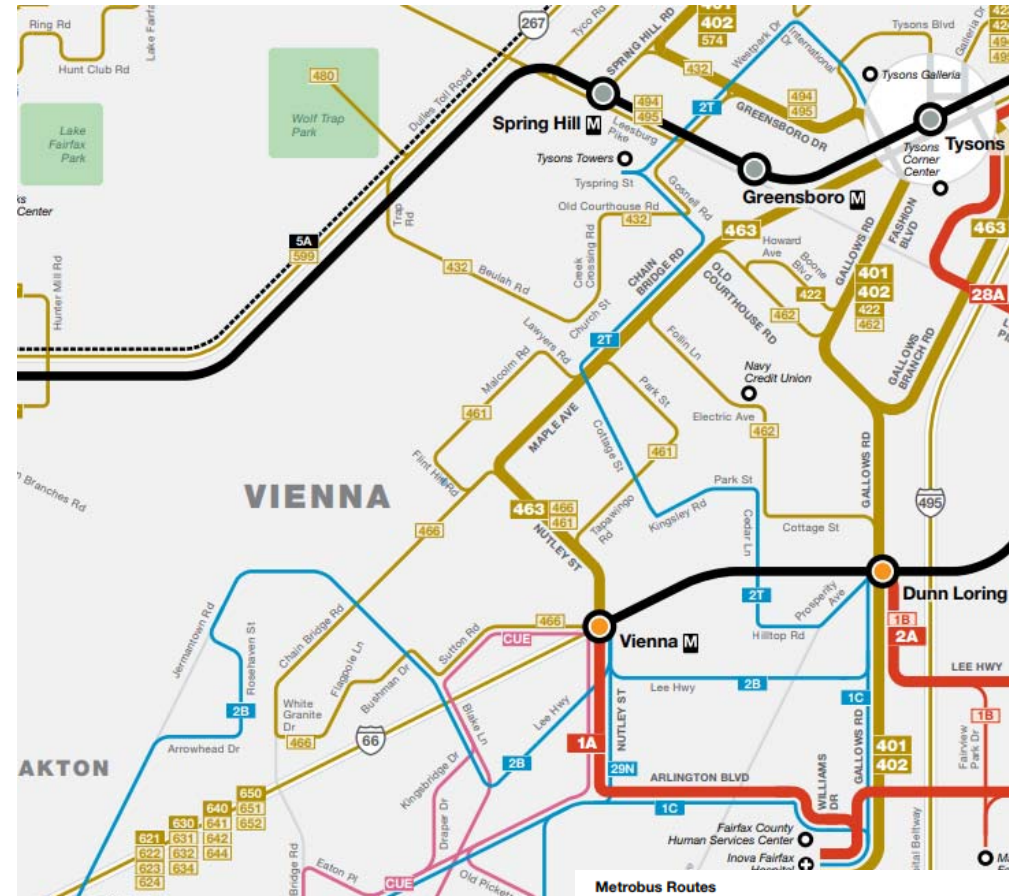
It is noted that there is a small gap in the sidewalk near the proposed site; there is no sidewalk infrastructure connecting the south sidewalk of Maple Avenue West to the east sidewalk of Wade Hampton Drive Southwest.

It is also noted that Glen Avenue SW lacks a sidewalk on either side of the street between Courthouse Road Southwest and Wade Hampton Drive Southwest. This is also true of the west side of Pleasant Street Southwest between Maple Avenue West and Courthouse Road Southwest

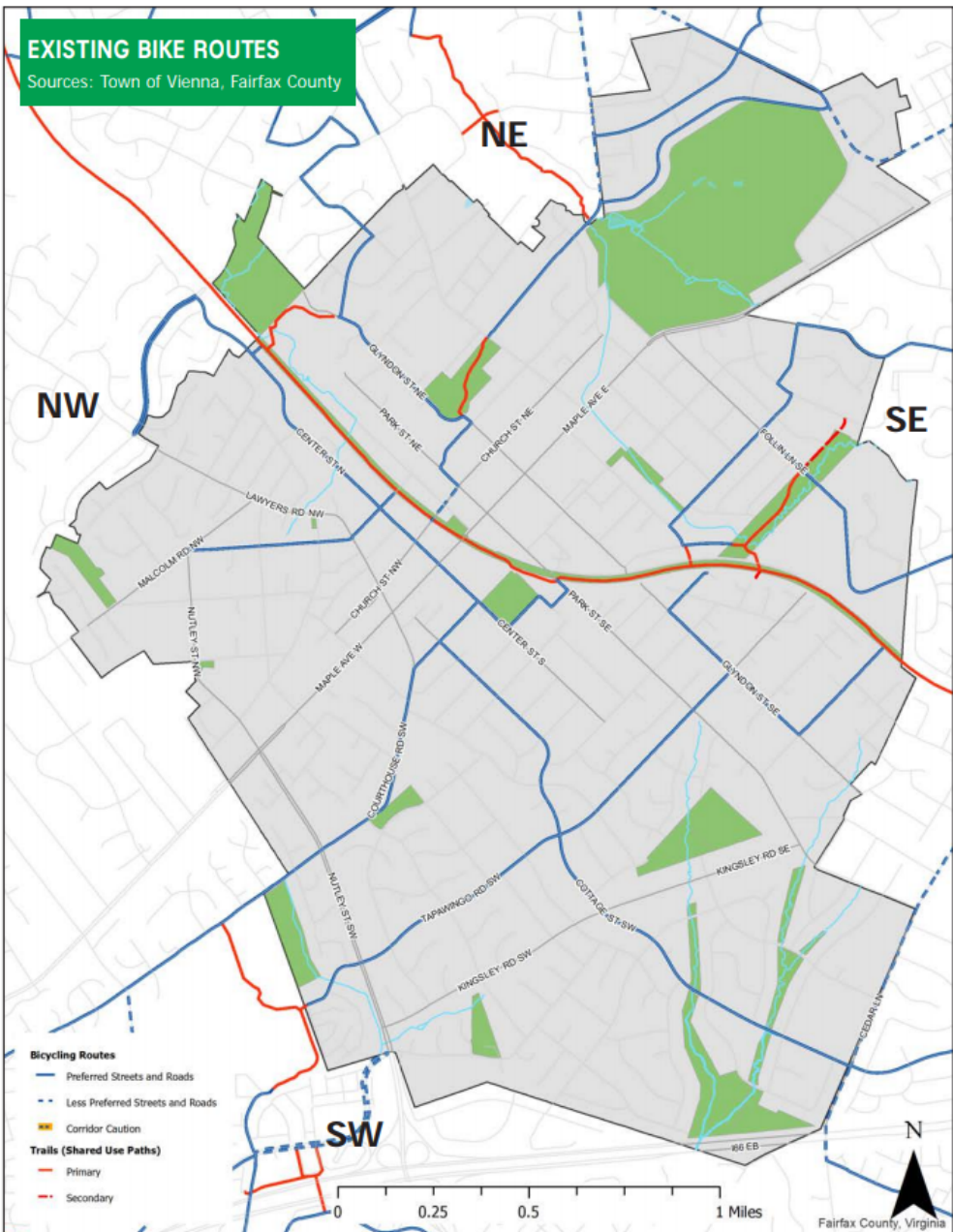
Pedestrian countdown signal heads and pushbuttons are provided on all legs of the signalized intersections. Courthouse Road, between Nutley Street and Locust Street is identified as a preferred bicycling route. The study area pedestrian and bicycle networks are shown **on Figure 4**.



Source: Town of Vienna Comprehensive Plan 2015 Update



Source: WMATA



Kimley»»Horn

380 Maple Avenue West, Town of Vienna, VA

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EXISTING CONDITIONS

Intersection capacity analyses was performed for existing, background, and total future traffic volumes for the study area intersections during the AM and PM peak hours and Saturday midday peak hour. The analyses were performed using the Synchro Software Package (Version 10.0), which utilizes methodologies contained in the *Highway Capacity Manual 2010 (HCM 2010)* for signalized and unsignalized intersections. According to the HCM, capacity is defined as the maximum number of vehicles that can pass over a particular road segment or through a particular intersection within a fixed time duration. The capacity is described by Level of Service (LOS) to indicate the operating characteristics of a road segment or intersection. LOS is defined as a qualitative measure that describes operational conditions and motorist perceptions within a traffic stream. The *Highway Capacity Manual* defines six levels of service, LOS A through LOS F, with A being the best and F being the worst. The level of service standard established as part of the scoping is LOS D.

The ranges of delay for each level of service are shown in **Table 1**.

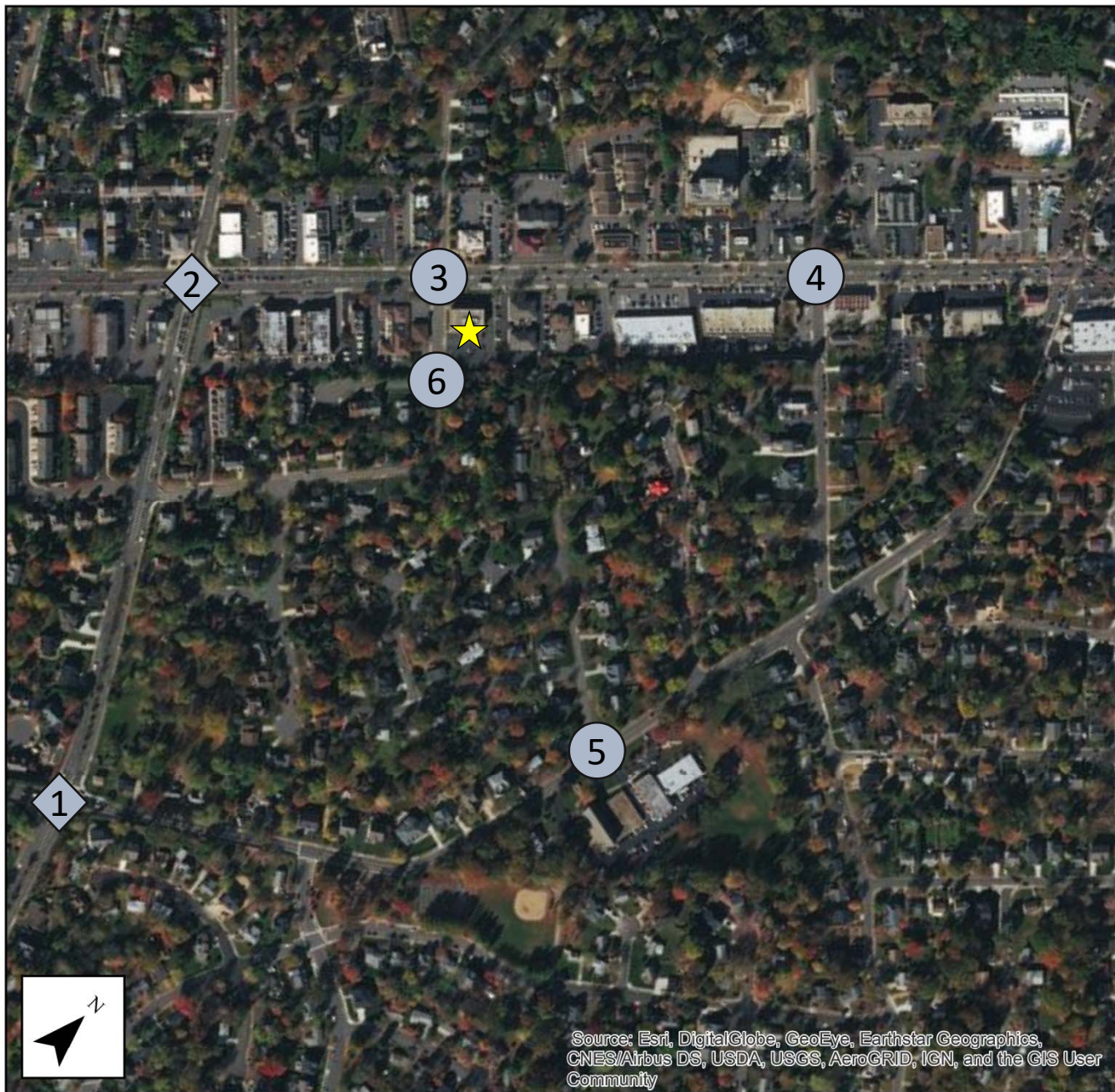
Table 1: Level of Service Range of Delay		
Level of Service (LOS)	Delay per Vehicle (seconds per vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

Traffic signal timings were provided by the Town of Vienna via Synchro files used as part of the 444 Maple Avenue Multi-modal Transportation Impact Study. These synchro files were used for the existing, background, and total future conditions analyses.

EXISTING TRAFFIC VOLUMES

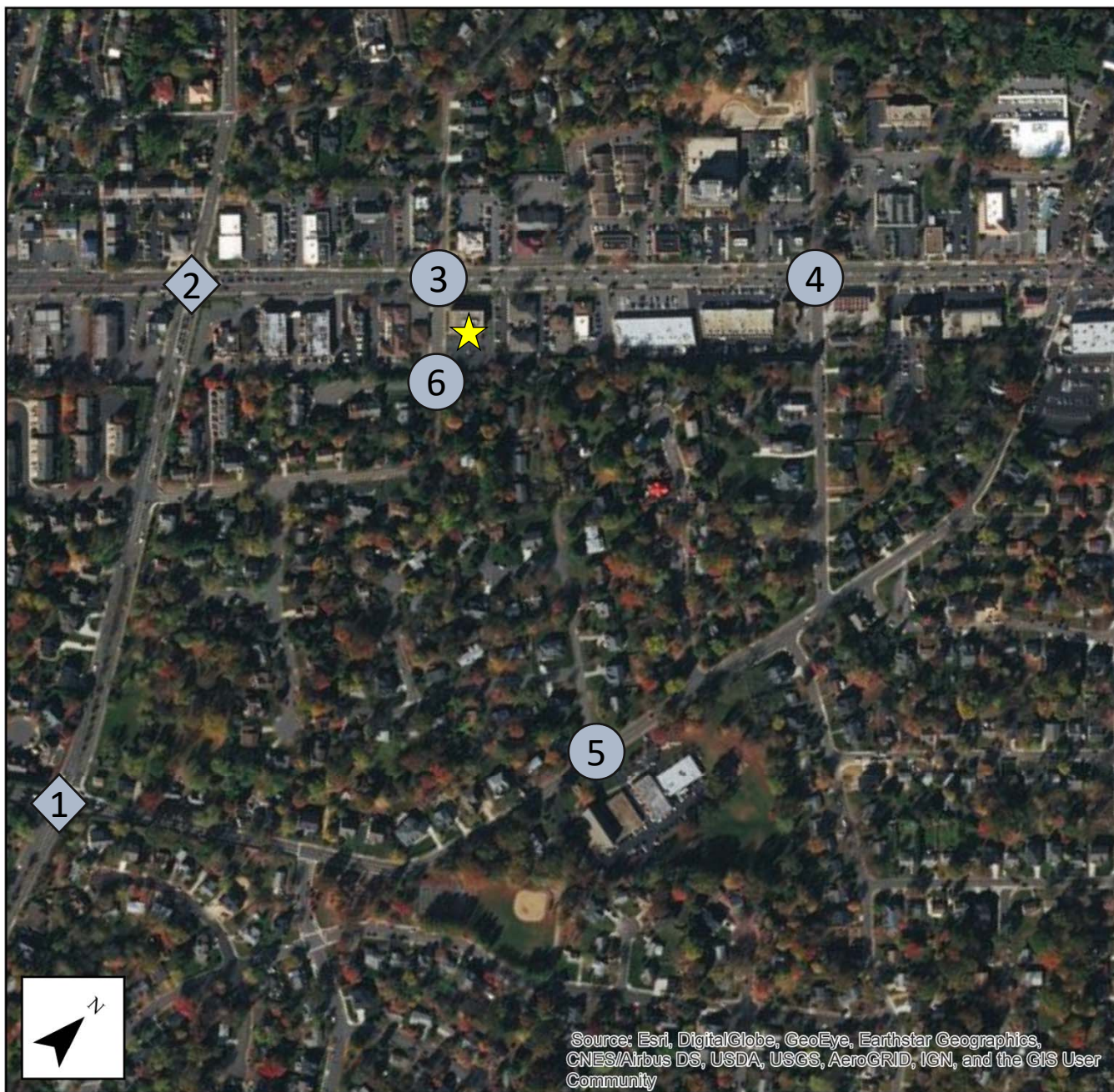
Traffic counts were collected on Saturday, August 25, 2018 from 11:00 AM to 2:00 PM and the week of September 10, 2018 from 6:00 AM to 9:00 AM and from 4:00 PM to 7:00 PM. The traffic count summary is included in **Appendix C**. Individual peak hour traffic volumes were calculated for each intersection. The existing 2018 AM and PM peak hours and Saturday midday peak hour traffic volumes are shown on **Figure 5 to Figure 7**.

1	15 512 24	46 34 193
Courthouse Rd SW	31 233 378	Nutley St SW 70 679 234
2	23 272 72	51 509 144
Maple Ave W	18 857 114	Nutley St SW 259 161 352
3	59 1 10	Lewis St NW 26 625 8
Maple Ave W	85 1264 12	Wade Hampton Dr SW 2 7 12
4	20 5 4	28 726 16
Maple Ave W	45 1075 31	Pleasant St NW 18 5 20



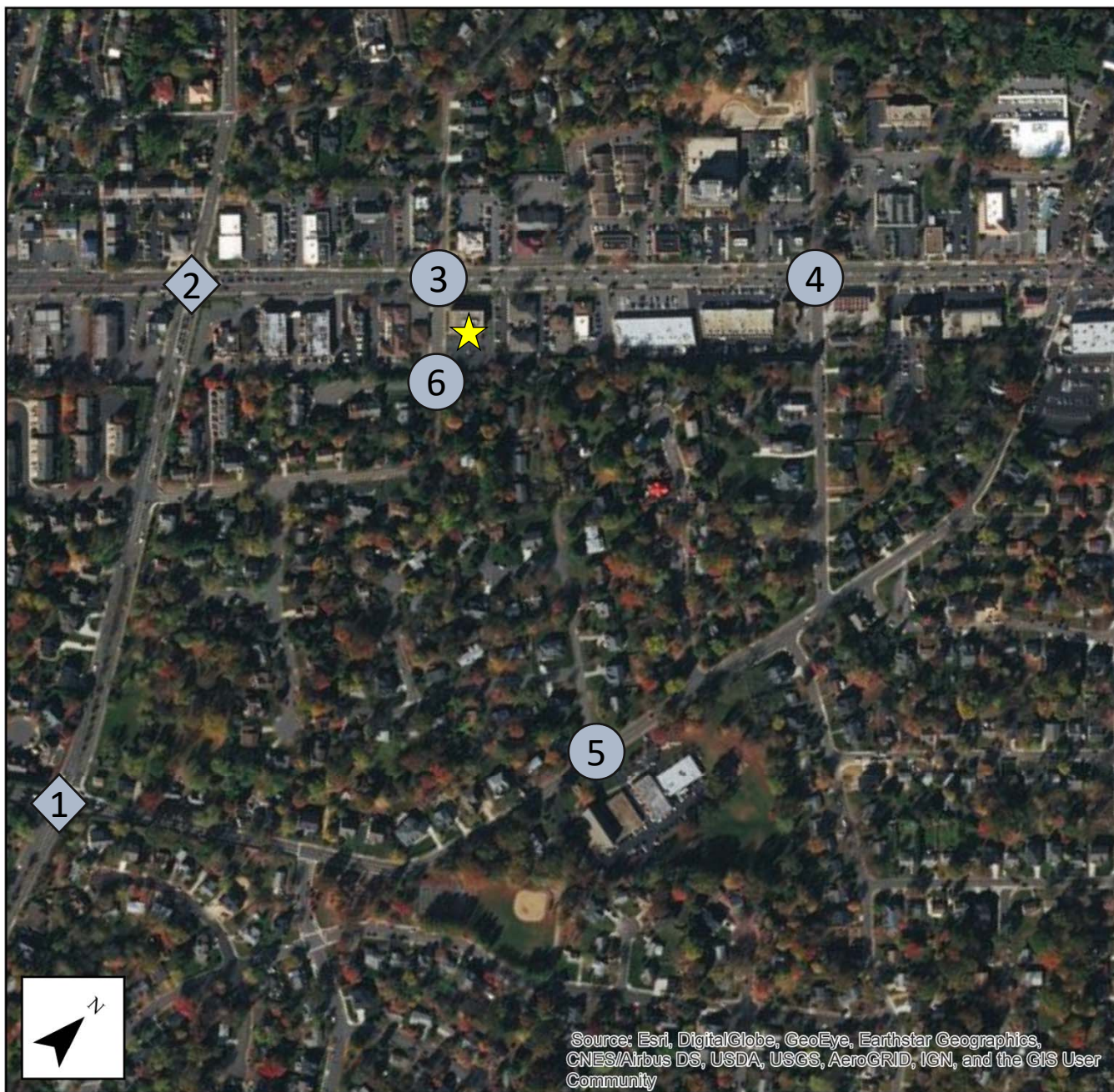
5	12 0 14	Glen Ave SW 10 202 1
Courthouse Rd SW	9 495 2	Private Drive 9 0 0
6	2 6 5	Glen Ave SW 11 0 0
Millwood Ct SW	0 1 1	Wade Hampton Dr SW 1 20 4

<div>1</div> <div> <div>55</div> <div>565</div> <div>13</div> </div>	<div> <div>33</div> <div>230</div> <div>212</div> </div>
<div>Courthouse Rd SW</div> <div> <div>34</div> <div>99</div> <div>130</div> </div>	<div>Nutley St SW</div> <div> <div>230</div> <div>790</div> <div>203</div> </div>
<div>2</div> <div> <div>18</div> <div>205</div> <div>67</div> </div>	<div> <div>52</div> <div>1167</div> <div>264</div> </div>
<div>Maple Ave W</div> <div> <div>28</div> <div>494</div> <div>155</div> </div>	<div>Nutley St SW</div> <div> <div>272</div> <div>199</div> <div>344</div> </div>
<div>3</div> <div> <div>32</div> <div>1</div> <div>5</div> </div>	<div>Lewis St NW</div> <div> <div>16</div> <div>1406</div> <div>8</div> </div>
<div>Maple Ave W</div> <div> <div>88</div> <div>897</div> <div>13</div> </div>	<div>Wade Hampton Dr SW</div> <div> <div>4</div> <div>1</div> <div>31</div> </div>
<div>4</div> <div> <div>19</div> <div>0</div> <div>3</div> </div>	<div> <div>37</div> <div>1391</div> <div>20</div> </div>
<div>Maple Ave W</div> <div> <div>29</div> <div>845</div> <div>46</div> </div>	<div>Pleasant St NW</div> <div> <div>11</div> <div>4</div> <div>28</div> </div>



<div>5</div> <div> <div>9</div> <div>0</div> <div>7</div> </div>	<div>Glen Ave SW</div> <div> <div>22</div> <div>474</div> <div>2</div> </div>
<div>Courthouse Rd SW</div> <div> <div>14</div> <div>350</div> <div>2</div> </div>	<div>Private Drive</div> <div> <div>4</div> <div>0</div> <div>13</div> </div>
<div>6</div> <div> <div>2</div> <div>14</div> <div>10</div> </div>	<div>Glen Ave SW</div> <div> <div>15</div> <div>1</div> <div>5</div> </div>
<div>Millwood Ct SW</div> <div> <div>1</div> <div>1</div> <div>0</div> </div>	<div>Wade Hampton Dr SW</div> <div> <div>1</div> <div>31</div> <div>0</div> </div>

1	35 472 34	29 97 208
Courthouse Rd SW	50 90 140	Nutley St SW 80 608 215
2	29 139 69	50 683 271
Maple Ave W	35 763 102	Nutley St SW 146 126 407
3	26 2 7	Lewis St NW 23 972 20
Maple Ave W	62 1155 13	Wade Hampton Dr SW 4 0 26
4	22 3 5	24 1007 26
Maple Ave W	42 1056 66	Pleasant St NW 15 3 25



5	8 1 21	Glen Ave SW 14 337 2
Courthouse Rd SW	13 350 2	Private Drive 22 0 17
6	2 12 23	Glen Ave SW 16 1 3
Millwood Ct SW	1 0 2	Wade Hampton Dr SW 1 11 2

2018 EXISTING CONDITIONS CAPACITY ANALYSIS

The existing conditions capacity analyses were based on the existing traffic volumes and existing lane uses and traffic controls at the study area intersections. The existing peak hour factors by intersection and existing heavy vehicle percentage by movements were calculated for this analysis. Peak hour factors are based on existing traffic counts with a range of 0.85 to 1.00. Heavy vehicle percentages are based on existing traffic counts with no upper or lower bounds. For the two-way stop controlled intersections on Maple Avenue West, the “include upstream intersection” Synchro setting was set to “yes” account for the effect of the adjacent signals along the corridor.

The results of the intersection capacity analyses are summarized in **Table 2**. Analysis results show overall level of service and corresponding delay information for each movement, approach, and overall intersection. The Synchro analysis reports are contained in **Appendix E**.

Under existing conditions, all signalized study intersections operate at or better than LOS D during the AM, PM, and Saturday midday peak hours.

It is noted that there are movements and approaches that operate at LOS E at signalized intersections during one or multiple peak hours. These movement and approaches are typically along the minor street approaches and operate at LOS E. They include:

- Eastbound and westbound approaches at Nutley Street Southwest and Courthouse Road Southwest during the AM peak hour
- Southbound approach at Nutley Street Southwest and Maple Avenue West during the AM and PM peak hours and Saturday midday peak hour
- Northbound at Nutley Street Southwest and Maple Avenue West during the PM peak hour

It is also noted that there are multiple minor street movements and approaches that operate at LOS E or F at unsignalized intersections, particularly those intersections along Maple Avenue West. Due the heavy east-west traffic flows along Maple Avenue West during the peak hours, additional delays are experienced for vehicles turning from the minor streets. It is noted that these delays are not uncommon or unexpected for unsignalized approaches to congested commuter-oriented corridors.

Table 2: Summary of 2018 Existing Intersection Capacity Analysis Results				
Delay, Seconds per Vehicle (Level of Service)				
Intersection		Existing (2018)		
Approach	Movement	AM	PM	SAT
1. Nutley Street SW and Courthouse Road SW (signalized)				
Northbound (Nutley Street SW)	L	26.1 (C)	17.7 (B)	14.3 (B)
	T	40.9 (D)	22.5 (C)	20.2 (C)
	R	41.9 (D)	23.1 (C)	21.0 (C)
	<i>Overall</i>	40.3 (D)	21.8 (C)	20.0 (C)
Southbound (Nutley Street SW)	L	30.7 (C)	20.5 (C)	16.1 (B)
	T	33.8 (C)	25.3 (C)	18.4 (B)
	R	33.9 (C)	25.6 (C)	18.5 (B)
	<i>Overall</i>	33.7 (C)	25.4 (C)	18.3 (B)
Eastbound (Courthouse Road SW)	L	43.1 (D)	53.5 (D)	47.4 (D)
	T	0.0	0.0	0.0

Table 2: Summary of 2018 Existing Intersection Capacity Analysis Results Delay, Seconds per Vehicle (Level of Service)				
Intersection		Existing (2018)		
Approach	Movement	AM	PM	SAT
Westbound (Courthouse Road SW)	R	65.2 (E)	55.8 (E)	49.7 (D)
	Overall	56.1 (E)	54.6 (D)	48.6 (D)
	L	63.1 (E)	49.7 (D)	48.3 (D)
	T	0.0	0.0	0.0
	R	56.5 (E)	52.5 (D)	43.9 (D)
Overall Intersection		45.3 (D)	31.4 (C)	27.8 (C)
2. Nutley Street SW and Maple Avenue W (signalized)				
Northbound (Nutley Street SW)	L	62.0 (E)	73.1 (E)	53.7 (D)
	T	54.9 (D)	75.2 (E)	56.6 (E)
	R	37.7 (D)	38.0 (D)	32.5 (C)
	Overall	49.1 (D)	58.9 (E)	41.7 (D)
Southbound (Nutley Street SW)	L	47.9 (D)	59.1 (E)	52.7 (D)
	T	73.4 (E)	74.1 (E)	57.9 (E)
	R	-	-	-
	Overall	68.4 (E)	70.6 (E)	56.4 (E)
Eastbound (Maple Avenue W)	L	23.7 (C)	27.5 (C)	22.0 (C)
	T	48.3 (D)	36.2 (D)	40.1 (D)
	R	-	-	-
	Overall	47.8 (D)	35.9 (D)	39.4 (D)
Westbound (Maple Avenue W)	L	39.2 (D)	23.0 (C)	26.7 (C)
	T	29.4 (C)	35.0 (C)	24.0 (C)
	R	-	-	-
	Overall	31.4 (C)	32.9 (C)	24.7 (C)
Overall Intersection		46.7 (D)	43.3 (D)	36.2 (D)
3. Wade Hampton Drive/Lewis Street N and Maple Avenue (unsignalized)				
Northbound (Wade Hampton Drive/Lewis St North)	L	50.5 (F)	34.8 (D)	15.9 (C)
	T	-	-	-
	R	-	-	-
	Overall	50.5 (F)	34.8 (D)	15.9 (C)
Southbound (Wade Hampton Drive/Lewis St North)	L	13.2 (B)	42.9 (E)	21.1 (C)
	T	-	-	-
	R	-	-	-
	Overall	13.2 (B)	42.9 (E)	21.1 (C)
Eastbound (Maple Avenue W)	L	9.4 (A)	15.0 (C)	10.8 (B)
	T	-	-	-
	R	-	-	-
	Overall	0.6 (A)	1.3 (A)	0.5 (A)

Table 2: Summary of 2018 Existing Intersection Capacity Analysis Results Delay, Seconds per Vehicle (Level of Service)				
Intersection		Existing (2018)		
Approach	Movement	AM	PM	SAT
Westbound (Maple Avenue W)	L	9.5 (A)	8.5 (A)	9.6 (A)
	T	-	-	-
	R	-	-	-
	Overall	0.1 (A)	0.0 (A)	0.2 (B)
Overall Intersection		-	-	-
4. Pleasant Street Northwest and Maple Avenue (unsignalized)				
Northbound (Pleasant Street Northwest)	L	588.1 (F)	39.7 (E)	75.0 (F)
	T	-	-	-
	R	-	-	-
	Overall	588.1 (F)	39.7 (E)	75.0 (F)
Southbound (Pleasant Street Northwest)	L	63.7 (F)	17.1 (C)	30.9 (D)
	T	-	-	-
	R	-	-	-
	Overall	63.7 (F)	17.1 (C)	30.9 (D)
Eastbound (Maple Avenue W)	L	8.9 (A)	10.1 (B)	8.8 (A)
	T	-	-	-
	R	-	-	-
	Overall	1.0 (A)	0.3 (A)	0.3 (A)
Westbound (Maple Avenue W)	L	12.0 (B)	10.0 (A)	11.4 (B)
	T	-	-	-
	R	-	-	-
	Overall	0.2 (A)	0.1 (A)	0.3 (A)
Overall Intersection		-	-	-
5. Glen Avenue SW and Courthouse Road SW (unsignalized)				
Northbound (Glen Avenue SW)	L	17.7 (C)	12.7 (B)	14.9 (B)
	T	-	-	-
	R	-	-	-
	Overall	17.7 (C)	12.7 (B)	14.9 (B)
Southbound (Glen Avenue SW)	L	14.2 (B)	15.6 (C)	15.8 (C)
	T	-	-	-
	R	-	-	-
	Overall	14.2 (B)	15.6 (C)	15.8 (C)
Eastbound (Courthouse Road SW)	L	7.7 (A)	8.4 (A)	8.0 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-
	Overall	0.1 (A)	0.3 (A)	0.3 (A)

Table 2: Summary of 2018 Existing Intersection Capacity Analysis Results Delay, Seconds per Vehicle (Level of Service)				
Intersection		Existing (2018)		
Approach	Movement	AM	PM	SAT
Westbound (Courthouse Road SW)	L	8.5 (A)	8.0 (A)	8.1 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-
	Overall	0.0 (A)	0.0 (A)	0.0 (A)
Overall Intersection		-	-	-
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court (unsignalized)				
Northbound (Wade Hampton Drive SW)	L	7.2 (A)	7.2 (A)	7.2 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-
	Overall	0.3 (A)	0.2 (A)	0.5 (A)
Southbound (Wade Hampton Drive SW)	L	7.3 (A)	7.3 (A)	7.3 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-
	Overall	2.8 (A)	2.8 (A)	4.5 (A)
Eastbound (Glen Avenue SW/Millwood Court SW)	L	8.8 (A)	9.3 (A)	8.6 (A)
	T	-	-	-
	R	-	-	-
	Overall	8.8 (A)	9.3 (A)	8.6 (A)
Westbound (Glen Avenue SW/Millwood Court SW)	L	8.5 (A)	8.8 (A)	8.6 (A)
	T	-	-	-
	R	-	-	-
	Overall	8.5 (A)	8.8 (A)	8.6 (A)
Overall Intersection		-	-	-

2018 EXISTING CONDITIONS QUEUING ANALYSIS

Synchro 95th percentile queue analyses were performed at study area intersections under existing conditions as shown in **Table 3**. A 95th percentile queue length is the queue length that only has a 5 percent likelihood of being exceeded during the peak hour. The values shown below are based on an assumed queuing of 25 feet per vehicle in the queue, which is standard for Synchro queueing analyses. The effective storage of turn lanes, equal to the full-width length plus half the taper length, is shown for comparison. The Synchro analysis reports are contained in **Appendix F**. Under existing conditions, queuing at turning movements at the signalized intersections exceeds the available storage length under one or multiple peak periods at certain locations. These includes:

- NBL at Nutley Street Southwest and Courthouse Road Southwest during the PM peak hour
- EBTL at Nutley Street and Courthouse Road Southwest during the AM peak hour
- WBTR at Nutley Street Southwest and Courthouse Road Southwest during the AM, PM, and Saturday midday peak hours

- NBL at Nutley Street Southwest and Maple Avenue West during the AM and PM peak hours

Queuing at unsignalized intersections is generally minimal.

The queuing for the through movements along Maple Avenue W underscores the fact that it is a significant east-west corridor that supports peak direction commuter travel patterns. During the peak hours, this eastbound and westbound queuing and congestion creates challenges for turning movements from minor street approaches.

Table 3: Summary of 2018 Existing Intersection 95 TH Percentile Queues (Feet)						
Intersection Approach		Movement	Storage	Existing (2018)		
		AM	PM	SAT		
1. Nutley Street SW and Courthouse Road SW (signalized)						
Northbound (Nutley Street SW)	NBL	115	85	208	74	
	NBTR	N/A	607	551	418	
Southbound (Nutley Street SW)	SBL	45	38	20	38	
	SBTR	N/A	330	287	252	
Eastbound (Courthouse Road SW)	EBLT	225	386	224	205	
	EBR	N/A	137	66	62	
Westbound (Courthouse Road SW)	WBL	N/A	305	322	282	
	WBTR	70	104	384	166	
2. Nutley Street SW and Maple Avenue W (signalized)						
Northbound (Nutley Street SW)	NBL	220	314	353	162	
	NBLT	n/a	280	382	209	
	NBR	n/a	178	112	153	
Southbound (Nutley Street SW)	SBL	200	111	116	104	
	SBTR	n/a	444	333	215	
Eastbound (Maple Avenue W)	EBL	90	25	31	39	
	EBTR	N/A	632	355	590	
Westbound (Maple Avenue W)	WBL	285	185	219	272	
	WBTR	n/a	283	712	365	
3. Wade Hampton Drive/Lewis Street N and Maple Avenue (unsignalized)						
Northbound (Wade Hampton Drive/Lewis St North)	NBLTR	N/A	38	33	20	
Southbound (Wade Hampton Drive/Lewis St North)	SBLTR	N/A	30	35	25	
Eastbound (Maple Avenue W)	EBL	120	8	20	8	
	EBTR	N/A	0	0	0	
Westbound (Maple Avenue W)	WBL	95	3	0	3	
	WBTR	N/A	0	0	0	
4. Pleasant Street Northwest and Maple Avenue (unsignalized)						
Northbound (Pleasant Street Northwest)	NBLTR	N/A	160	73	105	
Southbound (Pleasant Street Northwest)	SBLTR	N/A	43	13	35	
Eastbound (Maple Avenue W)	EBL	55	20	5	5	

Table 3: Summary of 2018 Existing Intersection 95 TH Percentile Queues (Feet)					
Intersection Approach	Movement	Storage	Existing (2018)		
			AM	PM	SAT
	EBTR	N/A	0	0	0
Westbound (Maple Avenue W)	WBL	70	3	3	3
	WBTR	N/A	0	0	0
5. Glen Avenue SW and Courthouse Road SW (unsignalized)					
Northbound (Glen Avenue SW)	NBLTR	N/A	3	5	8
Southbound (Glen Avenue SW)	SBLTR	N/A	5	3	8
Eastbound (Courthouse Road SW)	EBLTR	N/A	0	0	0
Westbound (Courthouse Road SW)	WBLTR	N/A	0	0	0
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court (unsignalized)					
Northbound (Wade Hampton Drive SW)	NBLTR	N/A	0	0	0
Southbound (Wade Hampton Drive SW)	SBLTR	N/A	0	0	0
Eastbound (Glen Avenue SW/Millwood Court SW)	EBLTR	N/A	0	0	0
Westbound (Glen Avenue SW/Millwood Court SW)	WBLTR	N/A	0	3	3

2020 FUTURE CONDITIONS WITHOUT DEVELOPMENT

BACKGROUND TRAFFIC VOLUMES

Background traffic volumes represent future traffic that would travel through the area intersections without the proposed development. *Table 4* and *Table 5* show the annual average daily traffic data along Maple Avenue West and along Nutley Street Southwest, respectively. The data in these tables generally shows declining traffic volumes. Therefore, a 1 percent annual growth rate represents a conservative estimate of growth based on the historical traffic data. This growth percentage was agreed to during project scoping.

Table 4: Annual Average Daily Traffic Maple Avenue (SCL Vienna to Follin Lane)		
Year	VDOT AADT	Growth to 2017
2017	31000	-
2016	30000	3%
2015	34000	-9%
2014	33000	-6%

Source: <http://www.virginiadot.org/info/ct-TrafficCounts.asp>

Table 5: Annual Average Daily Traffic Nutley Street (Courthouse Road to Maple Avenue)		
Year	VDOT AADT	Growth to 2017
2017	17000	-
2016	17000	0%
2015	17000	0%
2014	18000	-6%

Source: <http://www.virginiadot.org/info/ct-TrafficCounts.asp>

Based on the scoping document, the movements at the intersection of Nutley Street Southwest and Maple Avenue West were grown by 1 percent up to year 2020 traffic volumes. This growth was then distributed through the network as through volumes at up- and downstream intersections. This is consistent with the 444 Maple Avenue traffic study. The resulting 2020 traffic volumes resulting from regional growth are shown in **Figure 8 to Figure 10**.

In addition to regional growth, staff identified three nearby pipeline developments for consideration in this study:

- Flagship Carwash [Tax Map 38-3((2))115 and 38-3((2))152A], located at 540 Maple Avenue]. The development includes a car wash and 5,001 GSF fast-food restaurant
- Vienna Market/Maple Avenue Consolidation [Tax Map 38-4((4))2 & 4 and 38-4((2))15, 16 and 17], located at 245 Maple Avenue and 101, 107, 115 Pleasant Street. The development includes up to 8,200 GSF of retail use and up to 44 townhouse style units.
- 444 Maple Avenue [Tax Map 38-3 ((2)) 139, 140 & 141]. The development includes up to 160 multifamily dwelling units and up to 20,000 GSF of retail.

For the purposes of this study, and being consistent with the analyses performed as part of the 444 Maple Avenue traffic study, the trip generation for the Vienna Marketplace is based on the original proposed

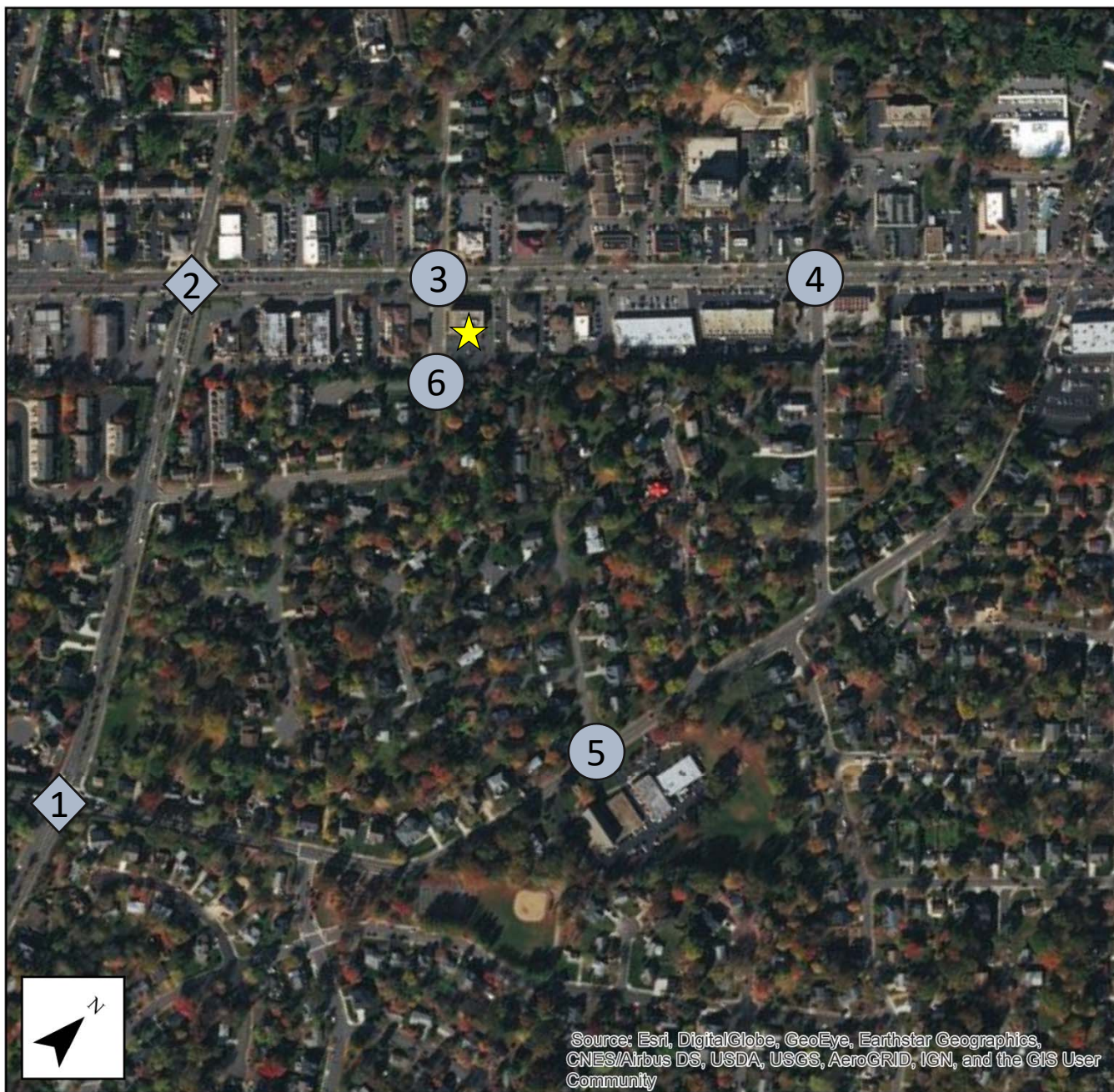
retail square footage. The approved retail square footage is slightly lower. This results in a conservative analysis of background trip generation (i.e. this study considers more trips and a slightly larger traffic impact than if the approved square footage were used.)

It is noted that the 444 Maple Avenue development has not yet been approved. Typically, traffic studies only consider the traffic generated by unbuilt developments that have been approved. Given the recent town-wide discussion and scrutiny regarding the MAC and, specifically, the 444 Maple Avenue application, it is prudent and appropriate to consider the traffic generated by the proposed use. Excluding this use would result in a gap in the understanding of the impacts of the potential redevelopment of the area and call into question the validity of the results of this study in comparison to other recently submitted studies.

The pipeline developments are shown on **Figure 11**. Peak hour traffic volumes associated with each pipeline development are based on the assignments reported in the 444 Maple Avenue Multi-modal Transportation Impact Analysis. The peak hour traffic volumes generated by the pipeline developments are shown on **Figure 12 to Figure 14**.

Figure 15 to Figure 17 show the 2020 background peak hour traffic volumes, which represent the existing traffic volumes increased by applying the annual traffic growth factor to the year 2020 and adding in the traffic associated with pipeline developments.

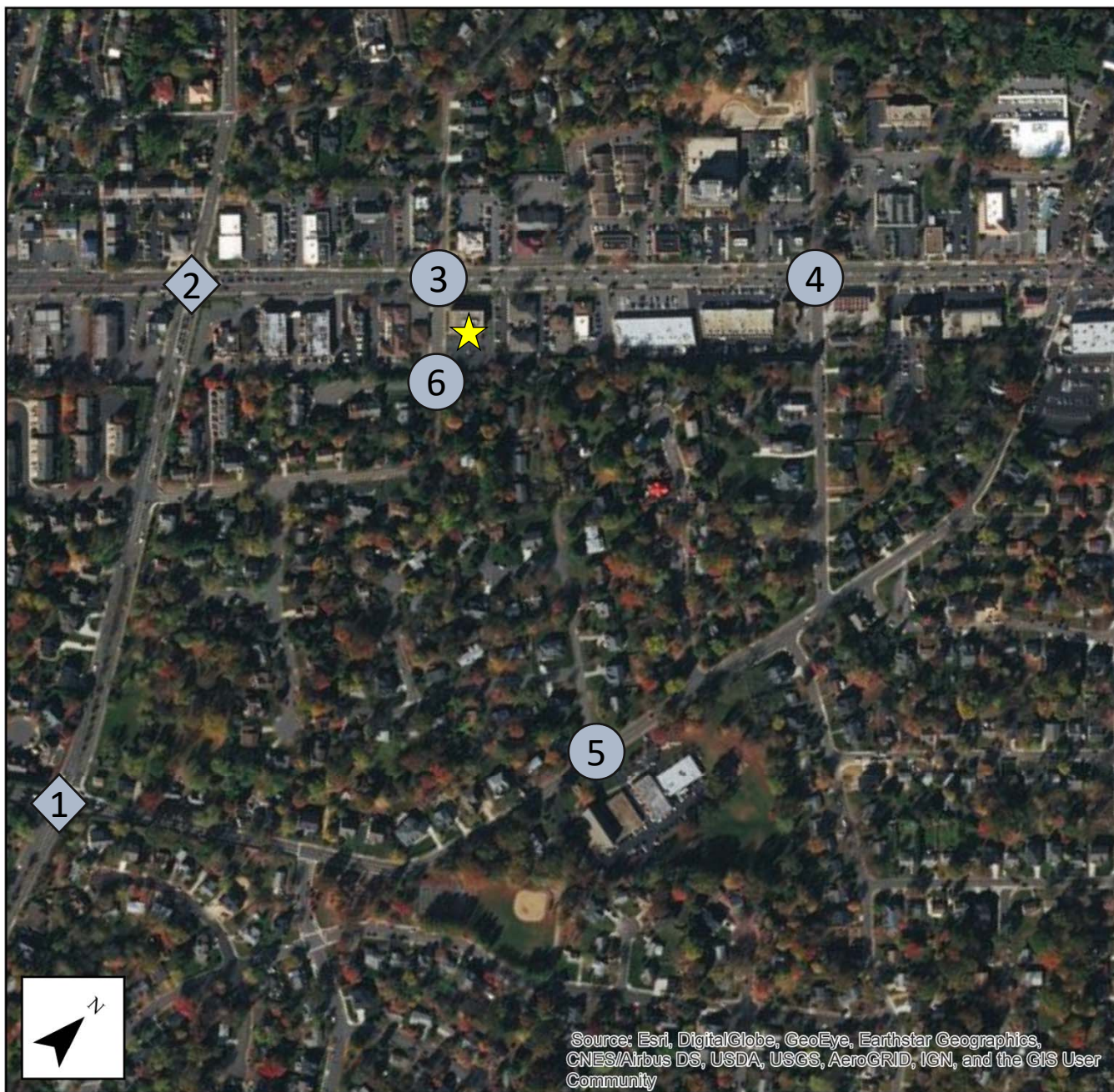
1	15 522 24 46 34 193
Courthouse Rd SW	31 233 378 Nutley St SW 70 694 234
2	23 277 73 52 519 147
Maple Ave W	18 874 116 Nutley St SW 264 164 359
3	59 1 10 Lewis St NW 26 639 8
Maple Ave W	85 1289 12 Wade Hampton Dr SW 2 7 12
4	20 5 4 28 740 16
Maple Ave W	45 1100 31 Pleasant St NW 18 5 20



5	12 0 14 Glen Ave SW 10 202 1
Courthouse Rd SW	9 495 2 Private Drive 9 0 0
6	2 6 5 Glen Ave SW 11 0 0
Millwood Ct SW	0 1 1 Wade Hampton Dr SW 1 20 4

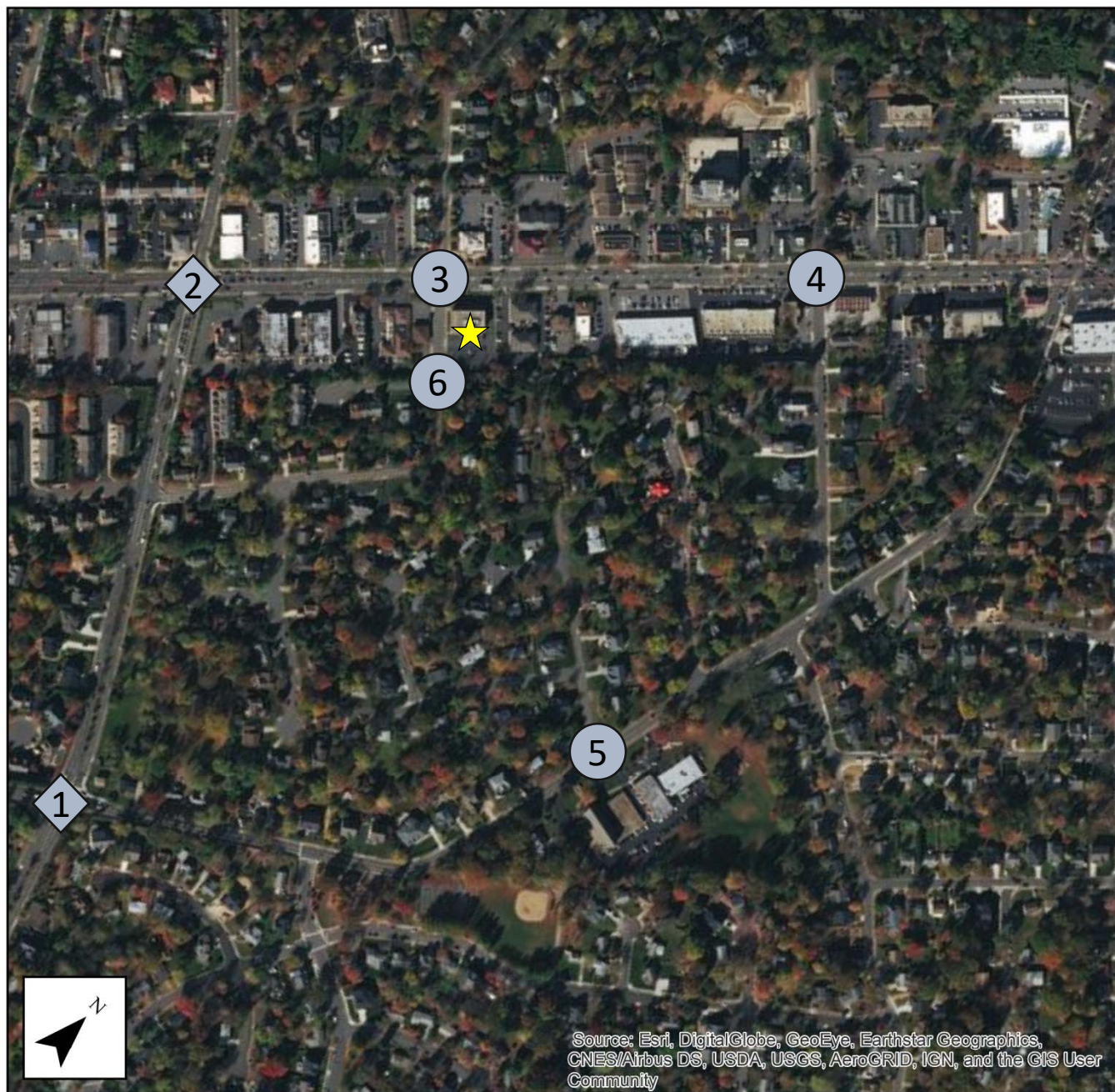
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1	55 577 13	33 230 212
Courthouse Rd SW	34 99 130	Nutley St SW 230 806 203
2	18 209 68	53 1190 269
Maple Ave W	29 504 158	Nutley St SW 277 203 351
3	32 1 5	Lewis St NW 16 1435 8
Maple Ave W	88 915 13	Wade Hampton Dr SW 4 1 31
4	19 0 3	37 1420 20
Maple Ave W	29 863 46	Pleasant St NW 11 4 28



5	9 0 7	Glen Ave SW 22 474 2
Courthouse Rd SW	14 350 2	Private Drive 4 0 13
6	2 14 10	Glen Ave SW 15 1 5
Millwood Ct SW	1 1 0	Wade Hampton Dr SW 1 31 0

1	35 482 34 29 97 208
Courthouse Rd SW	50 90 140 Nutley St SW 80 622 215
2	30 142 70 51 697 276
Maple Ave W	36 778 104 Nutley St SW 149 129 415
3	26 2 7 Lewis St NW 23 992 20
Maple Ave W	62 1179 13 Wade Hampton Dr SW 4 0 26
4	22 3 5 24 1027 26
Maple Ave W	42 1080 66 Pleasant St NW 15 3 25



5	8 1 21 Glen Ave SW 14 337 2
Courthouse Rd SW	13 350 2 Private Drive 22 0 17
6	16 1 3 Glen Ave SW 2 12 23
Millwood Ct SW	1 0 2 Wade Hampton Dr SW 1 11 2

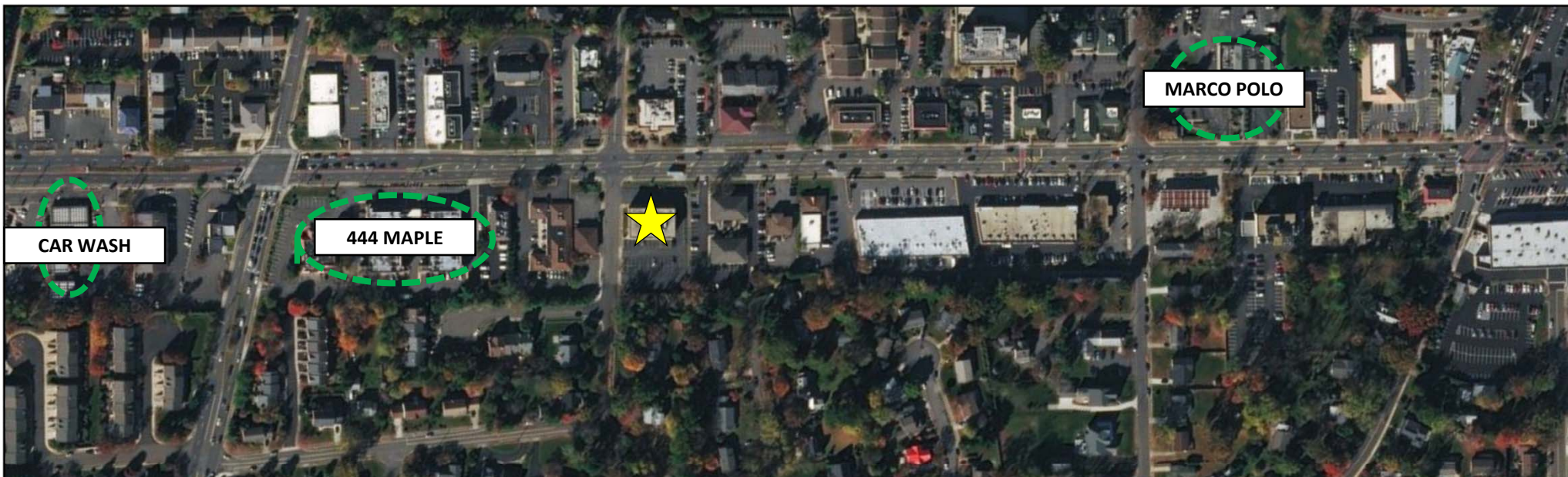


Table 4-1
444 Maple
Pipeline Trip Generation Analysis ¹

Land Use	Land Use Code	Size	Units	AM Peak Hour			PM Peak Hour			Weekday ADT	Saturday Peak Hour		
				In	Out	Total	In	Out	Total		In	Out	Total
Marco Polo Site													
ITE - Shopping Center	820	26,000	SF	43	26	69	117	126	243	2,829	189	175	364
Internal Capture (5% AM, 10% PM, 15% ADT)				(11)	0	(11)	(11)	(2)	(3)	(52)	(2)	(3)	(5)
				42	26	68	116	124	240	2,777	187	172	359
Pass-by Reduction (25%)				(11)	(7)	(17)	(29)	(31)	(60)	(694)	(47)	(43)	(90)
Retail Subtotal				31	19	51	87	93	180	2,083	140	129	269
Townhouses													
ITE - Shopping Center	230	49	DU	5	24	29	22	11	33	346	28	23	51
Internal Capture (5% AM, 10% PM, 15% ADT)				0	(1)	(1)	(2)	(1)	(3)	(52)	(3)	(2)	(5)
Residential Subtotal				5	23	28	20	10	30	294	25	21	46
Total Trips				36	42	79	107	103	210	2,377	165	150	315
Flagship Car Wash & Restaurant													
Car Wash				1	0	1	31	32	63	630	84	90	174
Fast-food Restaurant with Drive-thru	934	5,001	SF	116	112	228	85	79	164	2,482	151	145	296
Pass-By Trip Reduction				(59)	(57)	(116)	(40)	(37)	(77)		(71)	(68)	(139)
Diverted Link Trip Reduction				(32)	(31)	(63)	(20)	(18)	(38)		(35)	(33)	(68)
Restaurant New Primary				24	24	48	26	24	48		45	44	48
Total Trips				117	112	229	116	111	227	3,112	235	235	470

Note(s):

1. Trip generation for Marco Polo Site consistent with TIA performed by Wells + Associates and dated March 17, 2016
2. Trip generation for Flagship Car Wash & Restaurant consistent with TIA performed by Wells + Associates and dated April 6, 2016

Legend



Site Location

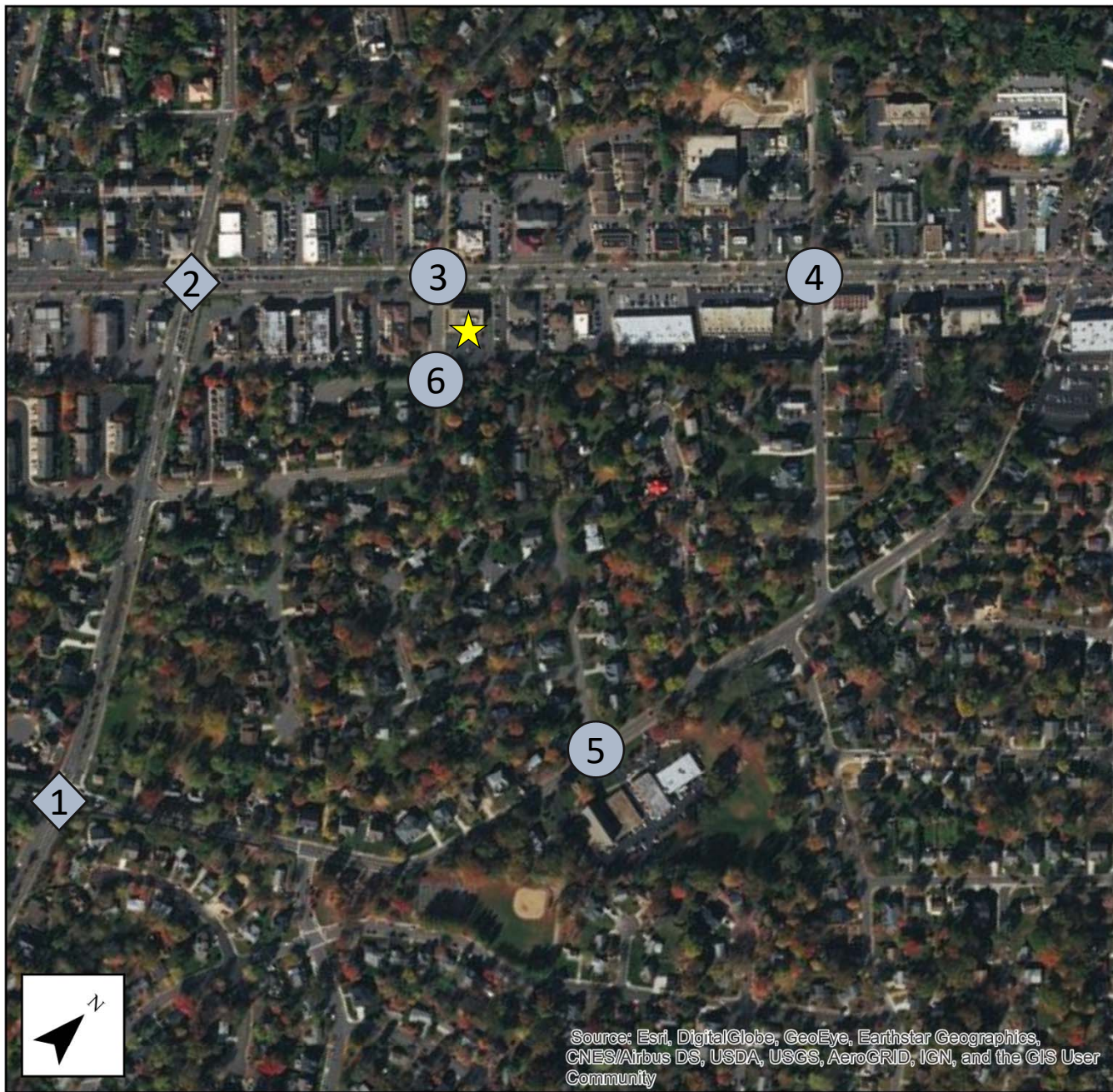
Pipeline Development

FIGURE NOT TO SCALE



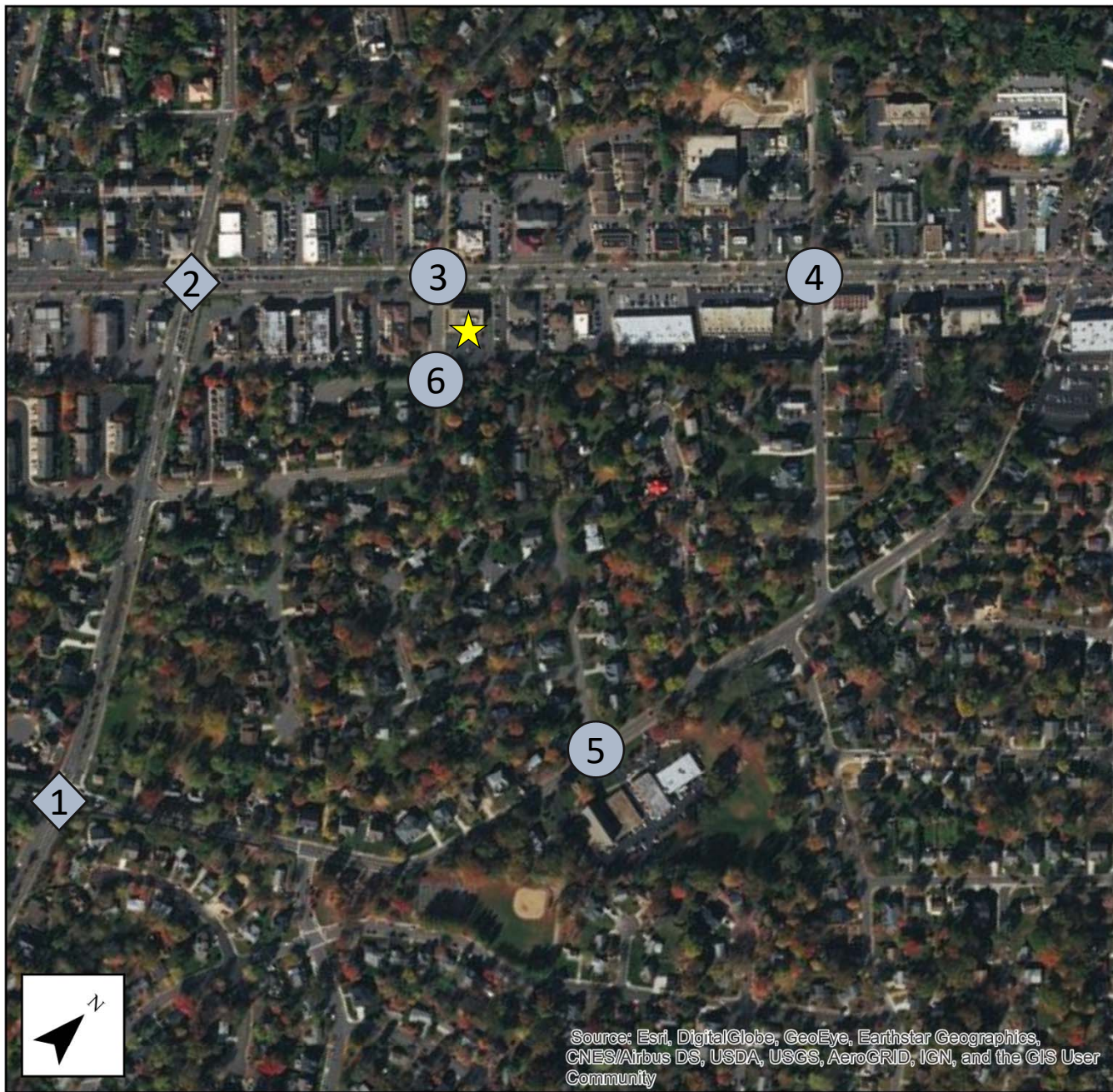
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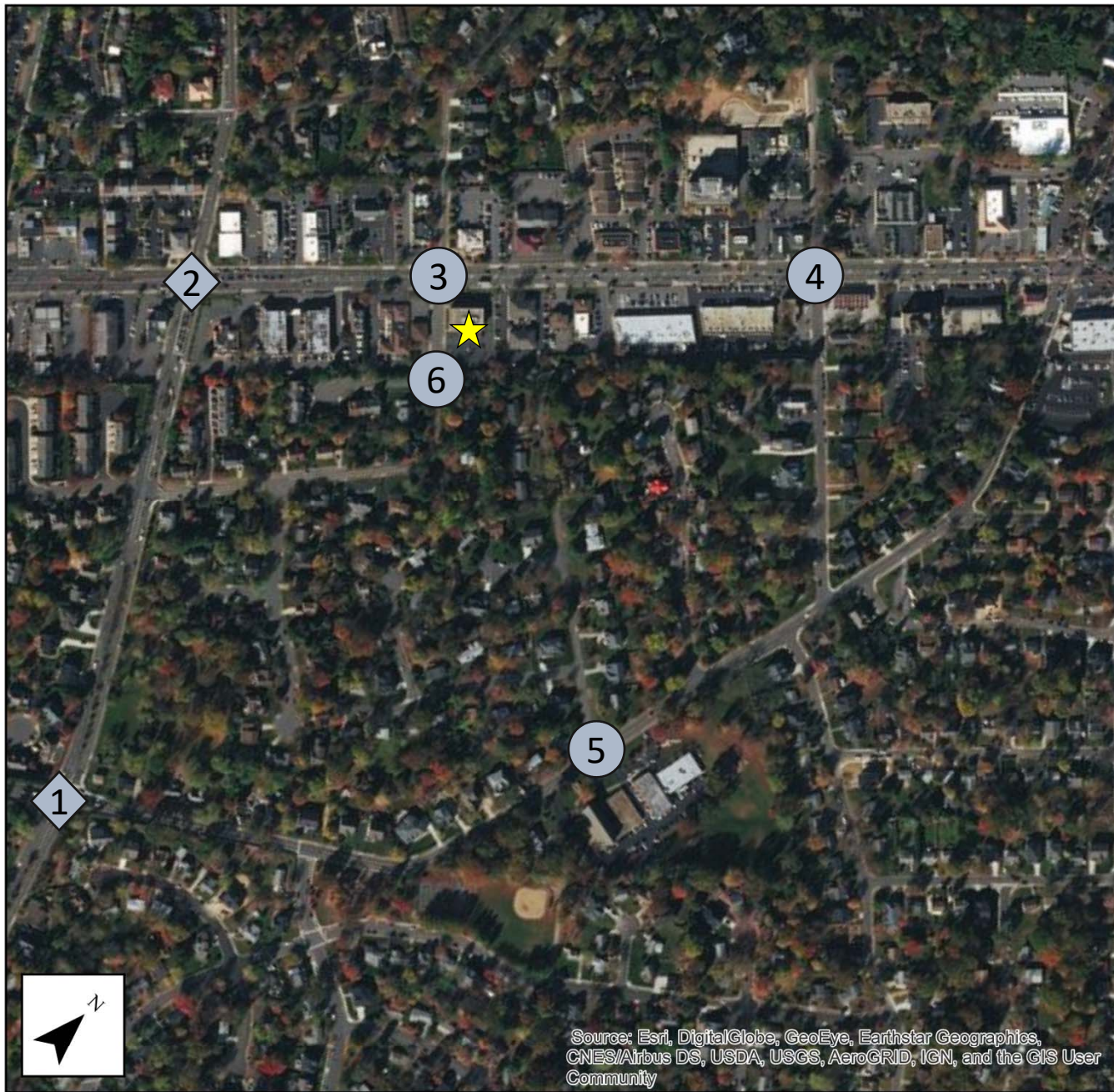
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Millwood Ct SW	<div> <div>←</div> <div>→</div> </div> <div> <div>←</div> <div>→</div> </div>	<div> <div>←</div> <div>→</div> </div> <div> <div>←</div> <div>→</div> </div>

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Maple Ave W	<div> <div> <div>←</div> <div>→ 22</div> <div>↓</div> </div> <div> <div>←</div> <div>↑</div> <div>→</div> </div> </div>
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Pleasant St NW	



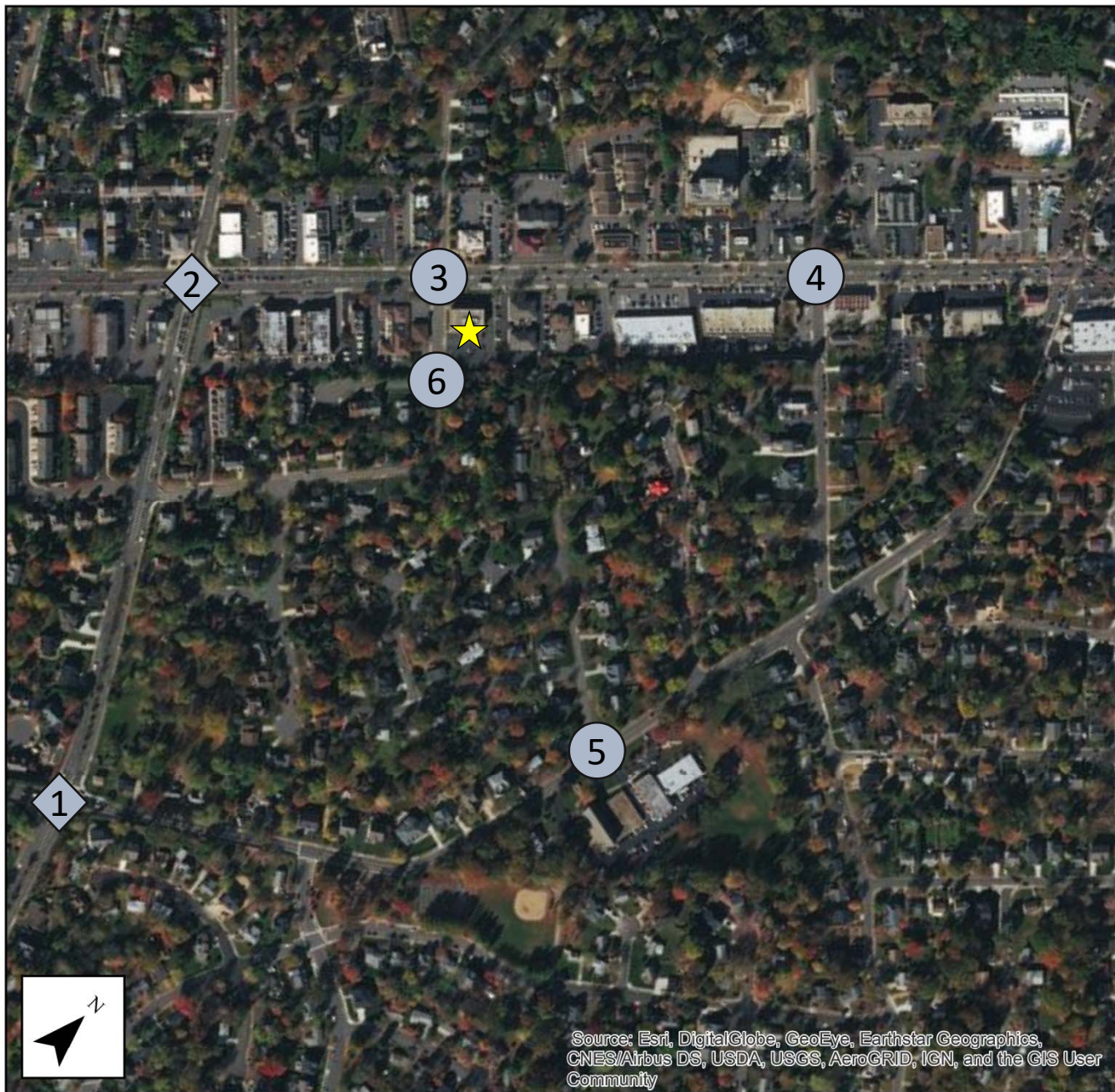
5	<div> <div> <div>←</div> <div>↓</div> <div>↓</div> </div> <div> <div>↑</div> <div>↑ 13</div> <div>↑</div> </div> </div>
Glen Ave SW	
Courthouse Rd SW	<div> <div> <div>←</div> <div>↑</div> <div>→</div> </div> <div> <div>←</div> <div>↑</div> <div>→</div> </div> </div>
Private Drive	
6	<div> <div> <div>←</div> <div>↓</div> <div>↓</div> </div> <div> <div>↑</div> <div>↑</div> <div>↑</div> </div> </div>
Glen Ave SW	
Millwood Ct SW	<div> <div> <div>←</div> <div>→</div> <div>↓</div> </div> <div> <div>←</div> <div>↑</div> <div>→</div> </div> </div>
Wade Hampton Dr SW	

1	43		
Courthouse Rd SW		Nutley St SW	52
2	14 5 32	9 86 27	
Maple Ave W	14 101 21	Nutley St SW	43 4 -11
3		Lewis St NW	49
Maple Ave W	49	Wade Hampton Dr SW	
4			49
Maple Ave W	49	Pleasant St NW	



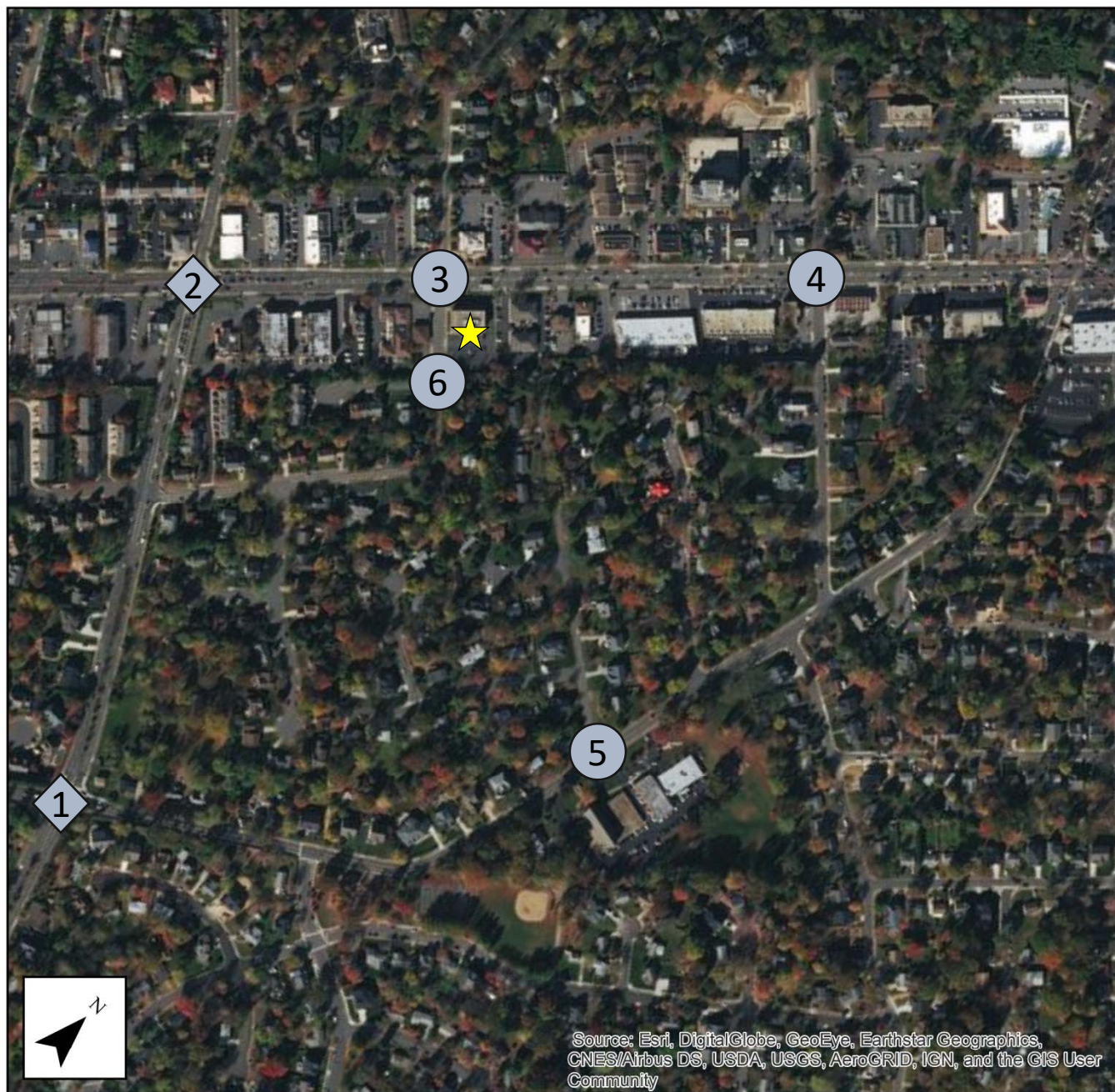
5		Glen Ave SW	21
Courthouse Rd SW		Private Drive	
6		Glen Ave SW	
Millwood Ct SW		Wade Hampton Dr SW	

1 15 553 24 ← ↓ →	46 34 193 ← ↓ →
Courthouse Rd SW 31 233 378 ← ↓ →	Nutley St SW 70 711 234 ← ↓ →
2 34 273 102 ← ↓ →	59 559 165 ← ↓ →
Maple Ave W 25 890 133 ← ↓ →	Nutley St SW 296 166 349 ← ↓ →
3 59 1 10 ← ↓ →	Lewis St NW 26 656 8 ← ↓ →
Maple Ave W 85 1320 12 ← ↓ →	Wade Hampton Dr SW 2 7 12 ← ↓ →
4 20 5 4 ← ↓ →	28 757 16 ← ↓ →
Maple Ave W 45 1131 31 ← ↓ →	Pleasant St NW 18 5 20 ← ↓ →



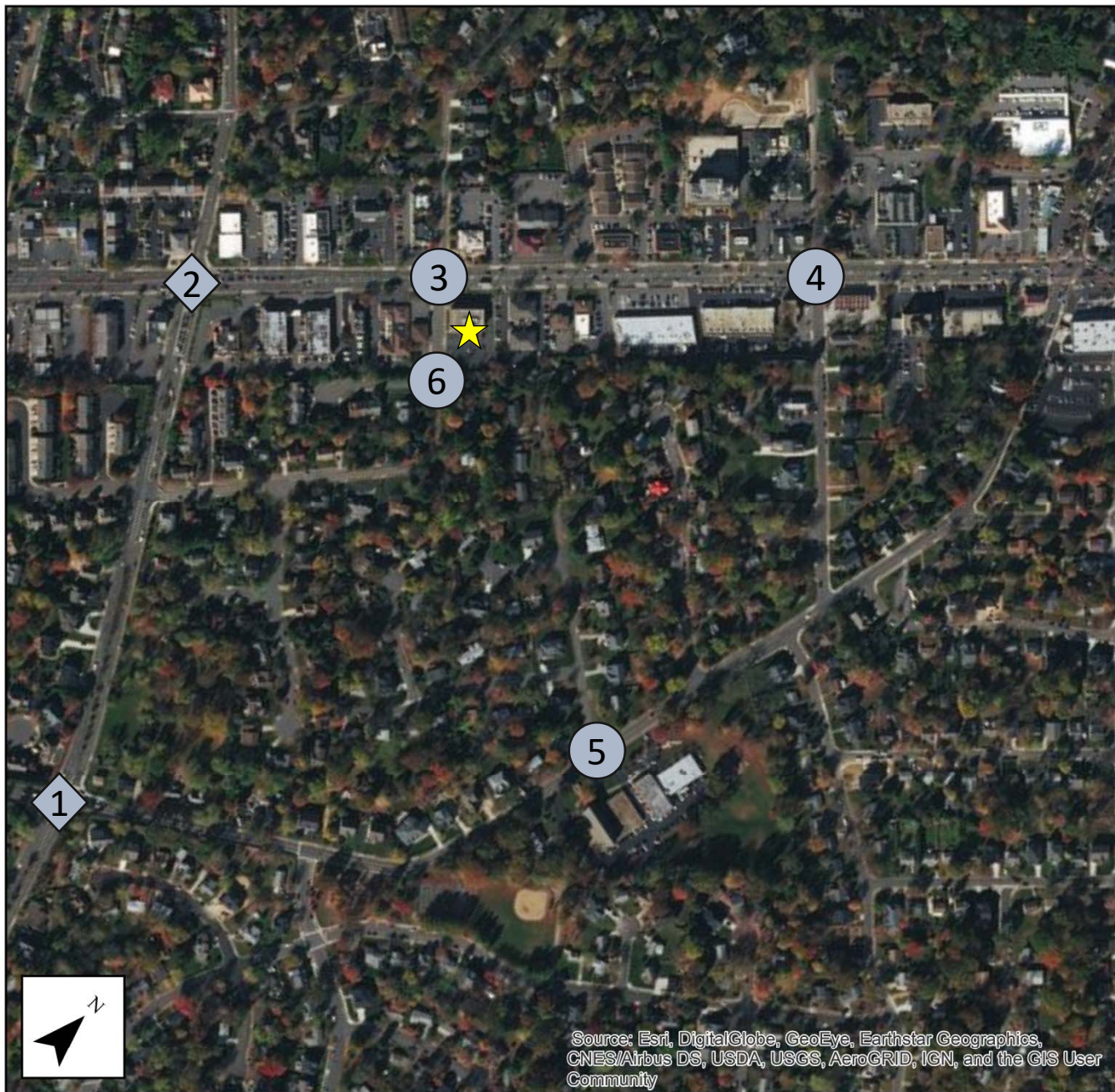
5 12 0 14 ← ↓ →	Glen Ave SW 10 211 1 ← ↓ →
Courthouse Rd SW 9 495 2 ← ↓ →	Private Drive 9 0 0 ← ↓ →
6 2 6 5 ← ↓ →	Glen Ave SW 11 0 0 ← ↓ →
Millwood Ct SW 0 1 1 ← ↓ →	Wade Hampton Dr SW 1 20 4 ← ↓ →

1	55 597 13	33 230 212
Courthouse Rd SW	34 99 130	Nutley St SW 230 836 203
2	26 208 91	57 1238 280
Maple Ave W	34 559 168	Nutley St SW 299 204 345
3	32 1 5	Lewis St NW 16 1464 8
Maple Ave W	88 937 13	Wade Hampton Dr SW 4 1 31
4	19 0 3	37 1449 20
Maple Ave W	29 885 46	Pleasant St NW 11 4 28



5	9 0 7	Glen Ave SW 22 487 2
Courthouse Rd SW	14 350 2	Private Drive 4 0 13
6	2 14 10	Glen Ave SW 15 1 5
Millwood Ct SW	1 1 0	Wade Hampton Dr SW 1 31 0

1	35 525 34	29 97 208
Courthouse Rd SW	50 90 140	Nutley St SW 80 674 215
2	44 137 102	60 783 303
Maple Ave W	50 879 125	Nutley St SW 192 133 404
3	26 2 7	Lewis St NW 23 1041 20
Maple Ave W	62 1228 13	Wade Hampton Dr SW 4 0 26
4	22 3 5	24 1076 26
Maple Ave W	42 1129 66	Pleasant St NW 15 3 25



5	8 1 21	Glen Ave SW 14 358 2
Courthouse Rd SW	13 350 2	Private Drive 22 0 17
6	2 12 23	Glen Ave SW 16 1 3
Millwood Ct SW	1 0 2	Wade Hampton Dr SW 1 11 2

2020 BACKGROUND CONDITIONS CAPACITY ANALYSIS

The 2020 background conditions capacity analyses were based on the background traffic volumes with existing lane uses and traffic controls at the study area intersections. Peak hour factors were increased to 0.92 or remained consistent with those used in the existing conditions. Heavy vehicle percentages were the same as those used in the existing conditions analyses. Signal timings were based on the background Synchro files prepared as part of the 444 Maple Avenue Multi-modal Transportation Study.

The results of the intersection capacity analyses are summarized in Table 6. Results of the existing conditions analyses are also shown for comparison. Analysis results show overall level of service and corresponding delay information for each movement, approach, and overall intersection. The Synchro analysis reports are contained in **Appendix E**.

The following signalized intersections will operate with a lower overall LOS compared to existing conditions:

- Nutley Street Southwest and Courthouse Road Southwest changes from LOS D to E during the AM peak hour
- Nutley Street Southwest and Maple Avenue West changes from LOS D to E during the AM peak hour and LOS C to D during the Saturday Midday peak hour

In comparison to existing conditions, under background conditions, both the intersection of Nutley Street Southwest and Courthouse Road Southwest and the intersection of Maple Avenue West and Nutley Street Southwest will operate at LOS E during the AM peak hour, which is below the intersection operation standard identified in the scoping document.

It is noted that, compared to existing conditions, there will be more movements and approaches at signalized intersections that operate at LOS E or F. These movements and approaches are typically along the minor street. Approaches that will operate at LOS E or F include:

- Eastbound and westbound approaches at Nutley Street Southwest and Courthouse Road Southwest during the AM, PM, and Saturday midday peak hours
- Southbound approach at Nutley Street Southwest and Maple Avenue West during the AM, PM, and Saturday midday peak hours
- Northbound approach at Nutley Street Southwest and Maple Avenue West during the PM peak hour
- Eastbound approach at Nutley Street Southwest and Maple Avenue West during the AM and Saturday midday peak hours

Generally, most movements and approaches will also experience increased vehicle delays due to the increased amount of traffic that is forecasted in the area. Exceptions to this occur where optimized signal timings were used to reallocate the amount of green time to better serve congested approaches.

It is also noted that there will be multiple minor street movements and approaches that operate at LOS E or F at unsignalized intersections, particularly those along Maple Avenue West. Due the predominant east-west traffic flows along Maple Avenue W during the peak hours, additional delays are experienced by vehicles turning from the minor street. It is noted that these delays are not uncommon or unexpected for unsignalized approaches to congested corridors.

Table 6: Summary of 2020 Background Intersection Capacity Analysis Results Delay, Seconds per Vehicle (Level of Service)							
Intersection		Existing (2018)			Background (2020)		
Approach	Movement	AM	PM	SAT	AM	PM	SAT
1. Nutley Street SW and Courthouse Road SW							
Northbound (Nutley Street SW)	L	26.1 (C)	17.7 (B)	14.3 (B)	23.0 (C)	16.7 (B)	14.2 (B)
	T	40.9 (D)	22.5 (C)	20.2 (C)	36.9 (D)	24.6 (C)	1.5 (A)
	R	41.9 (D)	23.1 (C)	21.0 (C)	37.2 (D)	24.7 (C)	1.5 (A)
	Overall	40.3 (D)	21.8 (C)	20.0 (C)	36.1 (D)	23.2 (C)	2.6 (A)
Southbound (Nutley Street SW)	L	30.7 (C)	20.5 (C)	16.1 (B)	27.0 (C)	21.7 (C)	15.3 (B)
	T	33.8 (C)	25.3 (C)	18.4 (B)	23.3 (C)	2.4 (A)	0.9 (A)
	R	33.9 (C)	25.6 (C)	18.5 (B)	23.2 (C)	2.4 (A)	0.9 (A)
	Overall	33.7 (C)	25.4 (C)	18.3 (B)	23.4 (C)	2.8 (A)	1.7 (A)
Eastbound (Courthouse Road SW)	L	43.1 (D)	53.5 (D)	47.4 (D)	53.8 (D)	76.5 (E)	63.1 (E)
	T	0.0	0.0	0.0	0.0	0.0	0.0
	R	65.2 (E)	55.8 (E)	49.7 (D)	155.4 (F)	92.4 (F)	69.5 (E)
	Overall	56.1 (E)	54.6 (D)	48.6 (D)	113.6 (F)	84.3 (F)	66.3 (E)
Westbound (Courthouse Road SW)	L	63.1 (E)	49.7 (D)	48.3 (D)	73.8 (E)	72.6 (E)	69.7 (E)
	T	0.0	0.0	0.0	0.0	0.0	0.0
	R	56.5 (E)	52.5 (D)	43.9 (D)	56.4 (E)	86.9 (F)	57.0 (E)
	Overall	61.2 (E)	51.1 (D)	46.6 (D)	68.7 (E)	80.5 (F)	64.9 (E)
Overall Intersection		45.3 (D)	31.4 (C)	27.8 (C)	56.4 (E)	34.3 (C)	20.1 (C)
2. Nutley Street SW and Maple Avenue W							
Northbound (Nutley Street SW)	L	62.0 (E)	73.1 (E)	53.7 (D)	72.6 (E)	116.0 (F)	57.4 (E)
	T	54.9 (D)	75.2 (E)	56.6 (E)	56.0 (E)	111.9 (F)	59.6 (E)
	R	37.7 (D)	38.0 (D)	32.5 (C)	20.2 (C)	51.1 (D)	5.4 (A)
	Overall	49.1 (D)	58.9 (E)	41.7 (D)	45.7 (D)	88.4 (F)	29.1 (C)
Southbound (Nutley Street SW)	L	47.9 (D)	59.1 (E)	52.7 (D)	51.3 (D)	62.5 (E)	56.6 (E)
	T	73.4 (E)	74.1 (E)	57.9 (E)	99.6 (F)	89.8 (F)	65.7 (E)
	R	-	-	-	-	-	-
	Overall	68.4 (E)	70.6 (E)	56.4 (E)	87.6 (F)	82.2 (F)	62.5 (E)
Eastbound (Maple Avenue W)	L	23.7 (C)	27.5 (C)	22.0 (C)	30.6 (C)	35.5 (D)	30.8 (C)
	T	48.3 (D)	36.2 (D)	40.1 (D)	84.5 (F)	43.3 (D)	79.7 (E)
	R	-	-	-	-	-	-
	Overall	47.8 (D)	35.9 (D)	39.4 (D)	83.2 (F)	43.0 (D)	77.4 (E)
Westbound (Maple Avenue W)	L	39.2 (D)	23.0 (C)	26.7 (C)	89.5 (F)	45.2 (D)	64.2 (E)
	T	29.4 (C)	35.0 (C)	24.0 (C)	27.2 (C)	23.3 (C)	14.4 (B)
	R	-	-	-	-	-	-
	Overall	31.4 (C)	32.9 (C)	25.7 (C)	40.3 (D)	27.2 (C)	27.6 (C)
Overall Intersection		46.7 (D)	43.3 (D)	26.2 (C)	62.8 (E)	50.5 (D)	47.3 (D)
3. Wade Hampton Drive/Lewis Street N and Maple Avenue							
Northbound (Wade Hampton Drive/Lewis St North)	L	50.5 (F)	34.8 (D)	15.9 (C)	99.3 (F)	20.6 (C)	40.4 (E)
	T	-	-	-	-	-	-

Table 6: Summary of 2020 Background Intersection Capacity Analysis Results Delay, Seconds per Vehicle (Level of Service)							
Intersection		Existing (2018)			Background (2020)		
Approach	Movement	AM	PM	SAT	AM	PM	SAT
	R	-	-	-	-	-	-
	Overall	50.5 (F)	34.8 (D)	15.9 (C)	99.3 (F)	20.6 (C)	40.4 (E)
Southbound (Wade Hampton Drive/Lewis St North)	L	13.2 (B)	42.9 (E)	21.1 (C)	17.2 (C)	22.9 (C)	44.2 (E)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	13.2 (B)	42.9 (E)	21.1 (C)	17.2 (C)	22.9 (C)	44.2 (E)
Eastbound (Maple Avenue W)	L	9.4 (A)	15.0 (C)	10.8 (B)	8.2 (A)	11.1 (B)	8.9 (A)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	0.6 (A)	1.3 (A)	0.5 (A)	0.5 (A)	0.9 (A)	0.4 (A)
Westbound (Maple Avenue W)	L	9.5 (A)	8.5 (A)	9.6 (A)	9.7 (A)	8.5 (A)	10.1 (B)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	0.1 (A)	0.0 (A)	0.2 (B)	0.1 (A)	0.0 (A)	0.2 (B)
Overall Intersection		-	-	-	-	-	-
4. Pleasant Street Northwest and Maple Avenue							
Northbound (Pleasant Street Northwest)	L	588.1 (F)	39.7 (E)	75.0 (F)	26.9 (D)	22.6 (C)	328.6 (F)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	588.1 (F)	39.7 (E)	75.0 (F)	26.9 (D)	22.6 (C)	328.6 (F)
Southbound (Pleasant Street Northwest)	L	63.7 (F)	17.1 (C)	30.9 (D)	20.4 (C)	16.3 (C)	56.4 (F)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	63.7 (F)	17.1 (C)	30.9 (D)	20.4 (C)	16.3 (C)	56.4 (F)
Eastbound (Maple Avenue W)	L	8.9 (A)	10.1 (B)	8.8 (A)	8.7 (A)	10.6 (B)	9.1 (A)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	1.0 (A)	0.3 (A)	0.3 (A)	0.9 (A)	0.3 (A)	0.3 (A)
Westbound (Maple Avenue W)	L	12.0 (B)	10.0 (A)	11.4 (B)	9.1 (A)	8.4 (A)	9.5 (A)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	Overall	0.2 (A)	0.1 (A)	0.3 (A)	0.2 (A)	0.1 (A)	0.2 (A)
Overall Intersection		-	-	-	-	-	-
5. Glen Avenue SW and Courthouse Road SW							
Northbound (Glen Avenue SW)	L	17.7 (C)	12.7 (B)	14.9 (B)	17.7 (C)	12.8 (B)	15.2 (C)
	T	-	-	-	-	-	-

Table 6: Summary of 2020 Background Intersection Capacity Analysis Results Delay, Seconds per Vehicle (Level of Service)							
Intersection		Existing (2018)			Background (2020)		
Approach	Movement	AM	PM	SAT	AM	PM	SAT
	R	-	-	-	-	-	-
	<i>Overall</i>	17.7 (C)	12.7 (B)	14.9 (B)	17.7 (C)	12.8 (B)	15.2 (C)
Southbound (Glen Avenue SW)	L	14.2 (B)	15.6 (C)	15.8 (C)	14.2 (B)	15.8 (C)	16.2 (C)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	<i>Overall</i>	14.2 (B)	15.6 (C)	15.8 (C)	14.2 (B)	15.8 (C)	16.2 (C)
Eastbound (Courthouse Road SW)	L	7.7 (A)	8.4 (A)	8.0 (A)	7.7 (A)	8.45(A)	8.1 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-
	<i>Overall</i>	0.1 (A)	0.3 (A)	0.3 (A)	0.1 (A)	0.3 (A)	0.3 (A)
Westbound (Courthouse Road SW)	L	8.5 (A)	8.0 (A)	8.1 (A)	8.5 (A)	8.0 (A)	8.1 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-
	<i>Overall</i>	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
Overall Intersection		-	-	-	-	-	-
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court							
Northbound (Wade Hampton Drive SW)	L	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-
	<i>Overall</i>	0.3 (A)	0.2 (A)	0.5 (A)	0.3 (A)	0.2 (A)	0.5 (A)
Southbound (Wade Hampton Drive SW)	L	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-
	<i>Overall</i>	2.8 (A)	2.8 (A)	4.5 (A)	2.8 (A)	2.8 (A)	4.5 (A)
Eastbound (Glen Avenue SW/Millwood Court SW)	L	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	<i>Overall</i>	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)
Westbound (Glen Avenue SW/Millwood Court SW)	L	8.5 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)
	T	-	-	-	-	-	-
	R	-	-	-	-	-	-
	<i>Overall</i>	8.5 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)
Overall Intersection		-	-	-	-	-	-

2020 BACKGROUND CONDITIONS QUEUING ANALYSIS

Synchro 95th percentile queue analyses were performed at study area intersections under background conditions as shown in **Table 7**. A 95th percentile queue length is the queue length that only has a 5 percent likelihood of being exceeded during the peak hour. The values shown below are based on an assumed queuing of 25 feet per vehicle in the queue, which is standard for Synchro queueing analyses. The effective storage of turn lanes, equal to the full-width length plus half the taper length, is shown for comparison. Synchro reports are included in Appendix F.

Under background conditions, queuing at certain turning movements at the signalized intersections will exceed the available storage length under one or multiple peak periods. This includes:

- NBL at Nutley Street Southwest and Courthouse Road Southwest during the PM peak hour (consistent with existing conditions)
- EBTL at Nutley Street Southwest and Courthouse Road Southwest during the AM peak hour
- WBTR at Nutley Street Southwest and Courthouse Road Southwest during the AM and PM peak hours and Saturday peak hour (less queuing compared to existing conditions)
- NBL at Nutley Street Southwest and Maple Avenue West during the AM and PM peak hours (consistent with existing conditions)
- WBL at Nutley Street Southwest and Maple Avenue West during Saturday midday peak hours

Queuing at unsignalized intersections will remain insignificant with a maximum of six queued vehicles at the intersection of Maple Avenue West and Pleasant Street Southwest.

The queuing for the through movements along Maple Avenue West continue to underscore the fact that it is a significant east-west corridor that supports peak direction commuter travel patterns. During the peak hours, this amount of queuing and congestion creates challenges for turning movements from minor street approaches. This is more pronounced in the background conditions due to the growth of traffic volumes.

Table 7: Summary of 2018 Existing Intersection 95 TH Percentile Queues (Feet)								
Intersection		Existing (2018)			Background (2020)			
Approach	Movement	Storage	AM	PM	SAT	AM	PM	SAT
1. Nutley Street SW and Courthouse Road SW								
Northbound (Nutley Street SW)	NBL	115	85	208	74	36	120	84
	NBTR	N/A	607	551	418	267	618	352
Southbound (Nutley Street SW)	SBL	45	38	20	38	13	13	26
	SBTR	N/A	330	287	252	188	385	273
Eastbound (Courthouse Road SW)	EBLT	225	386	224	205	347	218	199
	EBR	N/A	137	66	62	353	59	50
Westbound (Courthouse Road SW)	WBL	N/A	305	322	282	278	312	276
	WBTR	70	104	384	166	94	378	161
2. Nutley Street SW and Maple Avenue W								
Northbound (Nutley Street SW)	NBL	220	314	353	162	384	448	142
	NBLT	N/A	280	382	209	237	451	158
	NBR	N/A	178	112	153	87	233	10
Southbound (Nutley Street SW)	SBL	200	111	116	104	152	152	146

Table 7: Summary of 2018 Existing Intersection 95 TH Percentile Queues (Feet)								
Intersection				Existing (2018)			Background (2020)	
Approach	Movement	Storage	AM	PM	SAT	AM	PM	SAT
	SBTR	N/A	444	333	215	502	384	234
Eastbound (Maple Avenue W)	EBL	90	25	31	39	32	39	54
	EBTR	N/A	632	355	590	722	424	783
Westbound (Maple Avenue W)	WBL	285	185	219	272	272	259	445
	WBTR	N/A	283	712	365	322	724	391
3. Wade Hampton Drive/Lewis Street N and Maple Avenue								
Northbound (Wade Hampton Drive/Lewis St North)	NBLTR	N/A	20	23	8	35	13	23
Southbound (Wade Hampton Drive/Lewis St North)	SBLTR	N/A	13	30	13	18	15	28
Eastbound (Maple Avenue W)	EBL	120	8	20	8	5	13	5
	EBTR	N/A	0	0	0	0	0	0
Westbound (Maple Avenue W)	WBL	95	0	0	3	0	0	3
	WBTR	N/A	0	0	0	0	0	0
4. Pleasant Street Northwest and Maple Avenue								
Northbound (Pleasant Street Northwest)	NBLTR	N/A	143	30	55	20	15	118
Southbound (Pleasant Street Northwest)	SBLTR	N/A	35	5	23	10	5	43
Eastbound (Maple Avenue W)	EBL	55	13	3	3	10	3	3
	EBTR	N/A	0	0	0	0	0	0
Westbound (Maple Avenue W)	WBL	70	3	3	3	3	3	3
	WBTR	N/A	0	0	0	0	0	0
5. Glen Avenue SW and Courthouse Road SW								
Northbound (Glen Avenue SW)	NBLTR	N/A	3	5	8	3	3	8
Southbound (Glen Avenue SW)	SBLTR	N/A	5	3	8	5	3	8
Eastbound (Courthouse Road SW)	EBLTR	N/A	0	0	0	0	0	0
Westbound (Courthouse Road SW)	WBLTR	N/A	0	0	0	0	0	0
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court								
Northbound (Wade Hampton Drive SW)	NBLTR	N/A	0	0	0	0	0	0
Southbound (Wade Hampton Drive SW)	SBLTR	N/A	0	0	0	0	0	0
Eastbound (Glen Avenue SW/Millwood Court SW)	EBLTR	N/A	0	0	0	0	0	0
Westbound (Glen Avenue SW/Millwood Court SW)	WBLTR	N/A	0	3	3	0	3	3

2020 FUTURE CONDITIONS WITH DEVELOPMENT

DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development will be located on a 36,842-square foot property currently occupied by a 23,620-square foot office building. The applicant proposes to rezone the site to the Maple Avenue Commercial (MAC) district and to redevelop with approximately 8,500 square feet of retail and up to 42 multi-family residential units.

Access to the site is planned to be provided by three access points, all along Wade Hampton Drive Southwest. Out of the three access points, the closest to Maple Avenue (VA 123) will allow for service vehicle loading/unloading access, while the other two access points will serve the retail and residential components on the site. The site will include a total of 125 parking space split between above- and below-grade garage parking. To reduce the possibility of site traffic driving through neighborhood streets, left turns will be prohibited for vehicles exiting the access points.

As a part of the development, the northbound approach at the intersection of Wade Hampton Southwest at Maple Avenue West will be changed from a single, left-through-right lane to one left-through lane and one right-turn only lane.

Development of the property is recommended in accordance with the Maple Avenue Commercial (“MAC”) Zone as outlined in the Town’s Zoning Ordinance. The “MAC” Zone envisions compact, mixed-use and pedestrian oriented development.

Bicycle parking will be provided on-site. There are 12 short term and 12 long term spaces provided for the residential component, and six spaces provided for the retail component.

The sidewalk along Maple Avenue West is being widened significantly in conformance with the “MAC” Zone. A connection from the sidewalk on the south side of Maple Avenue West to the east side of Wade Hampton Drive Southwest is being provided where there is currently a gap. A 5-foot sidewalk is being added to Glen Ave Southwest where there currently is none.

SITE TRIP GENERATION

Peak hour traffic volumes generated by the proposed development were calculated using the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition*. Trip generation for the existing and proposed uses on the property was calculated based on the peak hour of generator. **Table 8** shows the trip generation comparison for the existing and proposed uses on the site.

The net trip generation for this development is based on the proposed development with credit applied for the existing office building on the property.

Table 8: Existing and Proposed Trip Generation										
Land Use	AM			PM			Saturday Midday			ADT
	In	Out	Total	In	Out	Total	In	Out	Total	
Existing – 23,620 GSF General Office Building (LUC 710)	-31	-4	-35	-6	-28	-34	-7	-6	-13	-230
Proposed - 4,500 SF Shopping Center	8	6	14	10	9	19	10	10	20	170
Proposed - 4,000 SF High-Turnover (Sit-Down) Restaurant	32	24	56	36	34	70	23	22	45	449
Proposed – 42 DU Multifamily Housing (Mid -Rise)	4	9	13	10	7	17	9	9	18	228
Net Site Generated Trips	13	35	48	50	22	72	35	35	70	617

During the AM peak hour, the proposed use generates 48 additional trips compared to existing use. During the PM peak hour, the proposed use generates 72 additional trips compared to existing use. During the Saturday Midday peak hour, the proposed use generates 70 additional trips compared to the existing use.

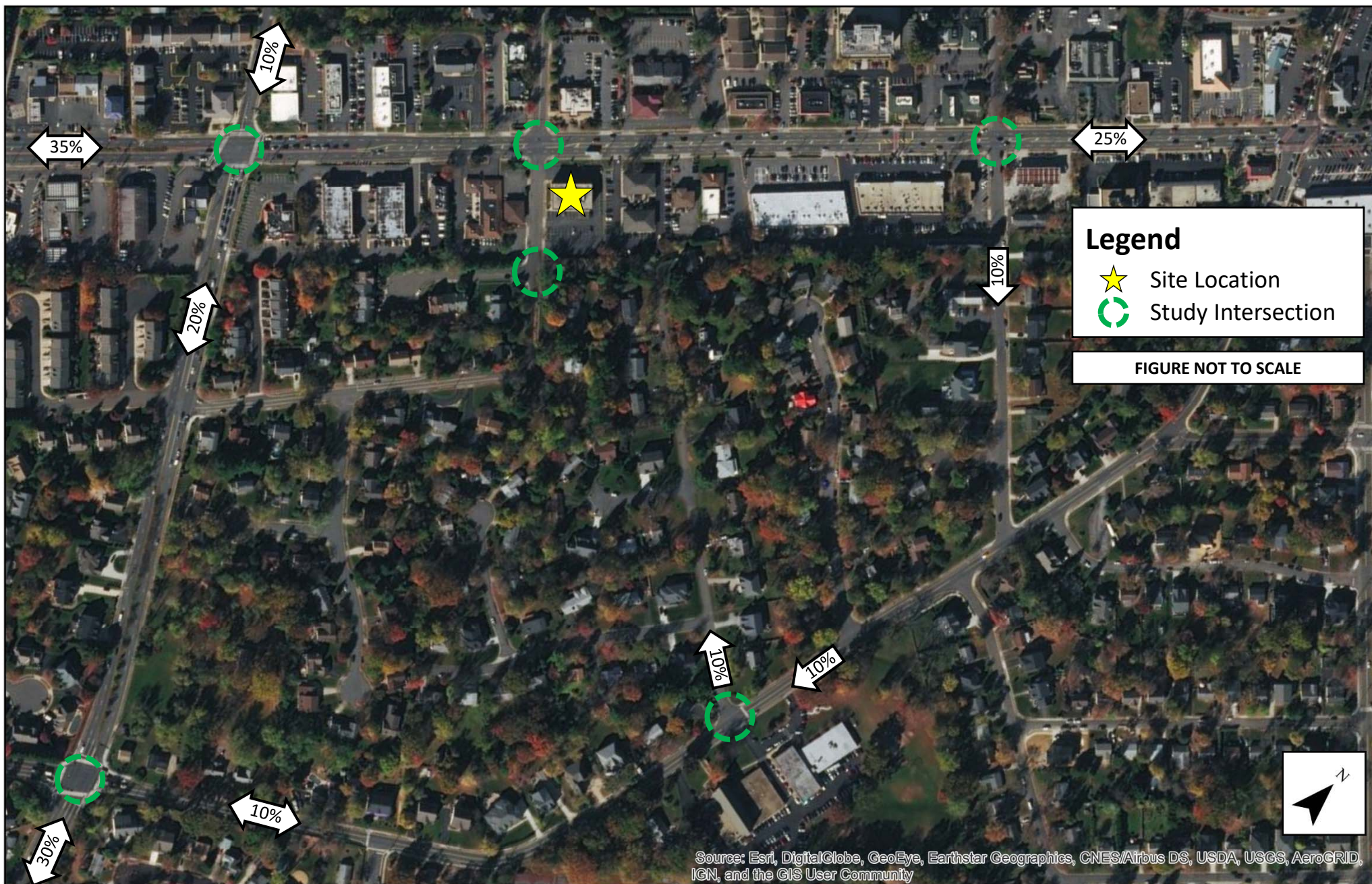
No pass-by or internal capture reductions were applied in this analysis. This results in a conservative analysis of traffic impacts as it is likely there would be double counting of retail trips that would originate from the on-site residents, as well as assuming there would be no existing motorists along Maple Avenue would be attracted to the shopping center or restaurant.

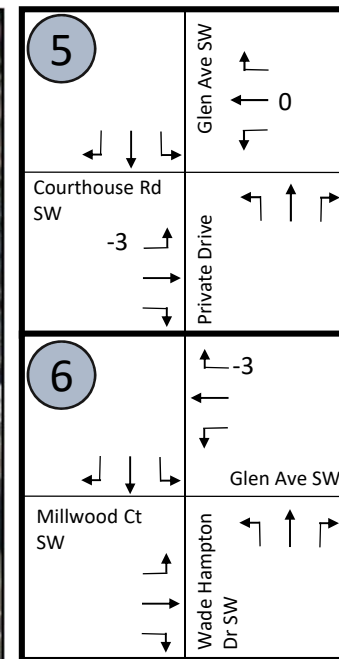
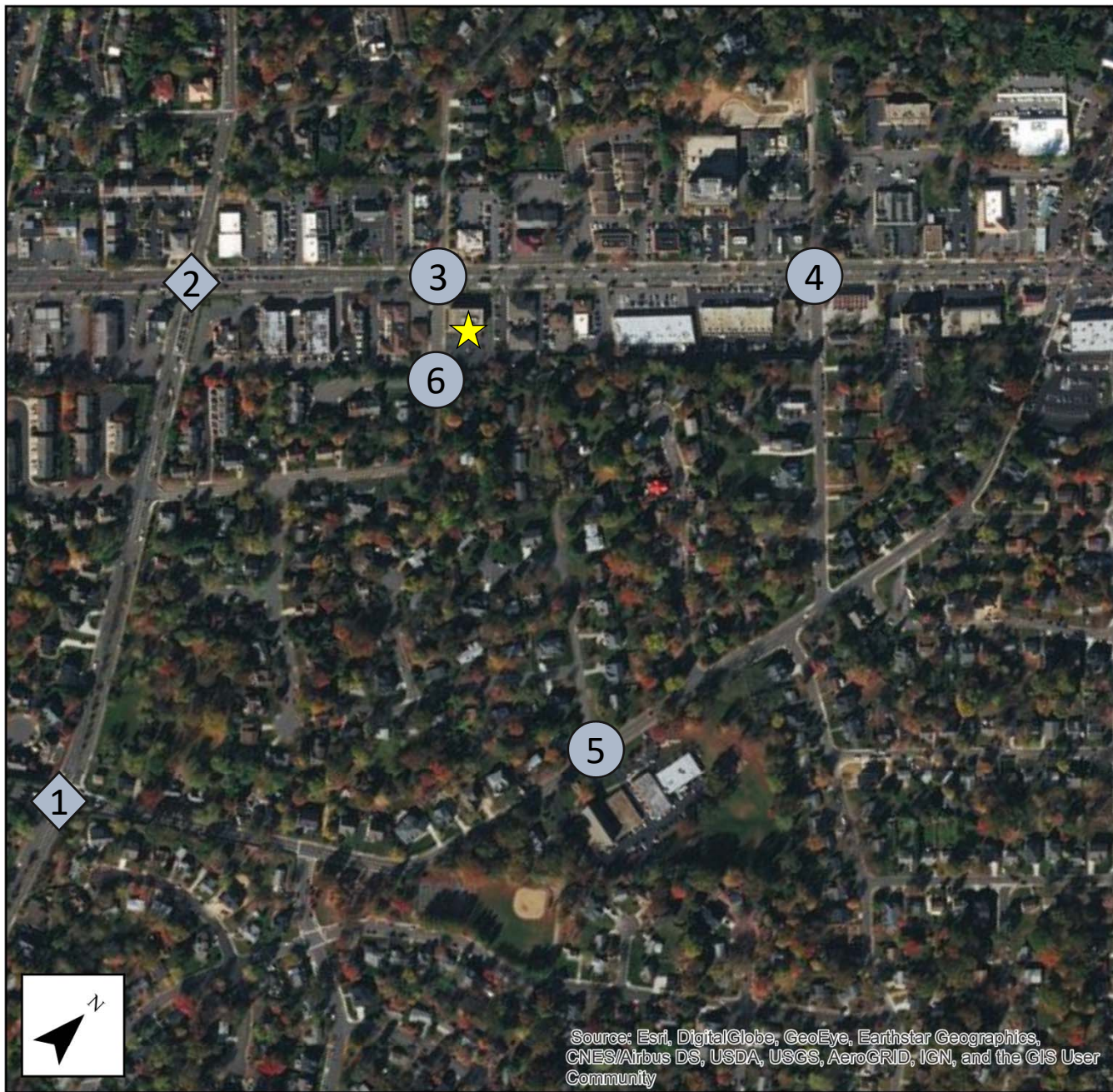
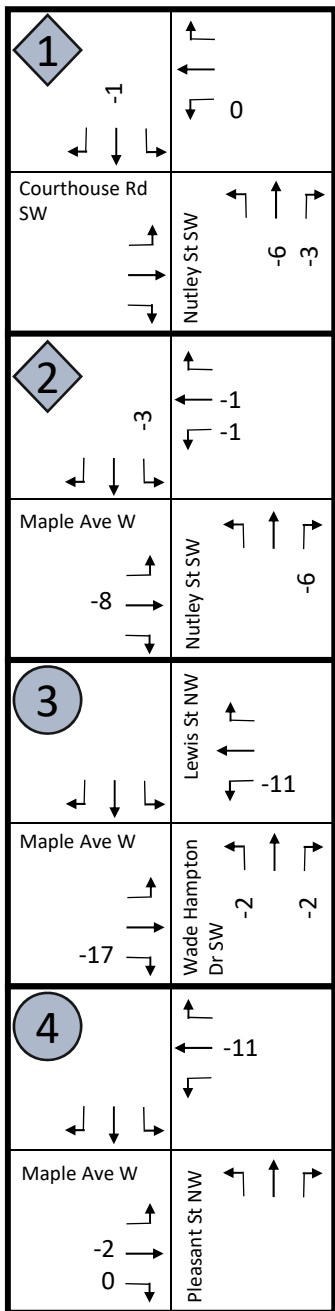
SITE TRIP DISTRIBUTION AND ASSIGNMENT

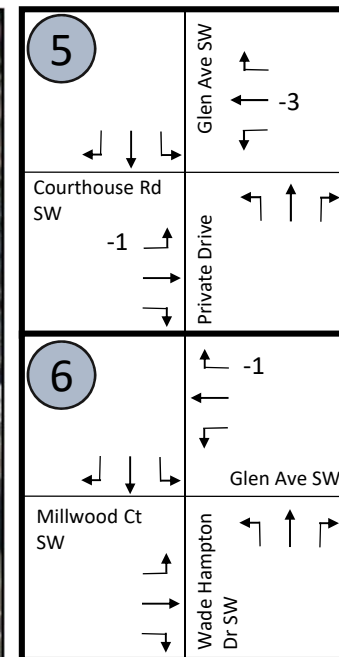
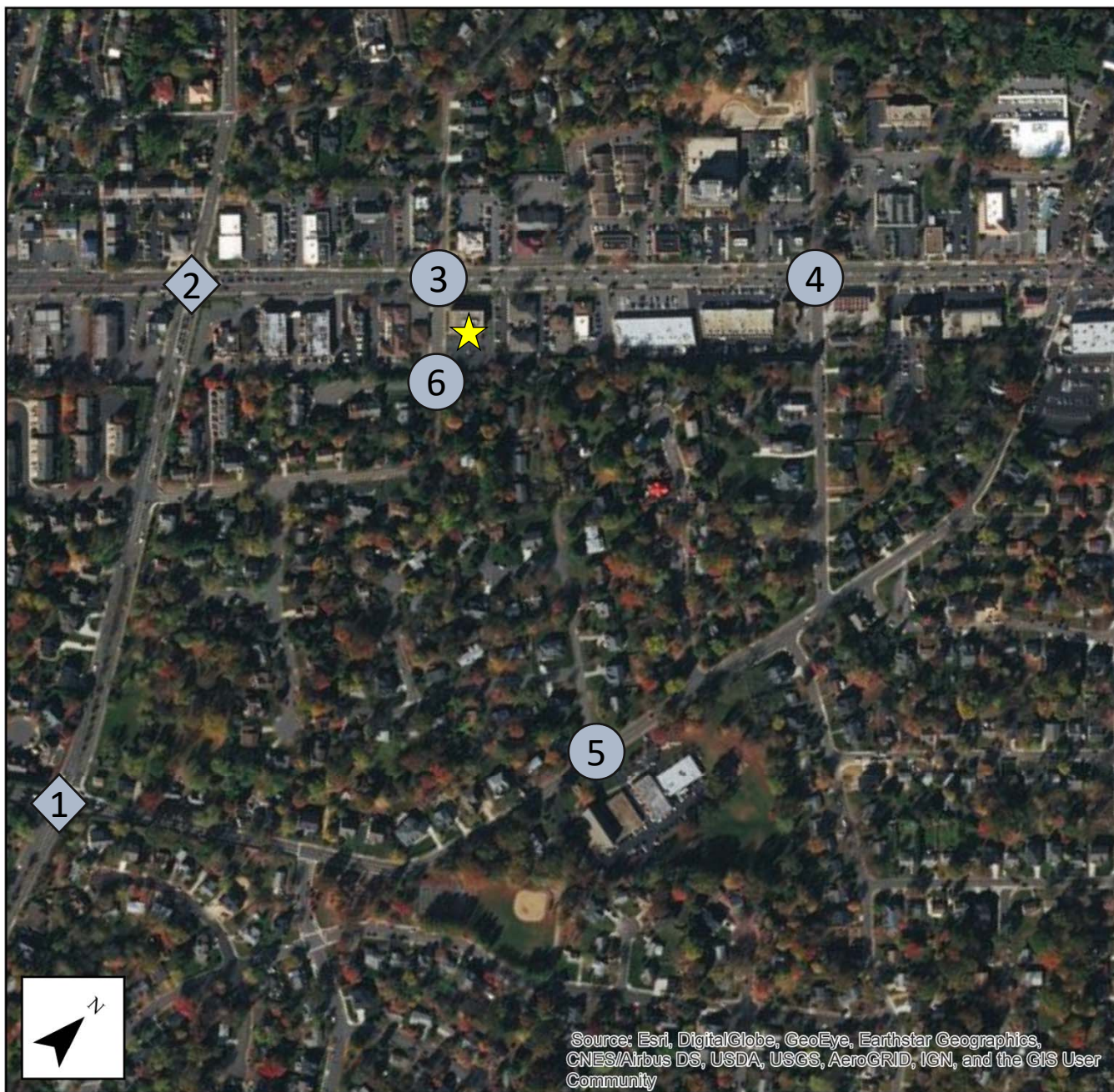
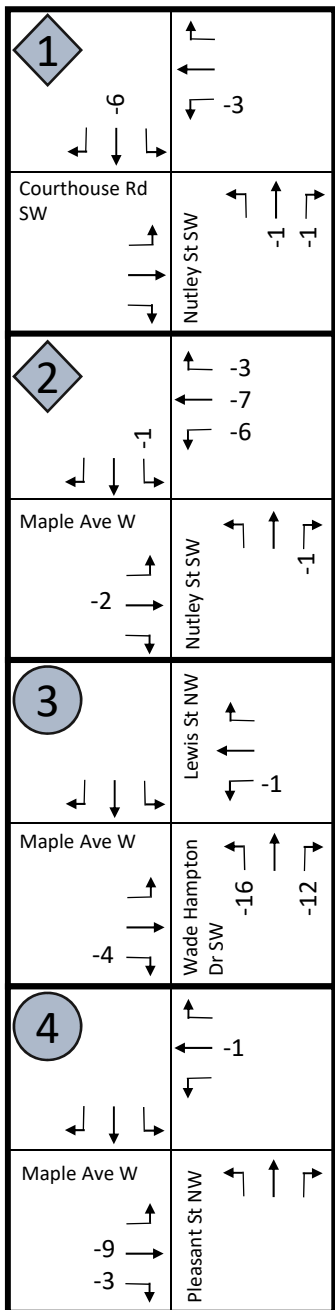
Existing trips were removed and site generated trips were assigned to the study area intersections based on the distributions agreed to as part of project scoping and summarized in **Table 9** below, and shown on **Figure 18**.

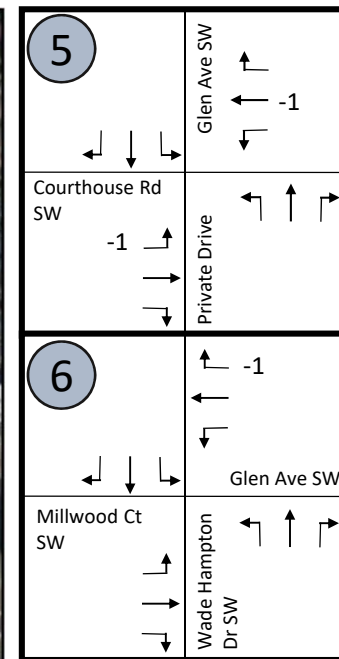
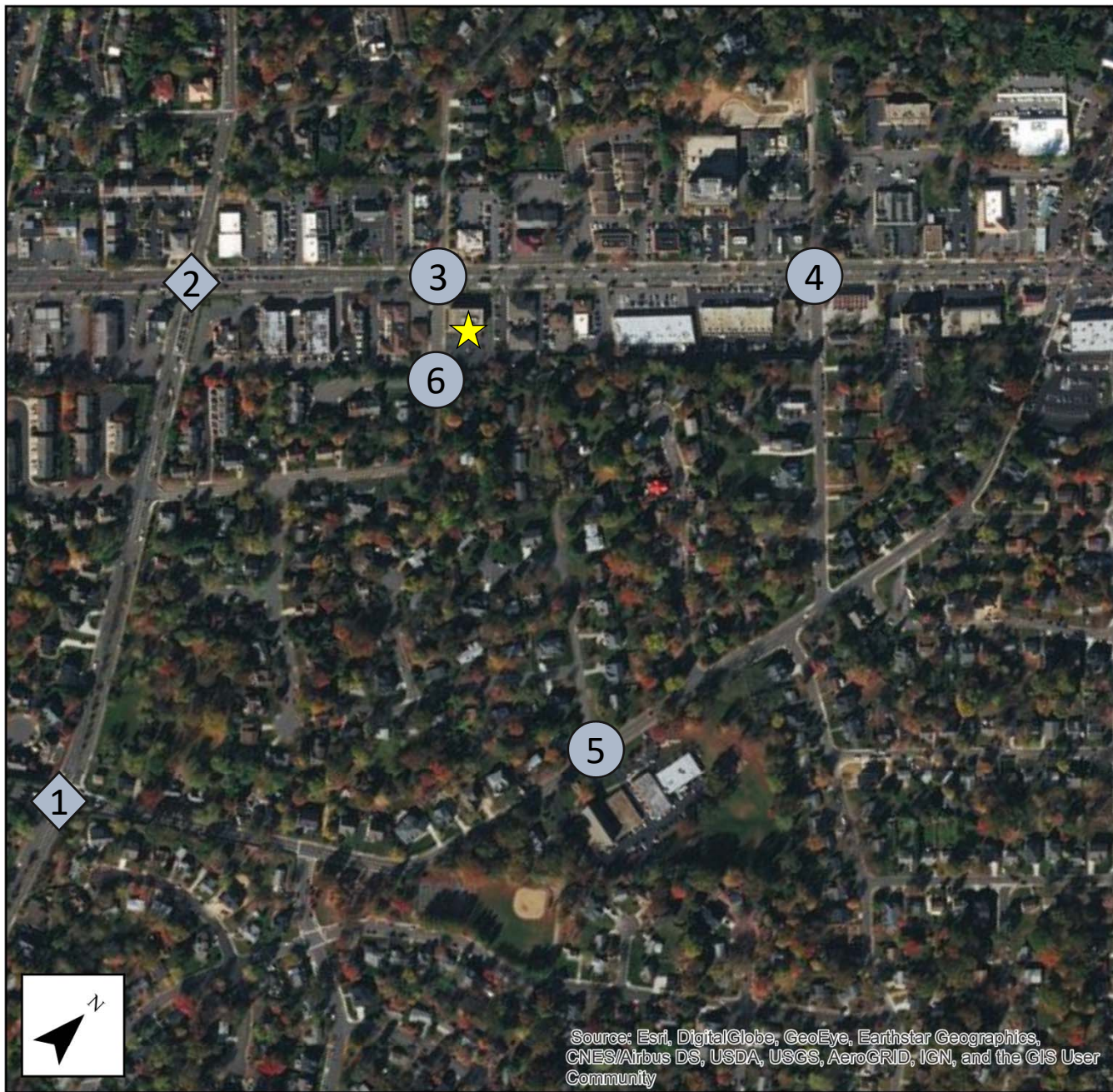
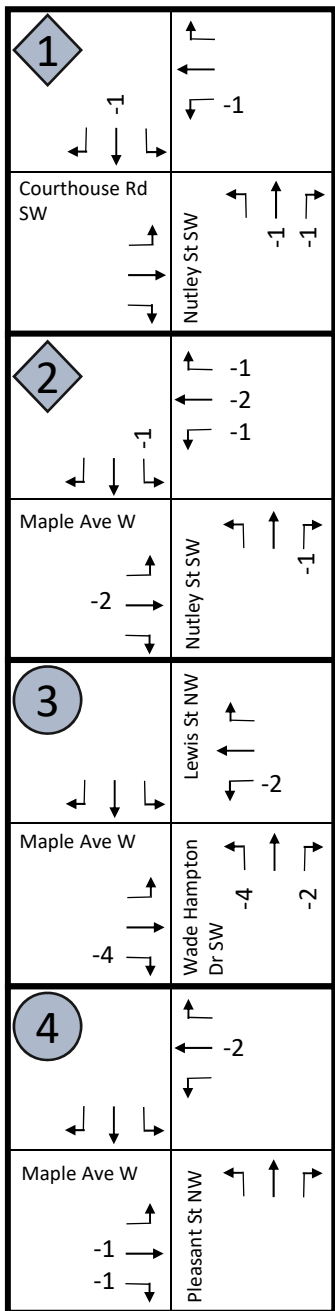
Table 9: Directional Distribution of Site Generated Traffic	
Direction To/From	Percentage
To/From East on Maple Avenue	35%
To/From West on Maple Avenue	25%
To/From South on Nutley Street	30%
To/From North on Nutley Street	10%
Total	100%

Figure 19 to Figure 21 show the removal of trips generated by the existing office. **Figure 22 to Figure 24** shows the assignment of site generated trips. **Figure 25 to Figure 27** shows the assignment of the net site generated trips onto study area intersections.

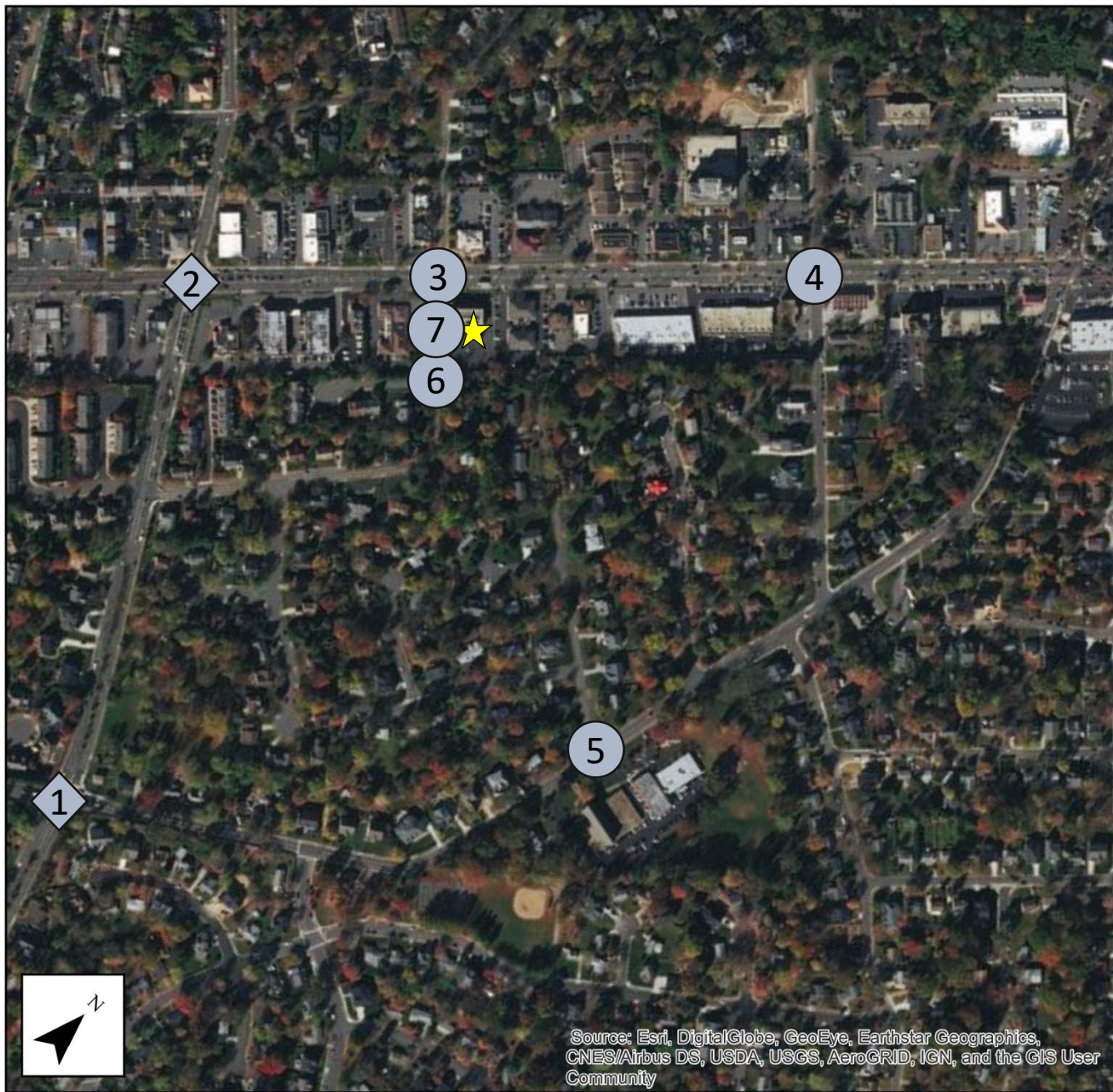




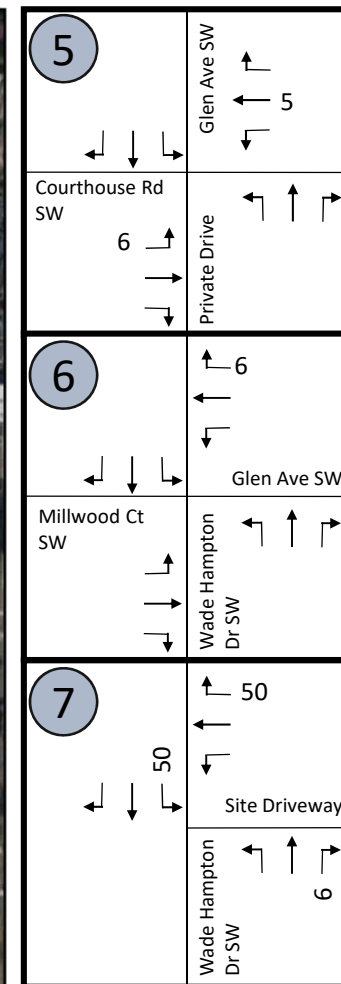
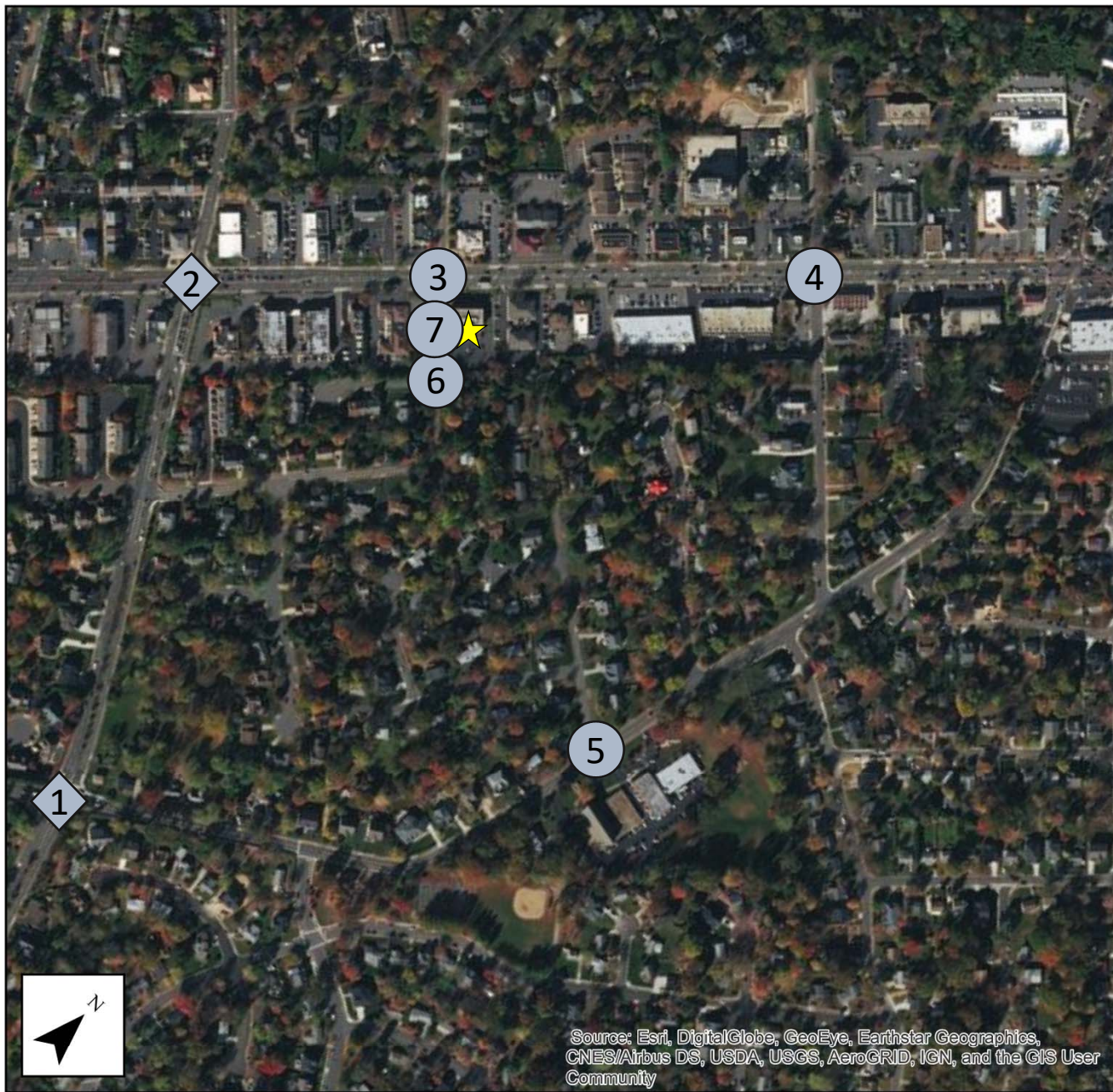
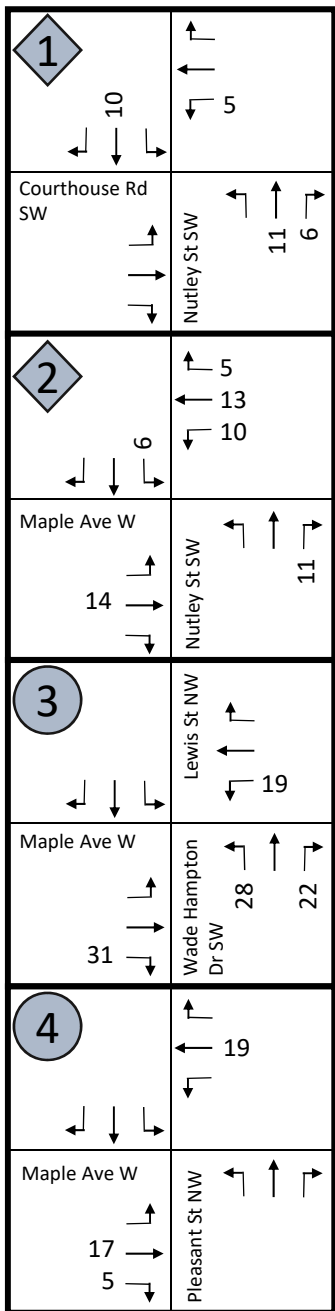


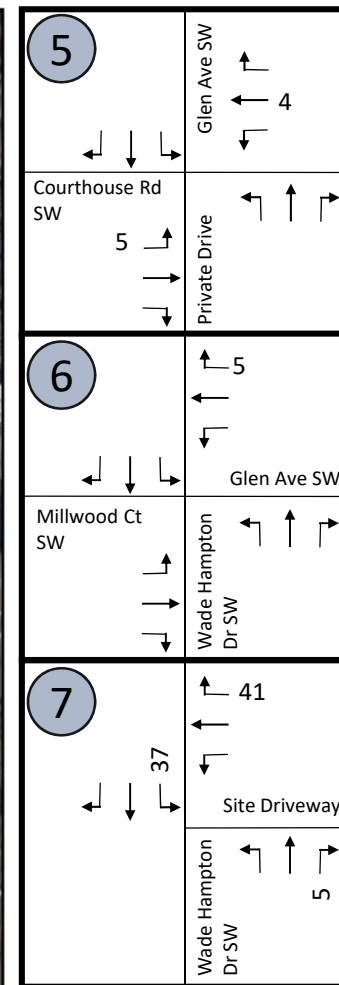
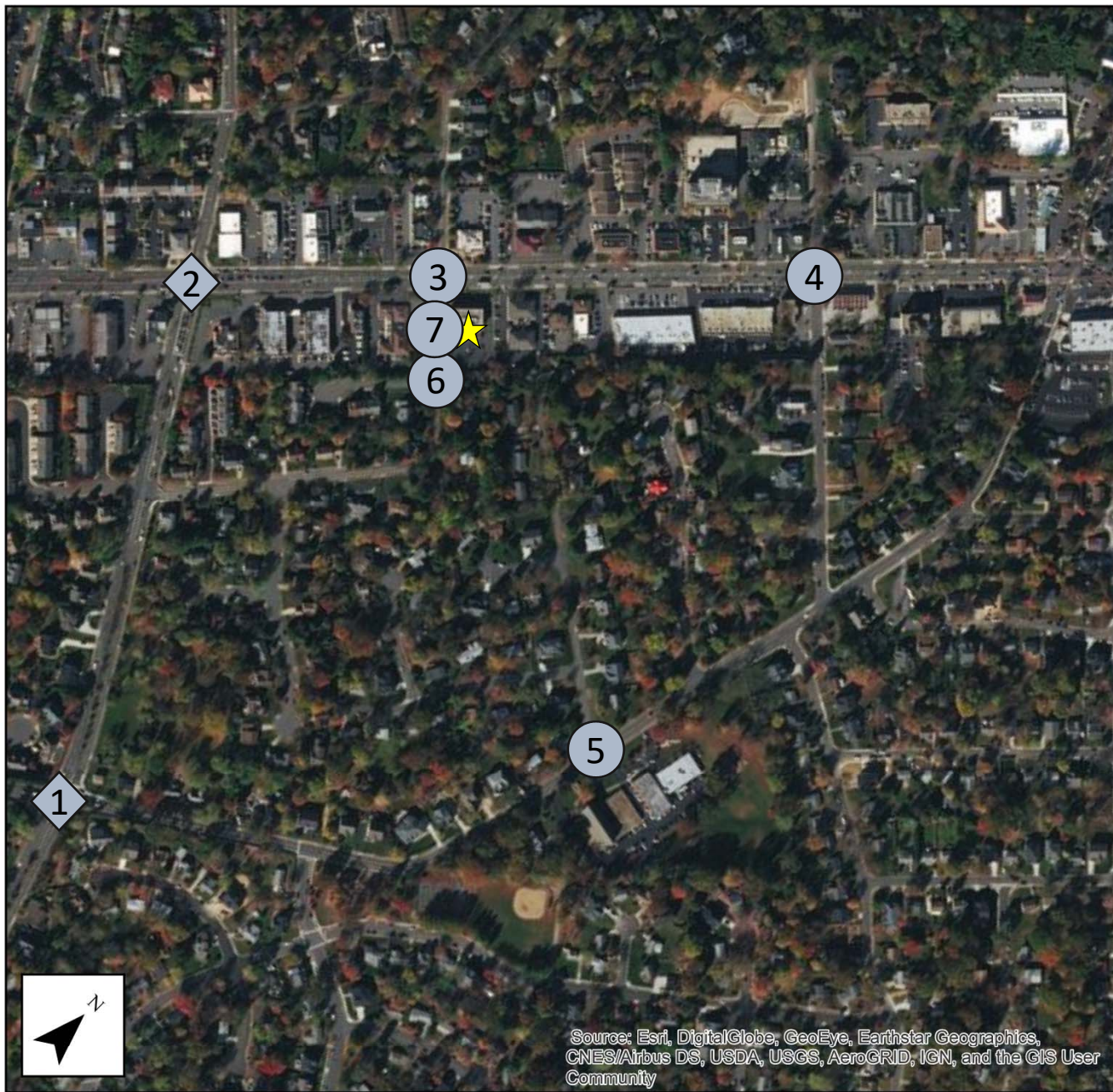
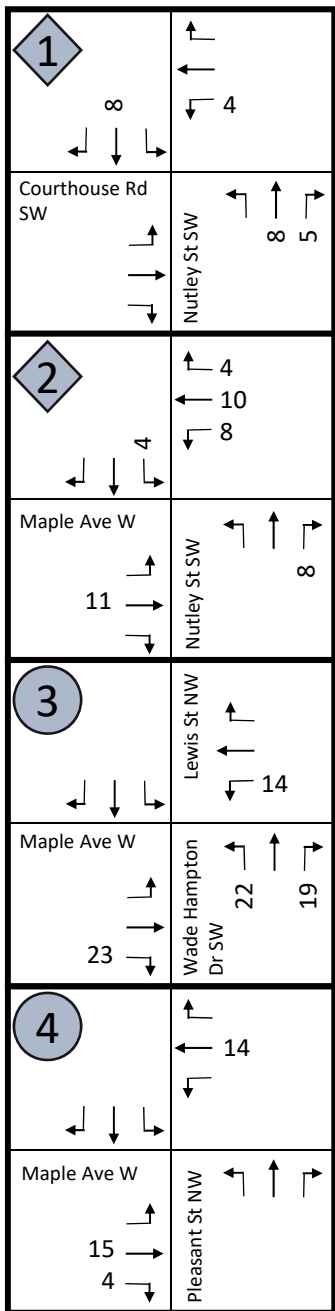


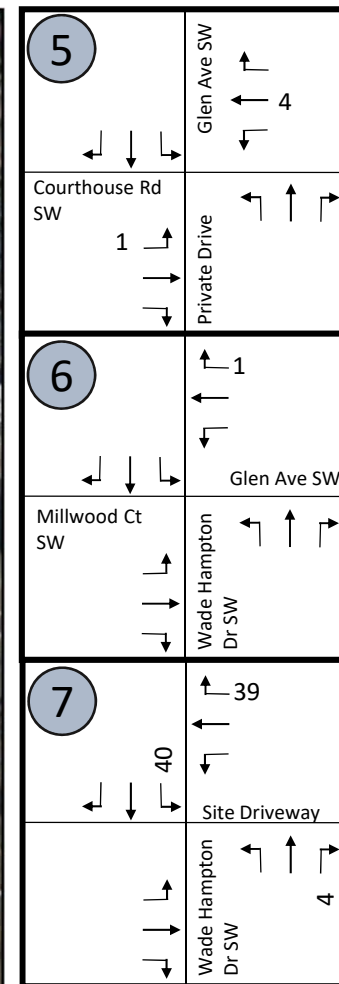
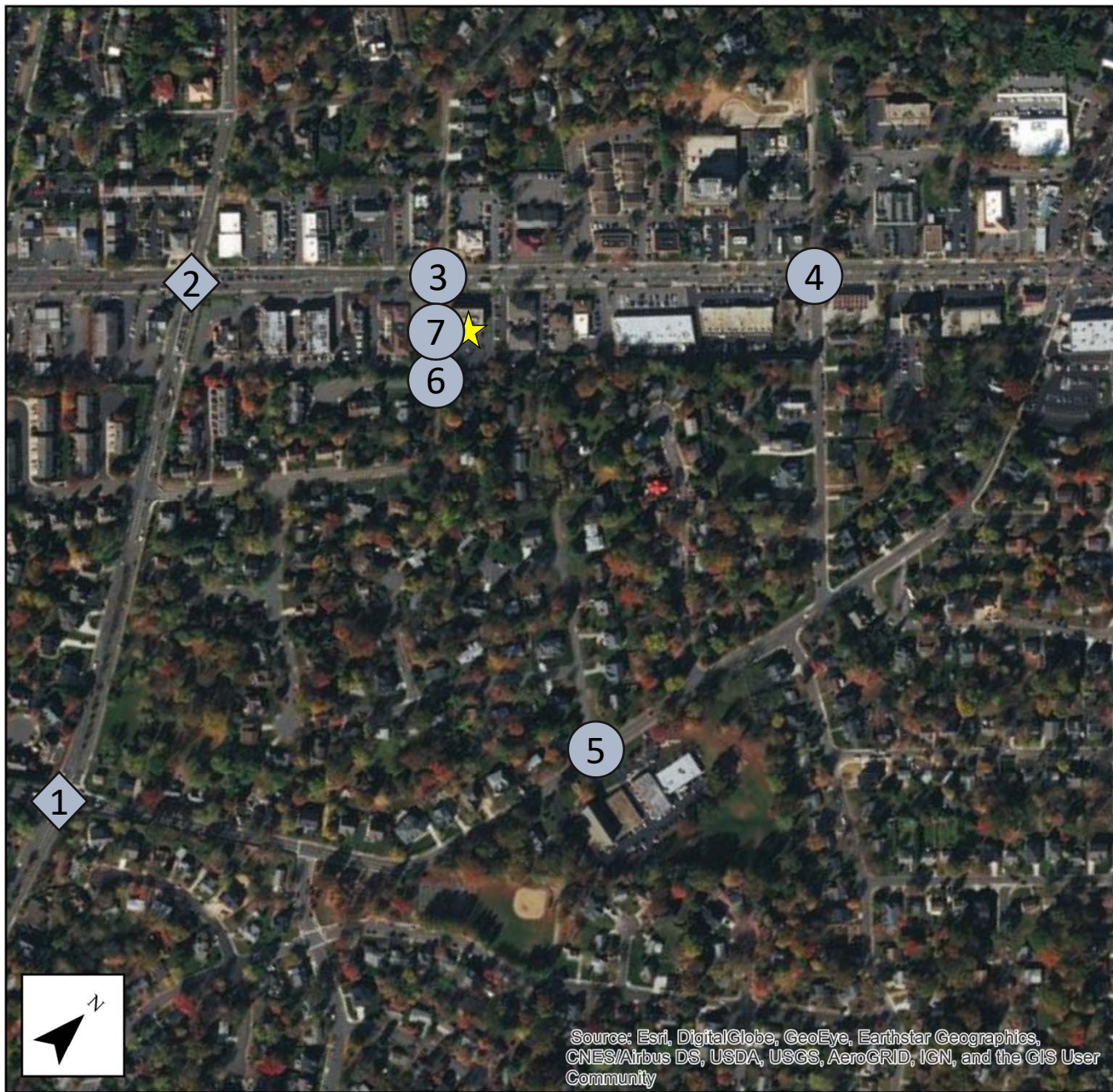
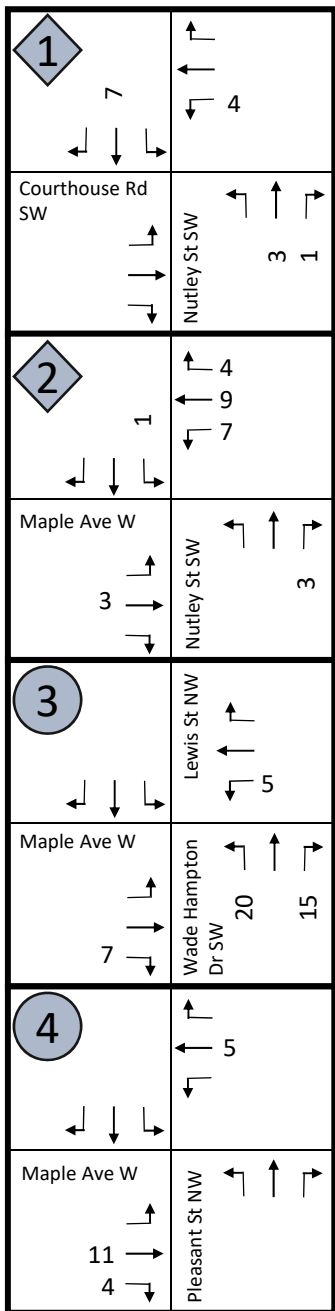
1	8 4	4
Courthouse Rd SW	Nutley St SW	9 4
2	4 10 8	4
Maple Ave W	Nutley St SW	9
11		
3	Lewis St NW	16
Maple Ave W	Wade Hampton Dr SW	22 17
24		
4	16	
Maple Ave W	Pleasant St NW	
13 4		

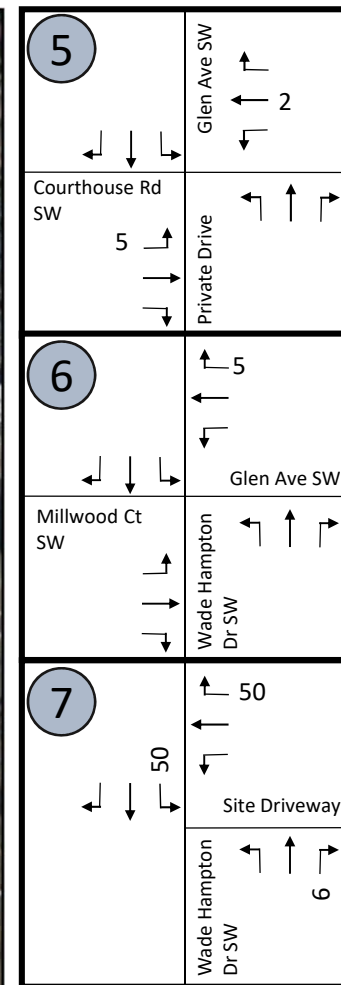
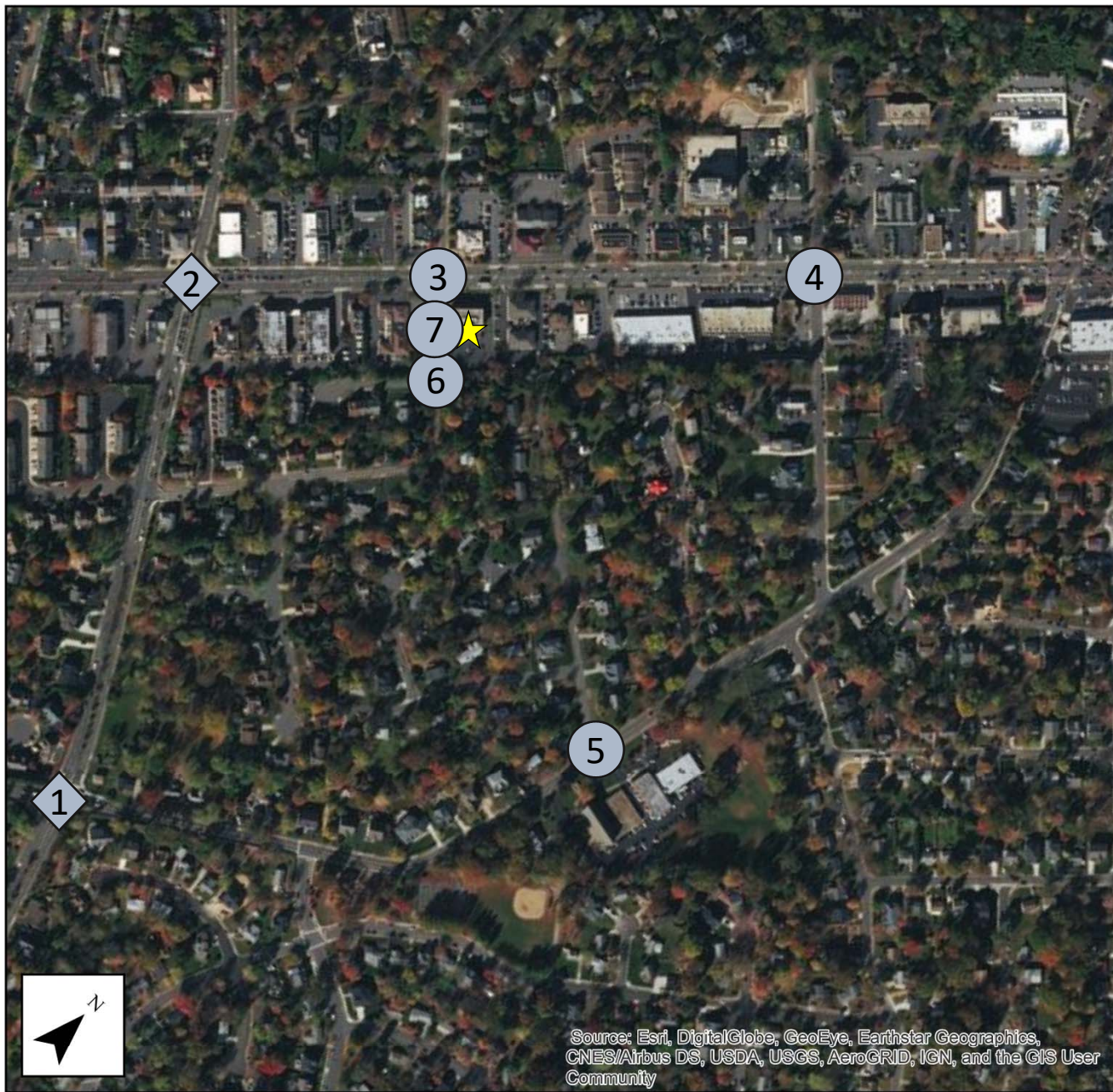
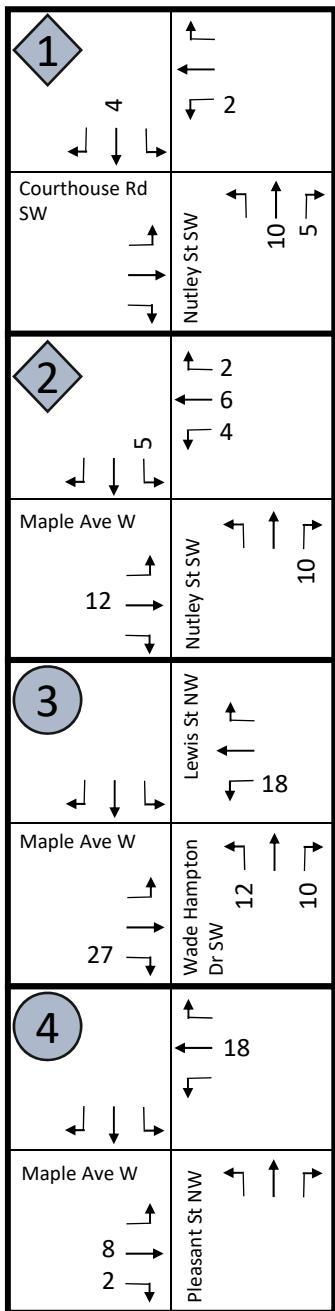


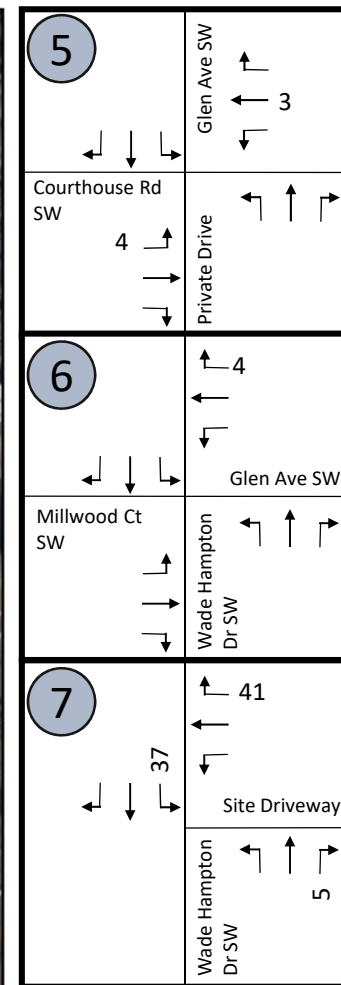
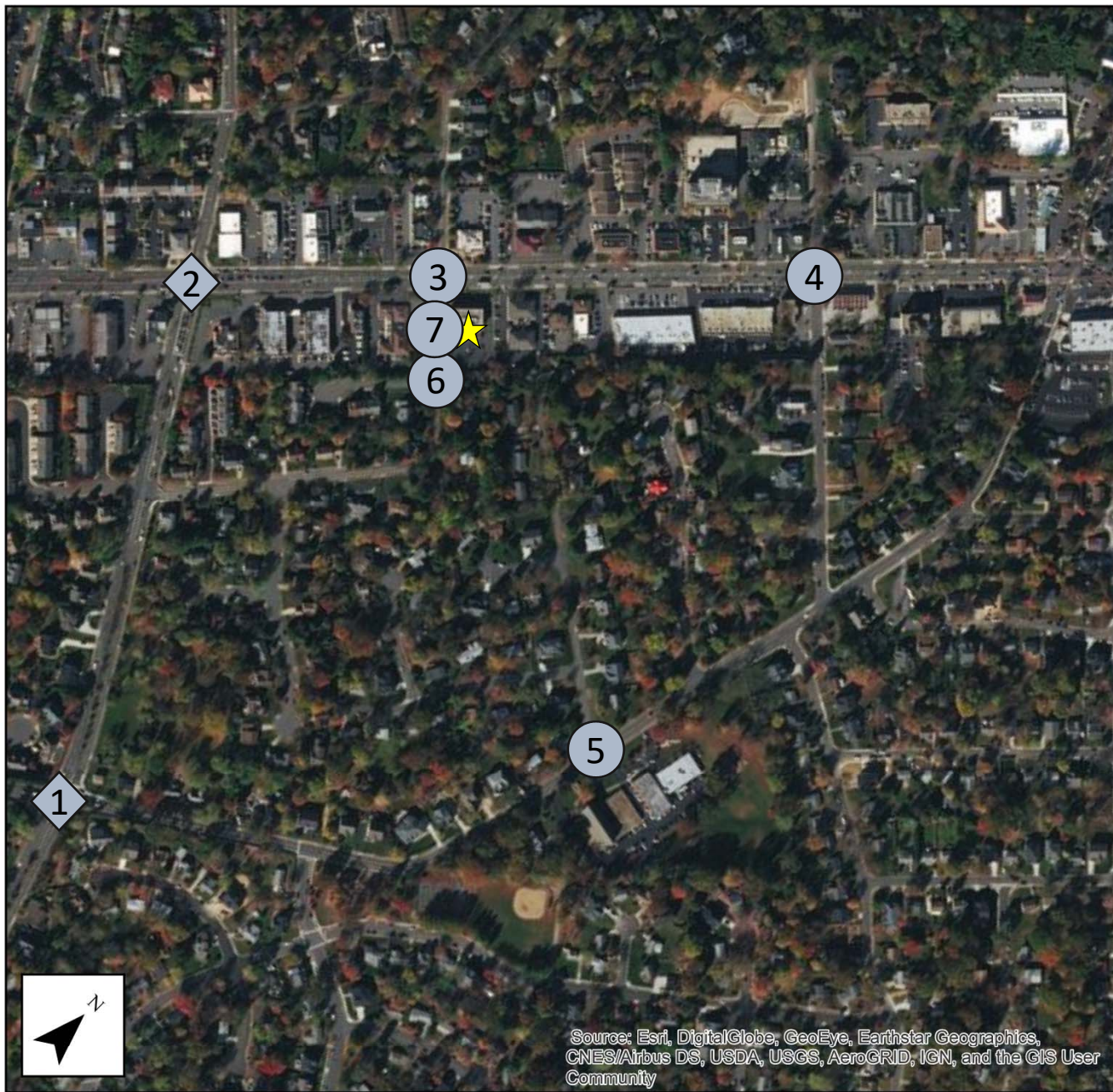
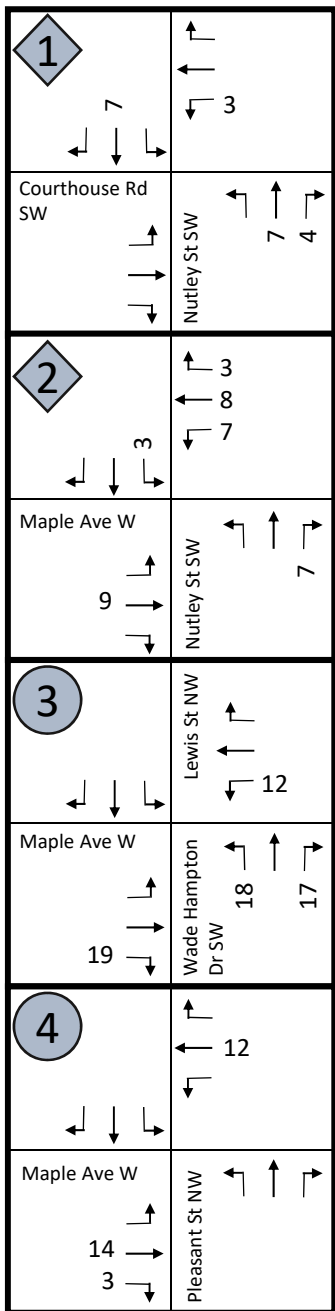
5	Glen Ave SW	4
Courthouse Rd SW	Private Drive	
4		
6	Glen Ave SW	4
Millwood Ct SW	Wade Hampton Dr SW	
7	Site Driveway	39
	Wade Hampton Dr SW	4







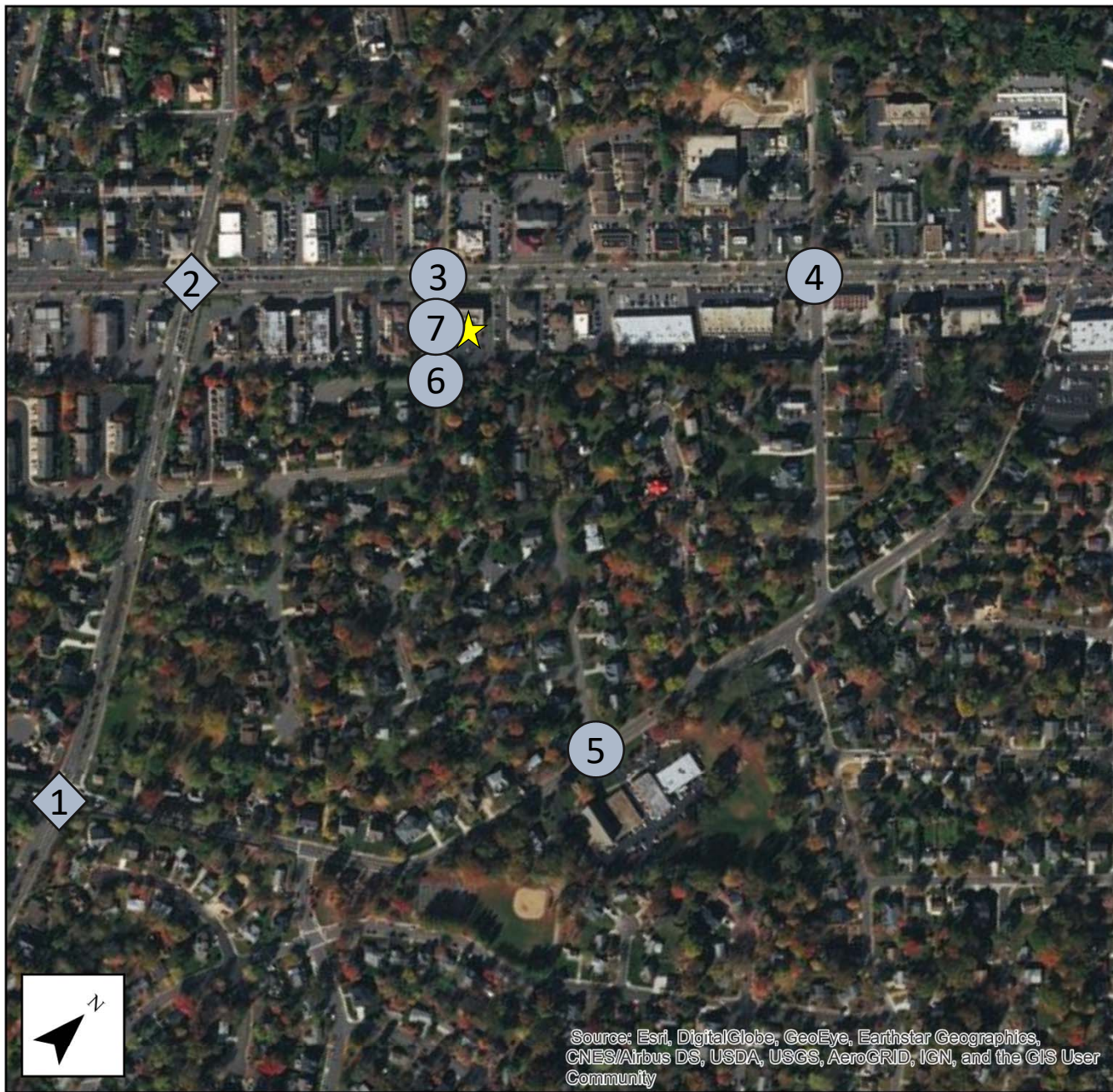




TOTAL FUTURE TRAFFIC VOLUMES

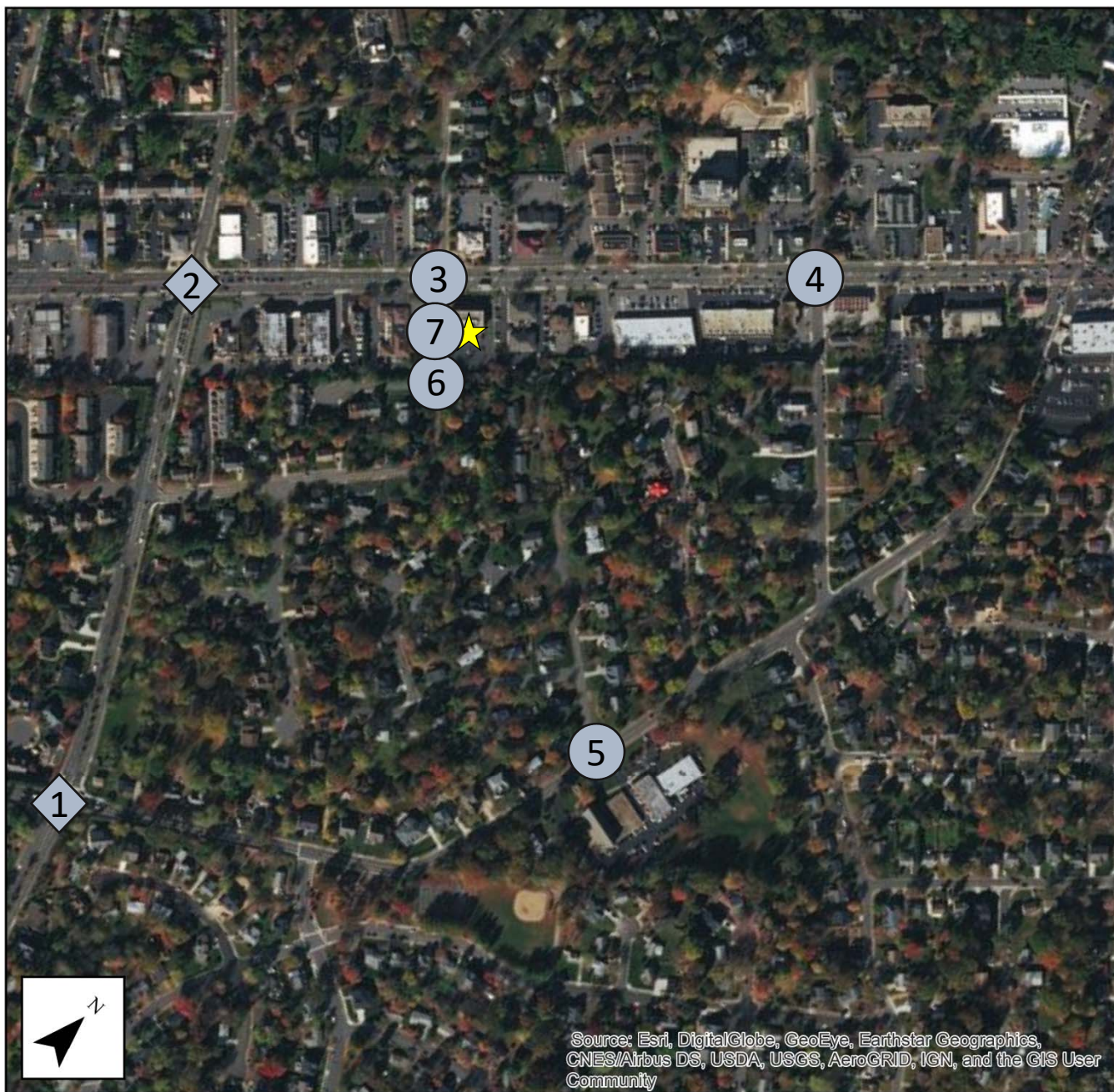
Total future volumes represent future traffic volumes with the full build-out of the proposed development. This was calculated by adding the trips generated by the net trips proposed to the background traffic volumes. Total future volumes were calculated for the build-out year of 2020. The resulting 2020 total future traffic volumes at the study intersections are shown on **Figure 28 to Figure 30**.

<div>1</div> <div> <div>15</div> <div>560</div> <div>24</div> </div> <div> <div>46</div> <div>34</div> <div>197</div> </div>	
<div>Courthouse Rd SW</div> <div> <div>31</div> <div>233</div> <div>378</div> </div> <div> <div>70</div> <div>714</div> <div>235</div> </div>	<div>Nutley St SW</div>
<div>2</div> <div> <div>63</div> <div>568</div> <div>172</div> </div> <div> <div>63</div> <div>568</div> <div>172</div> </div>	
<div>Maple Ave W</div> <div> <div>25</div> <div>893</div> <div>133</div> </div> <div> <div>296</div> <div>166</div> <div>352</div> </div>	<div>Nutley St SW</div>
<div>3</div> <div> <div>59</div> <div>1</div> <div>19</div> </div> <div> <div>26</div> <div>656</div> <div>13</div> </div>	<div>Lewis St NW</div>
<div>Maple Ave W</div> <div> <div>85</div> <div>1320</div> <div>12</div> </div> <div> <div>22</div> <div>7</div> <div>27</div> </div>	<div>Wade Hampton Dr SW</div>
<div>4</div> <div> <div>20</div> <div>5</div> <div>4</div> </div> <div> <div>28</div> <div>762</div> <div>16</div> </div>	
<div>Maple Ave W</div> <div> <div>45</div> <div>1142</div> <div>35</div> </div> <div> <div>18</div> <div>5</div> <div>20</div> </div>	<div>Pleasant St NW</div>



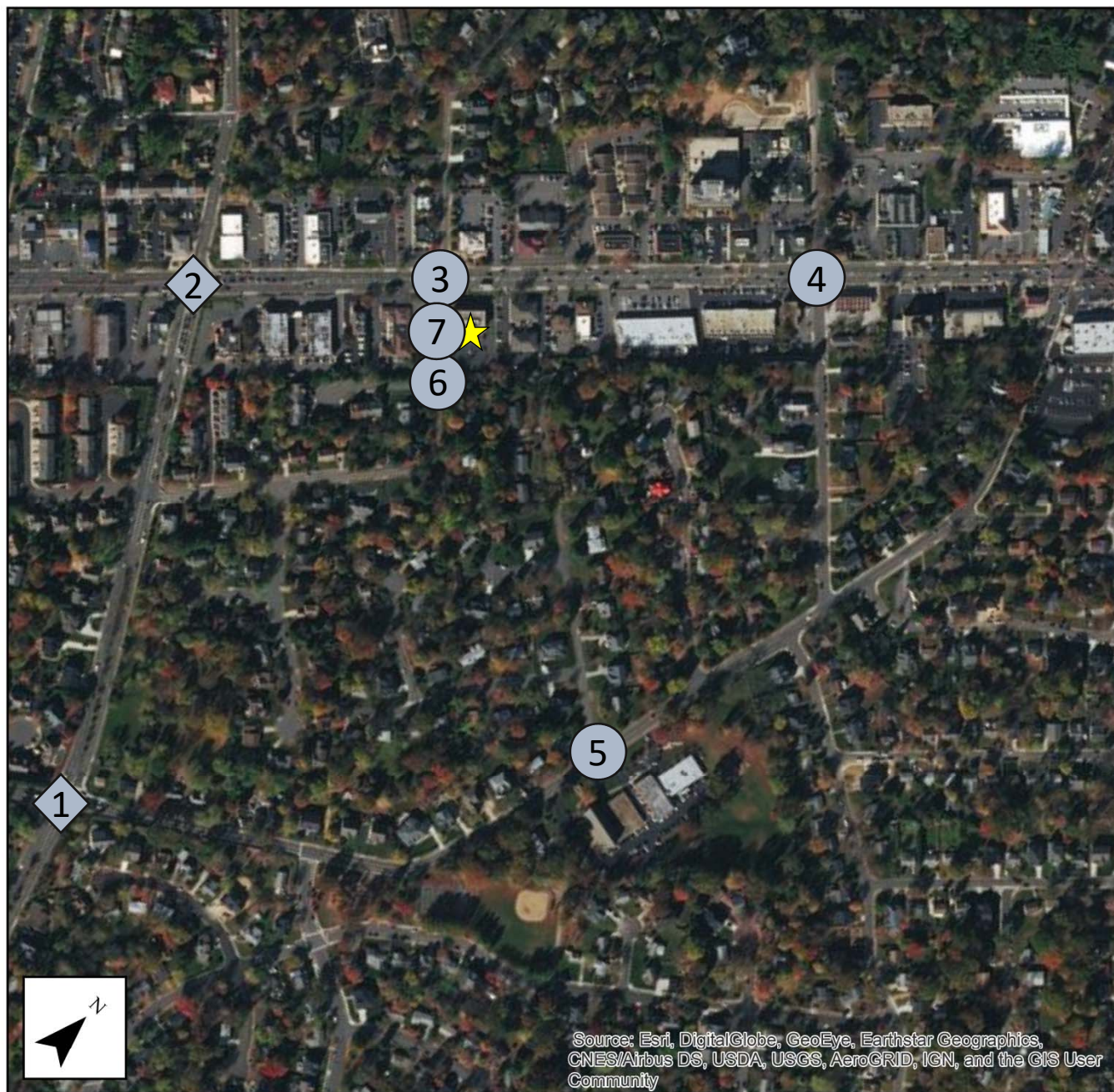
<div>5</div> <div> <div>12</div> <div>0</div> <div>14</div> </div> <div> <div>10</div> <div>215</div> <div>1</div> </div>	<div>Glen Ave SW</div>
<div>Courthouse Rd SW</div> <div> <div>10</div> <div>495</div> <div>2</div> </div> <div> <div>9</div> <div>0</div> <div>0</div> </div>	<div>Private Drive</div>
<div>6</div> <div> <div>2</div> <div>6</div> <div>5</div> </div> <div> <div>12</div> <div>0</div> <div>0</div> </div>	<div>Glen Ave SW</div>
<div>Millwood Ct SW</div> <div> <div>0</div> <div>1</div> <div>1</div> </div> <div> <div>1</div> <div>20</div> <div>4</div> </div>	<div>Wade Hampton Dr SW</div>
<div>7</div> <div> <div>13</div> <div>40</div> </div> <div> <div>39</div> <div>1</div> </div>	
<div>Wade Hampton Dr SW</div> <div> <div>28</div> <div>4</div> </div>	

1 55 601 13	33 230 214
Courthouse Rd SW 34 99 130	Nutley St SW 230 846 208
2 26 208 96	59 1244 284
Maple Ave W 34 571 168	Nutley St SW 299 204 355
3 32 1 5	Lewis St NW 16 1464 26
Maple Ave W 88 937 40	Wade Hampton Dr SW 16 1 41
4 19 0 3	37 1467 20
Maple Ave W 29 893 48	Pleasant St NW 11 4 28



5 9 0 7	Glen Ave SW 22 489 2
Courthouse Rd SW 19 350 2	Private Drive 4 0 13
6 2 14 10	Glen Ave SW 20 1 5
Millwood Ct SW 1 1 0	Wade Hampton Dr SW 1 31 0
7 26 50	Site Driveway 50
	Wade Hampton Dr SW 46 6

1	35 532 34	29 97 211
Courthouse Rd SW	50 90 140	Nutley St SW 80 681 219
2	44 137 105	63 791 310
Maple Ave W	50 888 125	Nutley St SW 192 133 411
3	26 2 7	Lewis St NW 23 1041 32
Maple Ave W	62 1228 32	Wade Hampton Dr SW 22 0 43
4	22 3 5	24 1088 26
Maple Ave W	42 1143 69	Pleasant St NW 15 3 25



5	8 1 21	Glen Ave SW 14 361 2
Courthouse Rd SW	17 350 2	Private Drive 22 0 17
6	2 12 23	Glen Ave SW 20 1 3
Millwood Ct SW	1 0 2	Wade Hampton Dr SW 1 11 2
7	37 37	Site Driveway 41
		Wade Hampton Dr SW 27 5

2020 TOTAL FUTURE CONDITIONS CAPACITY ANALYSIS

The capacity analyses for 2020 total future traffic volumes were based on the total future traffic volumes with existing lane uses and traffic controls at the study area intersections. Peak hour factors and heavy vehicle percentages were the same as those used in the background conditions analyses. The background traffic signal timings were unchanged for the total future conditions analyses.

The results of the intersection capacity analyses are summarized in *Table 10*. Results of the background 2020 conditions and existing 2018 conditions results are also shown for comparison. Analysis results show overall level of service and corresponding delay information for each movement, approach, and overall intersection. The Synchro analysis reports are contained in **Appendix E**.

The delay at the signalized intersections will increase under the total future conditions. It is noted, however, that all signalized intersections will operate at the same LOS when comparing background and total future conditions. This indicates that the traffic impacts on congestion and delay associated with the proposed development will be minimal, especially when compared to the impacts of the assumed regional growth and the pipeline developments.

The intersection of Nutley Street Southwest and Courthouse Road Southwest and the intersection of Maple Avenue West and Nutley Street Southwest will continue to operate at LOS E during the AM peak hour, which is below the intersection operation standard identified in the scoping document. However, during the AM peak hour, the traffic generated by the proposed development only adds 0.2 seconds of overall intersection delay to the former intersection and only adds 2.4 seconds of overall intersection delay to the latter intersection.

It is noted that, compared to background conditions, the same movements and approaches at signalized intersections will operate at LOS E or F during one or multiple peak hours. The only significant change will be the eastbound approach of Maple Avenue West which changes from LOS E to LOS F during the Saturday midday peak period.

Generally, most movements and approaches will also experience increased vehicle delays due to the increased amount of traffic that is forecasted in the area. Exceptions to this occur where optimized signal timings were used to reallocate the amount of green time to better serve congested approaches.

It is also noted that there will be multiple minor street movements and approaches that operate at LOS E or F at unsignalized intersections, particularly those along Maple Avenue West. Due the heavy east-west traffic flows along Maple Avenue West during the peak hours, additional delays are experienced for vehicles turning from the minor street. It is noted that these delays are not uncommon or unexpected for unsignalized approaches to congested corridors.

Under total future conditions, a significant delay is anticipated at the northbound approach of Wade Hampton Drive Southwest at Maple Avenue West. Traffic exiting the proposed site is anticipated to experience delays accessing Maple Avenue (particularly for those vehicles that are turning left).

It is anticipated that motorists will find a balance between waiting out the delays at the northbound approach and the extra travel time required to identify and use an alternate route.

Realistically, there are not many mitigation options to reduce the delay at the minor street approach; the traffic volumes do not warrant a signal (which is also precluded by intersection spacing along Maple Avenue West) and the east-west travel traffic patterns along Maple Avenue are dependent on efficient intersection to intersection progression, which limits the number of gaps available for left turn movements

from the minor streets along Maple Avenue West. However, to mitigate the impacts at the intersection of Wade Hampton Southwest at Maple Avenue West, the project will change the northbound approach from a single, left-through-right lane to one left-through lane and one right-turn only lane. This improvement provides a significant benefit for the approach by allowing right-turning vehicles their own lane so that they are not blocked by left-turning or through vehicles which experience heavier delay. This also allows vehicles that would normally turn left onto Maple Avenue West the option to easily turn right if they determine that the delay for the left-turn movement is long than they would prefer to wait.

Should the Town determine that the existing or forecasted delays at this intersection are too large, potential mitigation options may include restricting certain turning movements during the peak hours or installing “do not block the intersection” signage and/or pavement markings to facilitate the creation of gaps in traffic during congested conditions.

Table 10: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
1. Nutley Street Southwest and Courthouse Road Southwest (signalized)										
Northbound (Nutley Street Southwest)	L	26.1 (C)	17.7 (B)	14.3 (B)	23.0 (C)	16.7 (B)	14.2 (B)	23.2 (C)	16.7 (B)	14.3 (B)
	T	40.9 (D)	22.5 (C)	20.2 (C)	36.9 (D)	24.6 (C)	1.5 (A)	37.4 (D)	24.9 (C)	1.6 (A)
	R	41.9 (D)	23.1 (C)	21.0 (C)	37.2 (D)	24.7 (C)	1.5 (A)	37.7 (D)	25.0 (C)	1.6 (A)
	Overall	40.3 (D)	21.8 (C)	20.0 (C)	36.1 (D)	23.2 (C)	2.6 (A)	36.5 (D)	23.4 (C)	2.7 (A)
Southbound (Nutley Street Southwest)	L	30.7 (C)	20.5 (C)	16.1 (B)	27.0 (C)	21.7 (C)	15.3 (B)	27.3 (C)	21.8 (C)	15.4 (B)
	T	33.8 (C)	25.3 (C)	18.4 (B)	23.3 (C)	2.4 (A)	0.9 (A)	23.6 (C)	2.4 (A)	0.9 (A)
	R	33.9 (C)	25.6 (C)	18.5 (B)	23.2 (C)	2.4 (A)	0.9 (A)	23.5 (C)	2.4 (A)	0.9 (A)
	Overall	33.7 (C)	25.4 (C)	18.3 (B)	23.4 (C)	2.8 (A)	1.7 (A)	23.7 (C)	2.8 (A)	1.7 (A)
Eastbound (Courthouse Road Southwest)	L	43.1 (D)	53.5 (D)	47.4 (D)	53.8 (D)	76.5 (E)	63.1 (E)	53.8 (D)	76.5 (E)	63.1 (E)
	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	R	65.2 (E)	55.8 (E)	49.7 (D)	155.4 (F)	92.4 (F)	69.5 (E)	155.4 (F)	92.4 (F)	69.5 (E)
	Overall	56.1 (E)	54.6 (D)	48.6 (D)	113.6 (F)	84.3 (F)	66.3 (E)	113.6 (F)	84.3 (F)	66.3 (E)
Westbound (Courthouse Road Southwest)	L	63.1 (E)	49.7 (D)	48.3 (D)	73.8 (E)	72.6 (E)	69.7 (E)	74.3 (E)	73.1 (E)	70.0 (E)
	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	R	56.5 (E)	52.5 (D)	43.9 (D)	56.4 (E)	86.9 (F)	57.0 (E)	56.1 (E)	86.9 (F)	56.7 (E)
	Overall	61.2 (E)	51.1 (D)	46.6 (D)	68.7 (E)	80.5 (F)	64.9 (E)	69.1 (E)	80.7 (F)	65.0 (E)
Overall Intersection		45.3 (D)	31.4 (C)	27.8 (C)	56.4 (E)	34.3 (C)	20.1 (C)	56.6 (E)	34.4 (C)	20.1 (C)
2. Nutley Street Southwest and Maple Avenue West (signalized)										
Northbound (Nutley Street Southwest)	L	62.0 (E)	73.1 (E)	53.7 (D)	72.6 (E)	116.0 (F)	57.4 (E)	72.8 (E)	116.0 (F)	57.4 (E)
	T	54.9 (D)	75.2 (E)	56.6 (E)	56.0 (E)	111.9 (F)	59.6 (E)	56.3 (E)	112.0 (F)	59.7 (E)
	R	37.7 (D)	38.0 (D)	32.5 (C)	20.2 (C)	51.1 (D)	5.4 (A)	20.4 (C)	48.3 (D)	4.7 (A)
	Overall	49.1 (D)	58.9 (E)	41.7 (D)	45.7 (D)	88.4 (F)	29.1 (C)	45.9 (D)	88.8 (F)	28.5 (C)
Southbound (Nutley Street Southwest)	L	47.9 (D)	59.1 (E)	52.7 (D)	51.3 (D)	62.5 (E)	56.6 (E)	51.4 (D)	62.8 (E)	56.9 (E)
	T	73.4 (E)	74.1 (E)	57.9 (E)	99.6 (F)	89.8 (F)	65.7 (E)	99.6 (F)	89.8 (F)	65.7 (E)
	R	-	-	-	-	-	-	-	-	-
	Overall	68.4 (E)	70.6 (E)	56.4 (E)	87.6 (F)	82.2 (F)	62.5 (E)	87.5 (F)	82.0 (F)	62.5 (E)
Eastbound (Maple Avenue West)	L	23.7 (C)	27.5 (C)	22.0 (C)	30.6 (C)	35.5 (D)	30.8 (C)	31.1 (C)	35.8 (D)	31.5 (C)
	T	48.3 (D)	36.2 (D)	40.1 (D)	84.5 (F)	43.3 (D)	79.7 (E)	91.5 (F)	43.8 (D)	91.3 (F)
	R	-	-	-	-	-	-	-	-	-
	Overall	47.8 (D)	35.9 (D)	39.4 (D)	83.2 (F)	43.0 (D)	77.4 (E)	90.1 (F)	43.5 (D)	88.5 (F)

Table 10: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Westbound (Maple Avenue West)	L	39.2 (D)	23.0 (C)	26.7 (C)	89.5 (F)	45.2 (D)	64.2 (E)	90.0 (F)	49.1 (D)	62.2 (E)
	T	29.4 (C)	35.0 (C)	24.0 (C)	27.2 (C)	23.3 (C)	14.4 (B)	27.6 (C)	24.3 (C)	14.4 (B)
	R	-	-	-	-	-	-	-	-	-
	Overall	31.4 (C)	32.9 (C)	24.7 (C)	40.3 (D)	27.2 (C)	27.6 (C)	41.0 (D)	28.7 (C)	27.1 (C)
Overall Intersection		46.7 (D)	43.3 (D)	36.2 (D)	62.8 (E)	50.5 (D)	47.3 (D)	65.2 (E)	50.9 (D)	50.6 (D)
3. Wade Hampton Drive/Lewis Street N and Maple Avenue (unsignalized)										
Northbound (Wade Hampton Drive/Lewis St North)	L	50.5 (F)	34.8 (D)	15.9 (C)	99.3 (F)	20.6 (C)	40.4 (E)	314.2 (F)	83.4 (F)	483.6 (F)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	12.6 (B)	10.5 (B)	13.2 (B)
	Overall	50.5 (F)	34.8 (D)	15.9 (C)	99.3 (F)	20.6 (C)	40.4 (E)	168.8 (F)	31.9 (D)	172.4 (F)
Southbound (Wade Hampton Drive/Lewis St North)	L	13.2 (B)	42.9 (E)	21.1 (C)	17.2 (C)	22.9 (C)	44.2 (E)	17.8 (C)	29.1 (D)	49.5 (E)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	13.2 (B)	42.9 (E)	21.1 (C)	17.2 (C)	22.9 (C)	44.2 (E)	17.8 (C)	29.1 (D)	49.5 (E)
Eastbound (Maple Avenue West)	L	9.4 (A)	15.0 (C)	10.8 (B)	8.2 (A)	11.1 (B)	8.9 (A)	8.2 (A)	11.1 (B)	8.9 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	0.6 (A)	1.3 (A)	0.5 (A)	0.5 (A)	0.9 (A)	0.4 (A)	0.5 (A)	0.9 (A)	0.4 (A)
Westbound (Maple Avenue West)	L	9.5 (A)	8.5 (A)	9.6 (A)	9.7 (A)	8.5 (A)	10.1 (B)	9.7 (A)	8.5 (A)	10.2 (B)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	0.1 (A)	0.0 (A)	0.2 (B)	0.1 (A)	0.0 (A)	0.2 (B)	0.1 (A)	0.1 (A)	0.3 (B)
Overall Intersection		-	-	-	-	-	-	-	-	-
4. Pleasant Street Northwest and Maple Avenue (unsignalized)										
Northbound (Pleasant Street Northwest)	L	588.1 (F)	39.7 (E)	75.0 (F)	26.9 (D)	22.6 (C)	328.6 (F)	18.6 (C)	24.8 (C)	372.8 (F)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	588.1 (F)	39.7 (E)	75.0 (F)	26.9 (D)	22.6 (C)	328.6 (F)	18.6 (C)	24.8 (C)	372.8 (F)
Southbound (Pleasant Street Northwest)	L	63.7 (F)	17.1 (C)	30.9 (D)	20.4 (C)	16.3 (C)	56.4 (F)	14.2 (C)	16.4 (C)	61.0 (F)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	63.7 (F)	17.1 (C)	30.9 (D)	20.4 (C)	16.3 (C)	56.4 (F)	14.2 (C)	16.4 (C)	61.0 (F)
Eastbound (Maple Avenue W)	L	8.9 (A)	10.1 (B)	8.8 (A)	8.7 (A)	10.6 (B)	9.1 (A)	8.3 (A)	10.6 (B)	9.1 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-

Table 10: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
	Overall	1.0 (A)	0.3 (A)	0.3 (A)	0.9 (A)	0.3 (A)	0.3 (A)	0.3 (A)	0.3 (A)	0.3 (A)
Westbound (Maple Avenue W)	L	12.0 (B)	10.0 (A)	11.4 (B)	9.1 (A)	8.4 (A)	9.5 (A)	9.1 (A)	8.4 (A)	9.5 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	0.2 (A)	0.1 (A)	0.3 (A)	0.2 (A)	0.1 (A)	0.2 (A)	0.2 (A)	0.1 (A)	0.2 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-
5. Glen Avenue SW and Courthouse Road SW (unsignalized)										
Northbound (Glen Avenue SW)	L	17.7 (C)	12.7 (B)	14.9 (B)	17.7 (C)	12.8 (B)	15.2 (C)	17.8 (C)	12.9 (B)	15.4 (C)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	17.7 (C)	12.7 (B)	14.9 (B)	17.7 (C)	12.8 (B)	15.2 (C)	17.8 (C)	12.9 (B)	15.4 (C)
Southbound (Glen Avenue SW)	L	14.2 (B)	15.6 (C)	15.8 (C)	14.2 (B)	15.8 (C)	16.2 (C)	14.3 (B)	16.0 (C)	16.5 (C)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	14.2 (B)	15.6 (C)	15.8 (C)	14.2 (B)	15.8 (C)	16.2 (C)	14.3 (B)	16.0 (C)	16.5 (C)
Eastbound (Courthouse Road SW)	L	7.7 (A)	8.4 (A)	8.0 (A)	7.7 (A)	8.5 (A)	8.1 (A)	7.7 (A)	8.5 (A)	8.1 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	0.1 (A)	0.3 (A)	0.3 (A)	0.1 (A)	0.3 (A)	0.3 (A)	0.2 (A)	0.4 (A)	0.4 (A)
Westbound (Courthouse Road SW)	L	8.5 (A)	8.0 (A)	8.1 (A)	8.5 (A)	8.0 (A)	8.1 (A)	8.5 (A)	8.0 (A)	8.0 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court (unsignalized)										
Northbound (Wade Hampton Drive SW)	L	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)	7.2 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	0.3 (A)	0.2 (A)	0.5 (A)	0.3 (A)	0.2 (A)	0.5 (A)	0.3 (A)	0.2 (A)	0.5 (A)
Southbound (Wade Hampton Drive SW)	L	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)	7.3 (A)
	T	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)	0.0 (A)
	R	-	-	-	-	-	-	-	-	-
	Overall	2.8 (A)	2.8 (A)	4.5 (A)	2.8 (A)	2.8 (A)	4.5 (A)	2.8 (A)	2.8 (A)	4.5 (A)
Eastbound (Glen Avenue SW/Millwood Court SW)	L	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-

Table 10: Summary of 2020 Total Future Capacity Analysis Results										
Delay, Seconds per Vehicle (Level of Service)										
Intersection		Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Mvmnt	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
	Overall	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)	8.8 (A)	9.3 (A)	8.6 (A)
Westbound (Glen Avenue SW/Millwood Court SW)	L	8.5 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	8.5 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)	8.4 (A)	8.8 (A)	8.6 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-
7. Wade Hampton Drive SW and Site DW (unsignalized)										
Northbound (Wade Hampton Drive SW)	L	-	-	-	-	-	-	-	-	-
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	-	-	-	-	-	-	0.0 (A)	0.0 (A)	0.0 (A)
Southbound (Wade Hampton Drive SW)	L	-	-	-	-	-	-	7.3 (A)	7.4 (A)	7.3 (A)
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	-	-	-
	Overall	-	-	-	-	-	-	5.5 (A)	4.9 (A)	3.7 (A)
Westbound (Site Driveway)	L	-	-	-	-	-	-	-	-	-
	T	-	-	-	-	-	-	-	-	-
	R	-	-	-	-	-	-	8.6 (A)	8.8 (A)	8.6 (A)
	Overall	-	-	-	-	-	-	8.6 (A)	8.8 (A)	8.6 (A)
Overall Intersection		-	-	-	-	-	-	-	-	-

2020 TOTAL FUTURE CONDITIONS QUEUING ANALYSIS

Synchro 95th percentile queue analyses were performed at study area intersections under total future conditions as shown in **Table 11**. A 95th percentile queue length is the queue length that only has a 5 percent likelihood of being exceeded during the peak hour. The values shown below are based on an assumed queuing of 25 feet per vehicle in the queue, which is standard for Synchro queueing analyses. The effective storage of turn lanes, equal to the full-width length plus half the taper length, is shown for comparison. Synchro Reports are included in Appendix F.

Under total future conditions, queuing at certain turning movements at the signalized intersections will exceed the available storage length under one or multiple peak periods. These include:

- NBL at Nutley Street Southwest and Courthouse Road Southwest during the PM peak hour (consistent with background conditions)
- EBTL at Nutley Street Southwest and Courthouse Road Southwest during the AM peak hour (consistent with background conditions)
- WBTR at Nutley Street Southwest and Courthouse Road Southwest during the AM, PM and Saturday midday peak hours (consistent with background conditions)
- NBL at Nutley Street Southwest and Maple Avenue West during the AM and PM peak hours (consistent with background conditions)

- WBL at Nutley Street Southwest and Maple Avenue West during the AM and Saturday Middy peak hours (longer than background conditions during the AM and consistent with background conditions during the PM)

Queuing at unsignalized intersections will generally be insignificant with the exception of a queue of approximate 3.5 cars at the minor street northbound approach to Maple Avenue West from Wade Hampton Drive Southwest during the AM peak hour, and a queue of 5 vehicles at the minor street northbound approach to Maple Avenue West from Pleasant Street Northwest during the Saturday peak hour.

The queuing for the through movements along Maple Avenue W continue to underscore the fact that it is a significant east-west corridor that supports peak direction commuter travel patterns. During the peak hours, this amount of queuing and congestion creates challenges for turning movements from minor street approaches. This is more pronounced in the total future conditions, specifically at the adjacent street to the propose site (Wade Hampton Drive Southwest). However, the maximum northbound queueing at this location represents approximately 3.5 vehicles waiting to turn onto Maple Avenue West. This is not anticipated to negative impact access and egress to the proposed site or to impact the local neighborhood intersections and streets.

Table 11: Summary of 2020 Total Future 95 TH Percentile Queues (Feet)											
Intersection			Existing (2018)			Background (2020)			Total Future (2020)		
Approach	Movement	Storage	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
1. Nutley Street SW and Courthouse Road SW (signalized)											
Northbound (Nutley Street SW)	NBL	115	85	208	74	36	120	84	36	120	84
	NBTR	N/A	607	551	418	267	618	352	271	631	356
Southbound (Nutley Street SW)	SBL	45	38	20	38	13	13	26	13	13	26
	SBTR	N/A	330	287	252	188	385	273	193	386	275
Eastbound (Courthouse Road SW)	EBLT	225	386	224	205	347	218	199	347	218	199
	EBR	N/A	137	66	62	353	59	50	359	59	50
Westbound (Courthouse Road SW)	WBL	N/A	305	322	282	278	312	276	283	316	280
	WBTR	70	104	384	166	94	378	161	93	379	160
2. Nutley Street SW and Maple Avenue W (signalized)											
Northbound (Nutley Street SW)	NBL	220	314	353	162	384	448	142	384	448	142
	NBLT	n/a	280	382	209	237	451	158	237	451	158
	NBR	n/a	178	112	153	87	233	10	91	248	10
Southbound (Nutley Street SW)	SBL	200	111	116	104	152	152	146	153	159	151
	SBTR	n/a	444	333	215	502	384	234	502	384	234
Eastbound (Maple Avenue W)	EBL	90	25	31	39	32	39	54	32	39	54
	EBTR	N/A	632	355	590	722	424	783	726	433	793
Westbound (Maple Avenue W)	WBL	285	185	219	272	272	259	445	287	281	459
	WBTR	n/a	283	712	365	322	724	391	335	763	400
3. Wade Hampton Drive/Lewis Street N and Maple Avenue (unsignalized)											
Northbound (Wade Hampton Drive/Lewis St North)	NBLTR	N/A	20	23	8	35	13	23	-	-	-
	NBL	N/A	-	-	-	-	-	-	83	25	75

Table 11: Summary of 2020 Total Future 95 TH Percentile Queues (Feet)												
Intersection			Existing (2018)			Background (2020)			Total Future (2020)			
Approach	Movement	Storage	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT	
	NBR	67	-	-	-	-	-	-	5	5	8	
Southbound (Wade Hampton Drive/Lewis St North)	SBLTR	N/A	13	30	13	18	15	28	20	20	30	
Eastbound (Maple Avenue W)	EBL	120	8	20	8	5	13	5	5	13	5	
	EBTR	N/A	0	0	0	0	0	0	0	0	0	
Westbound (Maple Avenue W)	WBL	95	0	0	3	0	0	3	3	3	3	
	WBTR	N/A	0	0	0	0	0	0	0	0	0	
4. Pleasant Street Northwest and Maple Avenue (unsignalized)												
Northbound (Pleasant Street Northwest)	NBLTR	N/A	143	30	55	20	15	118	13	18	123	
Southbound (Pleasant Street Northwest)	SBLTR	N/A	35	5	23	10	5	43	5	5	45	
Eastbound (Maple Avenue W)	EBL	55	13	3	3	10	3	3	3	3	3	
	EBTR	N/A	0	0	0	0	0	0	0	0	0	
Westbound (Maple Avenue W)	WBL	70	3	3	3	3	3	3	3	3	3	
	WBTR	N/A	0	0	0	0	0	0	0	0	0	
5. Glen Avenue SW and Courthouse Road SW (unsignalized)												
Northbound (Glen Avenue SW)	NBLTR	N/A	3	5	8	3	3	3	3	8	3	
Southbound (Glen Avenue SW)	SBLTR	N/A	5	3	8	5	3	5	5	8	5	
Eastbound (Courthouse Road SW)	EBLTR	N/A	0	0	0	0	0	0	3	0	0	
Westbound (Courthouse Road SW)	WBLTR	N/A	0	0	0	0	0	0	0	0	0	
6. Wade Hampton Drive SW and Glen Avenue SW/ Millwood Court (unsignalized)												
Northbound (Wade Hampton Drive SW)	NBLTR	N/A	0	0	0	0	0	0	0	0	0	
Southbound (Wade Hampton Drive SW)	SBLTR	N/A	0	0	0	0	0	0	0	0	0	
Eastbound (Glen Avenue SW/Millwood Court SW)	EBLTR	N/A	0	0	0	0	0	0	0	0	0	
Westbound (Glen Avenue SW/Millwood Court SW)	WBLTR	N/A	0	3	3	0	3	3	0	3	3	
7. Wade Hampton Drive and Site Driveway (unsignalized)												
Northbound (Wade Hampton Drive)	NBTR	N/A	-	-	-	-	-	-	0	3	3	
Southbound (Wade Hampton Drive)	SBLT	N/A	-	-	-	-	-	-	3	3	3	
Westbound (Site Driveway)	WBLR	N/A	-	-	-	-	-	-	3	5	3	

TRANSPORTATION DEMAND MANAGEMENT

The Town of Vienna encourages developers to consider strategies and measure to reduce the impacts of traffic on the site and the adjacent streets. Transportation demand management means the application of strategies and policies to reduce travel demand of single-occupancy private vehicles, or to redistribute this demand in space or in time. The Town suggests that applicants should consider developing a TDM plan that includes a minimum of three of the following transportation demand management activities:

- Establish a development-specific website that provides multi-modal transportation information such as real-time travel/traffic information, bus routes, bus schedules and maps and alternative commute log (bicycle, pedestrian, carpool, and vanpool).
- Disclose in writing to all employees transportation information and educational materials.
- Coordinate the formation of, but not limited to, carpooling, vanpooling, ridesharing, guaranteed ride home, teleworking, or shuttle service programs.
- Create a preferential parking management plan that specifically marks spaces for each registered carpool and/or vanpool vehicle and/or accommodates carshare designated-spaces located near building entrances or in other preferential locations.
- Institute and maintain off-peak work schedules, allowing employees to arrive and depart at times other than the peak commute period. The peak morning commuter period is defined as 7:00 AM to 9:00 AM, the peak mid-day commuter period is defined as 11:30 AM to 1:30 PM, and the peak evening commuter period is defined as 5:00 PM. and 7:00 PM.
- Establish an office location within the development, staffed by the transportation coordinator that makes transportation and ride-sharing information available to employees and residents.

While the applicant has not yet identified specific TDM strategies, they remain committed to working with the Town and the community to reduce traffic into the residential neighborhoods. This has factored into the building design which facilitates easy access to ride sharing companies and delivery trucks. The applicant will also discuss feasibility of installing equipment that displays NextBus information with the Town Department of Public Works.

PARKING DEMAND

The proposed site will include 125 parking spaces divided among above- and below-grade garage parking to accommodate the employees, visitors, patrons, and residents.

Article 16 of the Town Code of Vienna specifies the following off-street parking requirements for the proposed uses:

- Multiple Family, two or more Bedrooms: 2 spaces/dwelling unit
- Commercial Building: 1 space/200 SF of floor area

Based on the parking ratios and the actual dwelling units/square footage of the current development (40 units and 7,500 SF of retail), the proposed development is *required* to have 80 parking spaces to satisfy the residential component (assuming only two-bedroom units), and 38 parking spaces to satisfy the retail component for a total of 118 parking spaces. The site will contain a surplus of 7 spaces.

Based on the principles of shared parking, it is recognized that different uses in a mixed-use site have unique peak parking trends. As such the peak demand for residential parking may not overlap with the peak demand for retail parking.

Should the applicant seek to reduce the number of parking spaces, a shared parking analysis and parking demand study would be provided as justification.

CONCLUSIONS

Based on the intersection capacity analyses that were conducted, it is concluded that the proposed development will result in minimal traffic impacts to the area transportation network and that parking will be provided in accordance with the Town's Zoning Ordinance.

Under existing conditions, all signalized study intersections operate at or better than overall intersection LOS D during the AM, PM, and Saturday midday peak hours.

Under background conditions, both the intersection of Nutley Street Southwest and Courthouse Road Southwest and the intersection of Maple Avenue West and Nutley Street Southwest will operate at LOS E during the AM peak hour, which is below the intersection operation standard identified in the scoping document.

These results suggest that the background traffic associated with regional growth and pipeline developments impact signalized intersection operations.

The delays at the signalized intersections also increase under the total future conditions, i.e. with the proposed development in place. It is noted, however, that all signalized intersections operate at the same LOS when compared to background conditions. This confirms that the traffic impacts on congestion and delay associated with the proposed development will be minimal, specifically when compared to the traffic impacts of the regional growth and the traffic generated by pipeline developments.

The intersection of Nutley Street Southwest and Courthouse Road Southwest and the intersection of Maple Avenue West and Nutley Street Southwest continue to operate at LOS E during the AM peak hour; this is below the intersection operation standard identified in the scoping document. It is noted; however, that the proposed development only adds 0.2 seconds of overall intersection delay to the Nutley Street Southwest and Courthouse Road Southwest intersection and only 2.4 seconds of overall intersection delay to Maple Avenue West and Nutley Street Southwest intersection during the AM peak hour.

Under total future conditions, significant delays are anticipated at the northbound approach of Wade Hampton Drive Southwest at Maple Avenue West. Traffic exiting the proposed site is anticipated to experience delays accessing Maple Avenue (particularly for those vehicles that are turning left). Due the heavy east-west traffic flows along Maple Avenue West during the peak hours, additional delays are experienced for vehicles turning from the minor streets along Maple Avenue West. It is noted that these delays are not uncommon or unexpected for unsignalized approaches to congested corridors. It is anticipated that motorists will find a balance between waiting out the delays at the northbound approach of Wade Hampton Drive Southwest and the extra travel time required to use an alternate route.

To mitigate the impacts at the intersection of Wade Hampton Southwest at Maple Avenue West, the project will change the northbound approach from a single, left-through-right lane to one left-through lane and one right-turn only lane. This improvement provides a significant benefit for the approach by allowing right-turning vehicles their own lane so that they are not blocked by left-turning or through vehicles which experience heavier delay. This also allows vehicles that would normally turn left onto Maple Avenue West the option to easily turn right if they determine that the delay for the left-turn movement is long than they would prefer to wait.

The maximum northbound queueing at this location is approximately 3.5 vehicles waiting to turn onto Maple Avenue West. This is not anticipated to negatively impact access and egress to the proposed site or to impact the local neighborhood intersections and streets.

Realistically, there are few mitigation options to reduce the delay at the minor street approach; the traffic volumes do not warrant a signal (which is also precluded by intersection spacing along Maple Avenue West) and the east-west travel pattern along Maple Avenue is dependent on efficient intersection to intersection progression, which limits the number of gaps available for left turn movements from the minor streets. The separation of the northbound approach into a left-through lane and right-turn lane at this location provides a considerable benefit.

Should the Town determine that the real or forecasted delays at this intersection are too much to bear, potential mitigation options may include restricting certain turning movements during the peak hours or installing “do not block the intersection” signage and/or pavement markings to facilitate the creation of gaps in traffic during congested conditions. The developer has also expressed a desire to work with the Town and the community to develop strategies to minimize the impact of traffic on residential streets. One such strategy is the proposed prohibition of left turns exiting the site, which will reduce the possibility of site traffic driving through neighborhood streets.