OAKVILLE TRIANGLE AND ROUTE 1 CORRIDOR PLANNING STUDY AREA

MULTIMODAL TRANSPORTATION STUDY

PREPARED FOR:

STONEBRIDGECARRAS, LLC.

MARCH 6, 2015 | FINAL REPORT

Prepared By:

Kimley»Horn

OAKVILLE TRIANGLE AND ROUTE 1 CORRIDOR PLANNING STUDY AREA

MULTIMODAL TRANSPORTATION STUDY

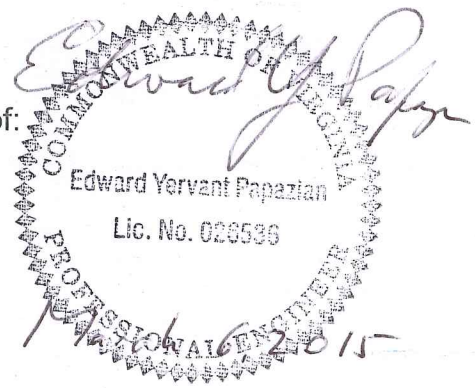
PREPARED FOR:

STONEBRIDGECARRAS, LLC.

MARCH 6, 2015 | FINAL REPORT

Prepared Under the Supervision of:

Edward Y. Papazian, P.E.



Kimley»Horn

11400 Commerce Park Drive, Suite 400
Reston, VA 20191
Phone: 703 674 1300

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Introduction and Executive Summary

1.1 OVERVIEW

As the east side of US Route 1 is being redeveloped, the City of Alexandria has focused attention to the parcels on the west side of Route 1 and is embarking on an effort to plan for the potential redevelopment of these parcels.

Oakville Triangle is the most significant and only tract along the west side of Route 1 that is positioned for redevelopment, while the balance of the land along the west side of Route 1 will require assemblage to undertake any meaningful increase in density,. Oakville Triangle is envisioned as an urban, walkable, mixed-use development. At full build-out, the Oakville Triangle is currently planned to contain approximately the following: a 150-room hotel, 1,074 mid-rise apartment units, 85,440 square feet of small format specialty retail uses, and 56,900 square feet of high-turnover restaurant uses.

The City of Alexandria recognizes the redevelopment potential of other parcels along the west side of US Route 1. The City of Alexandria estimates that by 2027, these parcels have the potential to be redeveloped into 70,000 square feet of commercial development and 720,000 square feet of residential development. Collectively, the Oakville Triangle and these remaining parcels along the west side of US Route 1 are known as the Route 1 Corridor Planning Study Area.

StonebridgeCarras and IndCor, the owner of the approximately 13-acre Oakville Triangle parcel that extends from Fannon Street to Calvert Avenue, are working with the City to develop the design principles and guidelines for the remaining Route 1 Corridor Planning Study Area. The planning process is expected to result in a Master Plan Amendment of the existing Potomac West Small Area Plan, which includes the areas containing the Oakville Triangle and the remaining Route 1 Corridor Planning Study Area parcels.

As a part of the collaboration between StonebridgeCarras and the City of Alexandria, this multimodal transportation analysis was prepared to study the existing and future transportation conditions of US Route 1 and affected neighborhood streets in the context of a redeveloped Oakville Triangle and Route 1 Corridor Planning Study Area.

This report documents and analyzes existing transportation conditions, future conditions without development (including future transportation improvements, regional growth in traffic, traffic generated by nearby approved and unbuilt developments), and future conditions with development. The study makes recommendations for transportation demand management, streets, transit, bicycles, and pedestrians related to the Oakville Triangle and Route 1 Corridor Planning Study Area.

1.2 STUDY PURPOSE

This study was performed concurrently with the land use plan development effort for Oakville Triangle to make recommendations for the future multimodal transportation network. The resulting transportation recommendations may become incorporated in a “small-small area plan” for the Route

1 Corridor Planning Study Area. This study was prepared in accordance with the City's Transportation Planning Administrative Guidelines – Multimodal Transportation Studies (March 2013).

This study also complies with *Virginia Department of Transportation (VDOT) Traffic Impact Analysis Regulations 24 VAC 30-155* under Chapter 527 of the 2006 Code of Virginia.

1.3 PUBLIC INVOLVEMENT

StonebridgeCarras, on behalf of the owner of the approximately 13-acre Oakville Triangle property, agreed to fund consultant services and staffing such that the City could begin the Route 1 Corridor planning efforts. Both the City and the developer view the community as a vital asset and resource in developing the "small-small area plan" principles for the study area, helping to establish a unified streetscape for Route 1, and an integrated approach to potential redevelopment along Route 1. A nine-member Oakville Triangle and Route 1 Corridor Advisory Group was established by the City Council on March 11, 2014. The Advisory Group provides advice to City staff on the planning and associated regulatory submissions for Oakville Triangle and the Route 1 Corridor, specifically assisting in developing Plan principles regarding potential land uses, open space, sustainability, transportation and connectivity issues, and potential community benefits.

1.4 EXECUTIVE SUMMARY

Site Location

The Oakville Triangle and Route 1 Corridor Planning Study Area parcels are located in the northeast corner of Alexandria. Arlington County and Four Mile Run are located to the north, the Potomac Yard Landbays and the Potomac River are located to the east, the residential neighborhoods of Lynhaven and Del Ray are located to the west and to the immediate south, and Old Town Alexandria is located further south. The Oakville Triangle and the other Route 1 Corridor Planning Study Area parcels are shown in regional context in ***Figure 1-1: Regional Context Map*** and in greater detail in ***Figure 1-2: Route 1 Corridor Planning Study Area*****.**

Description of Proposed Development

The land use scenarios described in this report for the Oakville Triangle are based on the development concept plans at the inception of this traffic study (June 2014). It is recognized that as the public involvement process continues, the developers of the Oakville Triangle and the City of Alexandria may refine the concepts and development levels. However, it is anticipated that the resulting density and land uses will be within the scope and magnitude of the overall quantities analyzed in this study. The full build-out approximate development quantities analyzed in this study for the Oakville Triangle are as follows:

- 1,074 dwelling units (primarily mid-rise apartments)
- 150-room Hotel
- 85,440 square feet of small-format specialty retail
- 56,960 square feet of high-turnover restaurant

The proposed development program for the Oakville Triangle will replace the existing 446,290 square foot mix of retail, services, and light industrial uses that currently exist on the site.

Figure 1-1: Regional Context Map

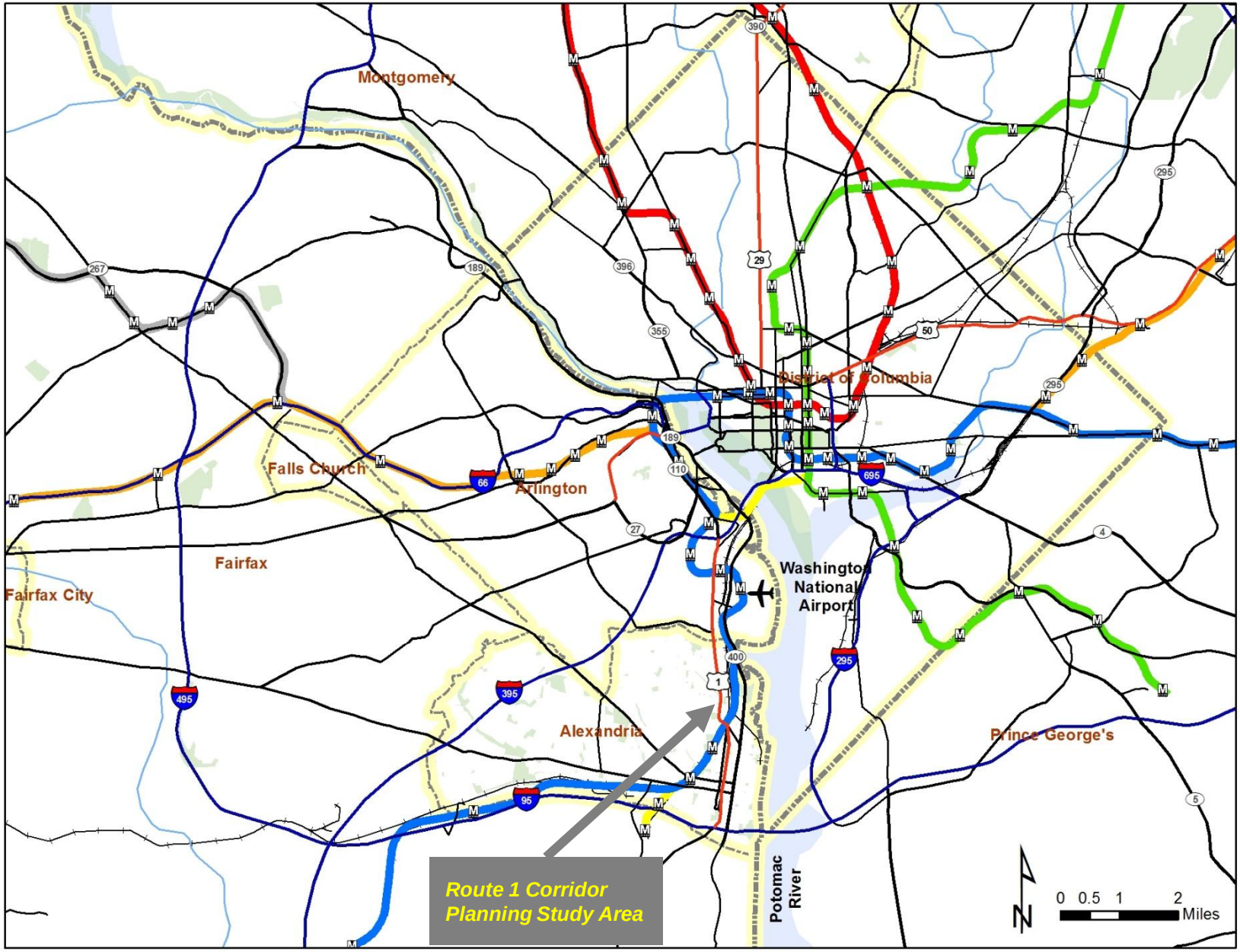
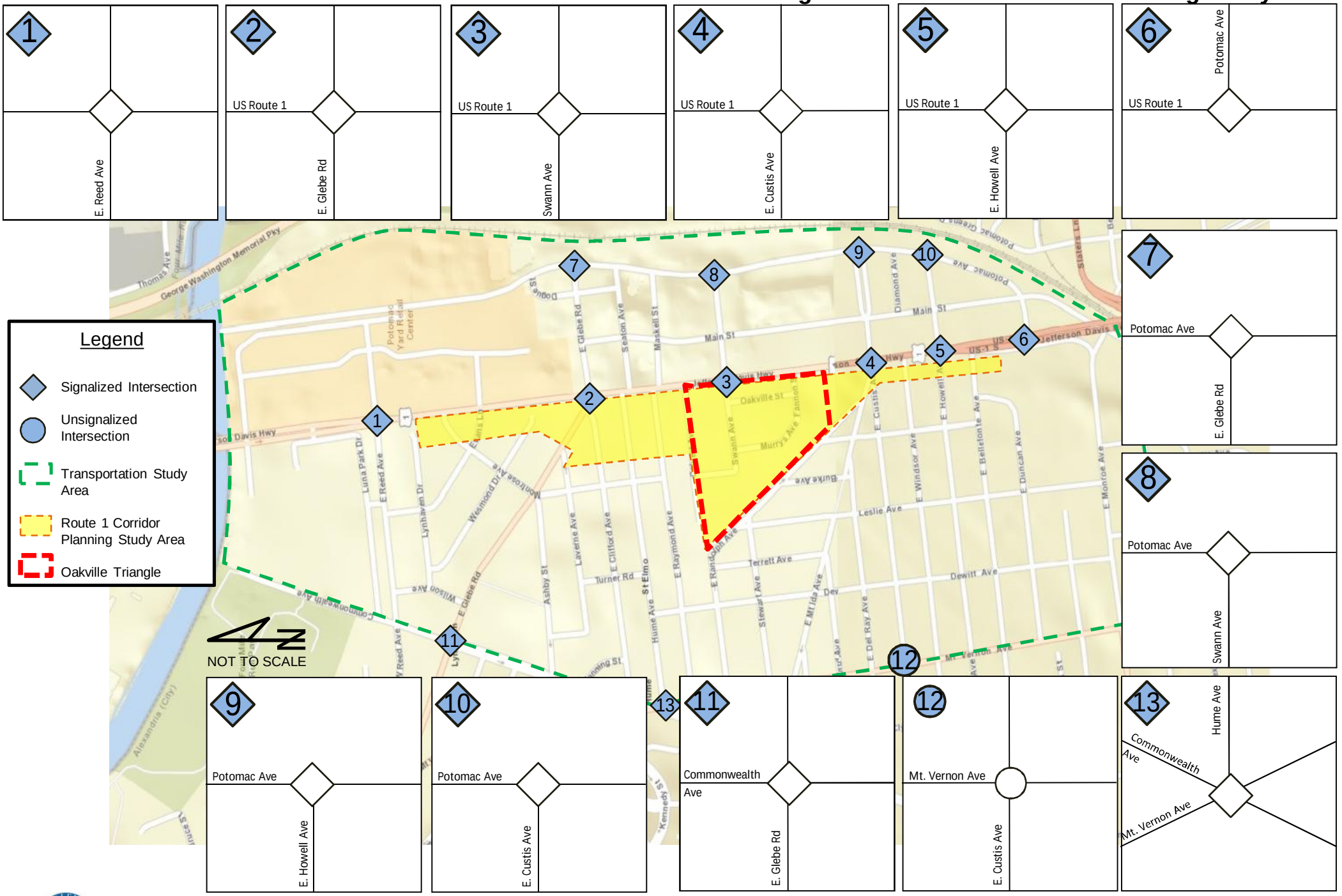


Figure 1-2: Route 1 Corridor Planning Study Area



The land use scenarios described in this report for the remaining non-Oakville Triangle parcels in the Route 1 Corridor Planning Study Area are based on information and forecasts provided by the City of Alexandria's Planning and Zoning Department. Development projections for the non-Oakville Triangle portions of the Route 1 Corridor Planning Study Area parcels are based on 90 percent residential and 10 percent commercial uses. For the purposes of this analysis, the trip generation of the commercial components of the Route 1 Corridor Planning Study Area assumes all commercial is retail, as directed by City Staff. It should be noted that the development projections were provided for use by the City based on what can be considered to be a maximum planning level forecast of the potential future development using information currently available. The forecasts assume that significant assemblage occurs in the 51 commercial properties owned by 41 owners in the remaining non-Oakville Triangle portion of the study area. Further, the development projections are subject to the ongoing community planning process. The potential development quantities analyzed in this study for the remaining parcels of the Route 1 Corridor Planning Study Area include 70,000 square feet of commercial land use (office and retail) and 720,000 square feet of residential land use (multifamily and townhouse, resulting in 576 residential units).

Study Methodology and Assumptions

Study Guidelines and General Information

This multimodal transportation study has been prepared to conform to the City of Alexandria's Transportation Planning Administrative Guidelines. Per the guidelines, a scoping agreement was prepared with the assistance of the City of Alexandria's Department of Transportation and Environmental Services (T&ES). This study has also been prepared to conform to certain previous assumptions of the completed Potomac Yard Multimodal Transportation Study (June 2010). The assumptions in that study have been previously reviewed and approved by both the City of Alexandria and the Virginia Department of Transportation; as such, the City has expressed a desire to continue to use the appropriate assumptions in order to maintain a level of consistency between the analyses performed for the Potomac Yard Multimodal Transportation Study and this analysis. Four analysis years are considered in this study: 2014 (the existing conditions year), 2018 (the year of Phase 1 build-out of the Oakville Triangle property), 2021 (the year of full build-out of the Oakville Triangle property), and 2027 (the horizon year up to which additional traffic generated by the remaining parcels of the Route 1 Corridor Planning Study Area are forecast). Thirteen study intersections were considered for analysis:

1. U.S. 1 and E. Reed Avenue
2. U.S. 1 and E. Glebe Road
3. U.S. 1 and Swann Avenue
4. U.S. 1 and E. Custis Avenue
5. U.S. 1 and E. Howell Avenue
6. U.S. 1 and Potomac Avenue
7. Potomac Avenue and E. Glebe Road
8. Potomac Avenue and Swann Avenue
9. Potomac Avenue and E. Custis Avenue
10. Potomac Avenue and E. Howell Avenue
11. Commonwealth Avenue and E. Glebe Road
12. Mt. Vernon Avenue and E. Custis Avenue
13. Commonwealth Avenue and Mt. Vernon Avenue

The City directed that intersection capacity analyses be performed using Highway Capacity Manual methodologies and Synchro software. Vehicle queuing at study intersections is also reported in the Appendix.

Existing Traffic Volumes

Traffic counts were conducted at the study area intersections on weekdays in April 2014 between 6:30 AM and 9:30 AM and between 4:00 PM and 7:00 PM. The network peak hours of study were identified as 7:45 AM to 8:45 AM for the morning peak and 5:15 PM to 6:15 PM for the afternoon peak. Peak hour traffic volumes, bicycle volumes, pedestrian volumes, peak hour factors, and heavy truck percentages were calculated for these network peak hours and incorporated into the analysis.

Existing traffic associated with the current uses on the Oakville Triangle property were determined based on the existing peak hour turning movement counts at the Route 1 and Swann Avenue intersection. The turning movement volumes in to and out of the Oakville Triangle at this intersection were assumed to represent one-half of the total trip generation for the current uses of the Oakville Triangle property. Accordingly, the total traffic generated by the current uses of the Oakville Triangle Property was assumed to be twice the existing turning movements at the Swann Avenue intersection. The total traffic generated by the current uses of the Oakville Triangle was removed from the network for the future scenario where the Oakville Triangle is redeveloped (i.e. an existing trip credit is assumed for the redevelopment of these uses).

Future Traffic Network

The following are planned transportation improvements that are anticipated to be completed, open, and operational prior to the 2018 study year:

- The Metroway, a center running bus rapid transit (BRT) line that travels in dedicated lanes along Route 1.
- The Potomac Yard Metrorail Station, a new station for the regional Metrorail system is planned to be located east of Potomac Yard.
- East Reed Avenue Intersection Improvements, improvement to the lane configurations at the intersection of Reed Avenue and Route 1 including an exclusive southbound right turn lane and the modification of the east and west approaches to allow thru movements

Future Traffic Volumes

Despite the lack of apparent traffic increases along US Route 1, a conservative one percent per year growth factor was applied to the existing turning movement volumes, up to a maximum growth of 10 percent. This one percent yearly growth factor is consistent with the factor used in the Potomac Yard Multimodal Transportation Study. This general growth is intended to reflect increases in traffic attributable to nonspecific growth in the City and currently unknown development in the vicinity of the Route 1 corridor. Consistent with the Potomac Yard Multimodal Transportation Study, this factor was applied only to northbound and southbound thru movements along US Route 1.

The Oakville Triangle portion of the Route 1 Corridor Planning Study Area is assumed to be partially developed in 2018 and fully built-out in 2021.

Planning level forecast of the land uses and quantities of the remaining "By-Others" development of the Route 1 Corridor Planning Study were provided by the City of Alexandria Planning and Zoning Department. Generalized development forecasts were provided for 2021 and 2027.

Person-trip generation figures for approved and unbuilt developments, the Oakville Triangle, and the Route 1 Corridor Planning Study Area are based on the trip generation rates and equations found in the 9th Edition of the Institute of Transportation Engineers' Trip Generation Manual.

The mode split assumptions developed for the Potomac Yard Multimodal Transportation study were applied to this analysis. This mode split recognizes the redevelopment of Route 1 as a transit-oriented corridor and the proximity of the proposed development to the future Metrorail station. As a result, a percentage of the trip generation in the study area is assumed to be accommodated by regional (Metrorail) and local transit (DASH, Metrobus, Metroway), pedestrian and bicycle, and by autos. The appropriate mode split percentage assumptions were applied to the person-trip generation of approved and unbuilt developments, the Oakville Triangle, and the remaining Route 1 Corridor Planning Study Area parcel on the basis of proximity to a Metrorail station and land use. Per the assumptions of the Potomac Yard Multimodal Transportation Study, the resulting person-trips by auto were taken to also represent the number of vehicle based trips (i.e. an assumed auto occupancy of 1.0).

It was determined that the internal capture of trips between land uses in the Route 1 Corridor Planning Study Area is contained within the pedestrian and bicycle mode split percentages. No other internal capture of trips is assumed for the study area.

A pass-by factor of 43% was applied to the PM peak hour trips for the restaurant land uses of the Oakville Triangle and relevant approved and unbuilt restaurant land uses. This represents the average pass-by factor for the High-Turnover Sit-Down Restaurant land use as contained in the ITE Trip Generation Handbook. No other land uses were assigned a pass-by factor in this study.

The existing peak hour factors (PHF) were increased according to the methodologies of the City of Alexandria's Transportation Planning Administrative Guidelines and do not exceed the VDOT recommended maximum of 0.95 for future scenarios. Pedestrian volumes, bicycle volumes, and heavy vehicle percentages are consistent with those used for the existing conditions analysis.

Principal Findings, Conclusions and Recommendations

Existing Conditions – The analysis shows that all study intersections operate at an overall LOS of D or better during both the AM and PM peak hours. The local street network to the west, north, and south of Route 1, the developing grid network of streets in the Potomac Yard east of US Route 1, and the opening of Potomac Avenue as a viable north-south alternative provide convenient opportunities for vehicle, pedestrian, bicycle, and transit travel due to the interconnected nature of the network.

The interconnected network of streets allows for the efficient dispersion of traffic, reducing the automobile pressure along the Route 1 corridor and allowing the signalized and unsignalized intersections in the area to operate efficiently.

It should be noted that there are side street approaches and movements that operate at LOS E or F. The Route 1 corridor is an essential component of north-south movements in the City of Alexandria and the greater Northern Virginia region. In order to ensure its continued success as an alternate route to the I-95 corridor, as a connection between Fairfax County, Alexandria, and Arlington County, and as a transit-oriented corridor offering traditional (DASH and Metrobus) and enhanced (Metroway) transit options, the City has prioritized the efficient operations of the north-south movements. This approach is not uncommon in urban corridors.

The overall intersection level of service summary for existing conditions is shown in Table 1-1.

Table 1-1: Existing Traffic Analysis Summary (Pre-Mitigation)
LOS (sec/veh)

Intersection	LOS (Delay)	
	AM	PM
1. US Route 1 & East Reed Avenue	***C (21.2)***	***C (26.9)***
2. US Route 1 & East Glebe Road	***C (34.4)***	***B (17.5)***
3. US Route 1 & Swann Avenue	***A (7.1)***	***A (8.4)***
4. US Route 1 & East Custis Avenue	***B (10.4)***	***A (7.4)***
5. US Route 1 & East Howell Avenue	***B (12.3)***	***A (5.7)***
6. US Route 1 & Potomac Avenue	***A (9.5)***	***B (11.4)***
7. Potomac Avenue & East Glebe Road	***A (2.9)***	***A (4.1)***
8. Potomac Avenue & Swann Avenue	***A (5.6)***	***A (5.2)***
9. Potomac Avenue & East Custis Avenue	***A (5.6)***	***A (3.8)***
10. Potomac Avenue & East Howell Avenue	***A (2.2)***	***A (0.1)***
11. Commonwealth Avenue & West Glebe Road/East Glebe Road	***B (17.6)***	***B (15.8)***
12. Mt. Vernon Avenue & East Custis Avenue *(Unsignalized)*	***B (10.9)***	***B (11.6)***
13. Commonwealth Avenue & Mt. Vernon Avenue & Hume Avenue	***D (38.5)***	***D (36.0)***

Future Conditions without Development – The analysis of future conditions without development considers the combined effects of the additional traffic generated by currently approved and unbuilt developments, regional traffic growth, and programmed transportation improvements.

Analysis results indicated that while most study intersectionS will continue to operate at LOS D or better, beginning in 2021 the intersections of Glebe Road and Reed Avenue with US Route 1 will operate at LOS of E or F in one or both peak hours. This gives an indication of intersections that may need operational improvements to operate at an acceptable level of service when considering future traffic volumes without development. The overall intersection level of service summary for future traffic without development is shown in Table 1-2.

Table 1-2: Future Without Development Traffic Analysis Summary (Pre-Mitigation) LOS (sec/veh)						
Intersection	2018 Conditions		2021 Conditions		2027 Conditions	
	AM	PM	AM	PM	AM	PM
1. US Route 1 & East Reed Avenue	D (50.5)	C (32.4)	F (83.8)	D (42.2)	F (141.7)	E (74.9)
2. US Route 1 & East Glebe Road	C (33.8)	B (16.8)	E (69.1)	C (22.9)	F (125.7)	E (59.9)
3. US Route 1 & Swann Avenue	A (6.9)	A (8.6)	A (9.4)	B (13.3)	C (27.8)	B (19.4)
4. US Route 1 & East Custis Avenue	B (10.3)	A (7.4)	B (12.9)	A (8.4)	D (44.5)	B (10.2)
5. US Route 1 & East Howell Avenue	B (12.1)	A (8.8)	B (13.2)	A (9.5)	C (27.3)	B (12.5)
6. US Route 1 & Potomac Avenue	B (10.9)	B (10.8)	B (13.1)	B (13.6)	D (40.6)	B (19.6)
7. Potomac Avenue & East Glebe Road	A (3.3)	A (4.8)	A (4.3)	A (7.3)	A (5.3)	A (9.1)
8. Potomac Avenue & Swann Avenue	A (5.6)	A (5.5)	A (6.1)	A (8.7)	A (6.6)	B (10.6)
9. Potomac Avenue & East Custis Avenue	A (5.9)	A (4.2)	A (5.8)	A (4.2)	A (5.8)	A (4.2)
10. Potomac Avenue & East Howell Avenue	A (2.6)	A (2.5)	A (2.7)	A (2.4)	A (2.8)	A (2.3)
11. Commonwealth Avenue & West Glebe Road/East Glebe Road	B (16.8)	B (15.5)	B (17.1)	B (16.1)	B (17.9)	B (17.4)
12. Mt. Vernon Avenue & East Custis Avenue *(Unsignalized)*	B (11.1)	B (12.1)	B (11.4)	B (12.5)	B (12.0)	B (13.3)
13. Commonwealth Avenue & Mt. Vernon Avenue & Hume Avenue	D (36.8)	C (34.5)	D (36.8)	C (34.5)	D (36.8)	C (34.5)

Future Conditions with Development - Analysis results indicated that while most study intersections will continue to operate at LOS D or better, beginning in 2021 the intersections of Glebe Road and Reed Avenue with US Route 1 will operate at LOS of E or F in one or both peak hours. In 2027, both the intersections of Swann Avenue and Custis Avenue with US Route 1 will also operate at LOS of E or F in one or both peak hours . This gives an indication of intersections that may need operational improvements to operate at an acceptable level of service when considering future traffic volumes with development. The overall intersection level of service summary with development for existing intersection configurations is shown in Table 1-3.

Table 1-3: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)						
Intersection	2018 Conditions		2021 Conditions		2027 Conditions	
	AM	PM	AM	PM	AM	PM
1. US Route 1 & East Reed Avenue	D (54.4)	C (32.6)	F (100.9)	D (50.8)	F (159.9)	F (89.4)
2. US Route 1 & East Glebe Road	D (36.4)	B (18.0)	F (83.4)	D (35.2)	F (148.6)	F (91.4)
3. US Route 1 & Swann Avenue	A (9.7)	B (11.7)	C (25.6)	C (29.4)	E (70.7)	D (54.4)
4. US Route 1 & East Custis Avenue	B (10.5)	A (6.7)	B (15.7)	A (7.5)	E (62.7)	B (12.6)
5. US Route 1 & East Howell Avenue	B (12.2)	A (8.9)	B (16.6)	B (11.7)	D (39.5)	B (16.9)
6. US Route 1 & Potomac Avenue	B (10.9)	B (10.5)	B (13.7)	B (13.1)	D (46.5)	B (19.6)

Table 1-3: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)						
Intersection	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
7. Potomac Avenue & East Glebe Road	***A (3.3)***	***A (4.8)***	***A (4.4)***	***A (7.3)***	***A (5.6)***	***A (9.2)***
8. Potomac Avenue & Swann Avenue	***A (6.0)***	***A (5.8)***	***A (6.9)***	***A (9.5)***	***A (7.3)***	***B (11.4)***
9. Potomac Avenue & East Custis Avenue	***A (5.9)***	***A (4.2)***	***A (5.9)***	***A (4.4)***	***A (6.0)***	***A (4.6)***
10. Potomac Avenue & East Howell Avenue	***A (2.6)***	***A (2.5)***	***A (2.7)***	***A (2.4)***	***A (2.8)***	***A (2.3)***
11. Commonwealth Avenue & West Glebe Road/East Glebe Road	***B (16.9)***	***B (15.6)***	***B (17.2)***	***B (16.4)***	***B (18.2)***	***B (17.9)***
12. Mt. Vernon Avenue & East Custis Avenue *(Unsignalized)*	***B (11.1)***	***B (12.1)***	***B (11.6)***	***B (12.7)***	***B (12.3)***	***B (13.7)***
13. Commonwealth Avenue & Mt. Vernon Avenue & Hume Avenue	***D (36.8)***	***C (34.5)***	***D (36.8)***	***C (34.5)***	***D (36.8)***	***C (34.5)***

Multimodal Mitigations and Transportation Improvement Recommendations – Proposed mitigation at the study intersections include:

Year 2018 Mitigation

- Improvement in north-south vehicle progression between traffic signals by adjusting traffic signal offsets.
- Modification of traffic signal phasing at the intersection of US Route 1 and East Reed Avenue.
  - Eastbound and westbound signal phasing is modified from split phase to concurrent phasing with protected-permitted left turn phases.
  - Northbound right turn phase is modified to allow overlap right turns
- Modification of traffic signal phasing at the intersection of US Route 1 and East Glebe Road.
  - Eastbound right turn movement is modified to allow overlap right turns.
- Modification of lane configurations at the intersection of US Route 1 and Swann Avenue.
  - Eastbound and westbound lanes modified from shared thru-left lanes and exclusive right lanes to exclusive left turn lanes and shared thru-right lanes.

Year 2021 Mitigation

- Increase in traffic signal cycle length along Route 1 from 140 seconds to 160 seconds
- Improvement in north-south vehicle progression between traffic signals by adjusting traffic signal offsets.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Reed Avenue.
  - Eastbound and westbound signal phasing is modified from split phase to concurrent phasing with protected-permitted left turn phases.

  - Northbound right turn phase is modified to allow overlap right turns
  - Westbound lanes modified from exclusive left turn lane and shared thru-right lane to exclusive left, thru, and right lanes.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Glebe Road.
  - Eastbound right turn movement is modified to allow overlap right turns.
  - Eastbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left, thru, and right lanes. It is noted that ROW acquisition/widening may be required to accommodate the eastbound lane configuration change. This future lane configuration and associated ROW impacts were also identified in the Potomac Yard Multimodal Transportation Study as strategies to accommodate the future Potomac Yard-generated traffic.
  - Westbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left turn lane and shared thru-right lane.
  - Eastbound and westbound left turn phasing modified to be protected-permitted movements.
- Modification of lane configurations at the intersection of US Route 1 and Swann Avenue.
  - Eastbound and westbound lanes modified from shared thru-left lanes and exclusive right lanes to exclusive left turn lanes and shared thru-right lanes.

Year 2027 Mitigation

- Increase in traffic signal cycle length along Route 1 from 140 seconds to 160 seconds
- Improvement in north-south vehicle progression between traffic signals by adjusting traffic signal offsets.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Reed Avenue.
  - Eastbound and westbound signal phasing is modified from split phase to concurrent phasing with protected-permitted left turn phases.
  - Northbound right turn phase is modified to allow overlap right turns
  - Westbound lanes modified from exclusive left turn lane and shared thru-right lane to exclusive left, thru, and right lanes.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Glebe Road.
  - Eastbound right turn movement is modified to allow overlap right turns.
  - Eastbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left, thru, and right lanes. It is noted that ROW acquisition/widening may be required to accommodate the eastbound lane configuration change. This future lane configuration and associated ROW impacts were also identified in the Potomac Yard Multimodal Transportation Study as strategies to accommodate the future Potomac Yard-generated traffic.
  - Westbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left turn lane and shared thru-right lane.

  - Eastbound and westbound left turn phasing modified to be protected-permitted movements.
- Modification of lane configurations at the intersection of US Route 1 and Swann Avenue.
  - Eastbound and westbound lanes modified from shared thru-left lanes and exclusive right lanes to exclusive left turn lanes and shared thru-right lanes.
- Modification of lane configurations at the intersection of US Route 1 and Custis Avenue.
  - Eastbound and westbound lanes modified from shared left, thru, right lanes to exclusive left turn lanes and shared thru-right lanes. It is noted that while ROW acquisition/widening may be required to accommodate the lane configuration change, this future lane configuration and associated ROW impacts were also identified in the Potomac Yard Multimodal Transportation Study as strategies to accommodate the future Potomac Yard-generated traffic.

The mitigations described above seek to minimize the impact of the Oakville Triangle development related traffic. The mitigation analysis is shown in Tables 1-4, 1-5, and 1-6.

Table 1-4: Mitigation Summary of 2018 Future With Development Traffic Analysis LOS (sec/veh)

Intersection	2018 Without Development		2018 With Development		2018 With Development and Mitigation	
	AM	PM	AM	PM	AM	PM
1. US Route 1 & East Reed Avenue	*D (50.5)*	*C (32.4)*	*D (54.4)*	*C (32.6)*	*C (32.7)*	*C (32.1)*
2. US Route 1 & East Glebe Road	*C (33.8)*	*B (16.8)*	*D (36.4)*	*B (18.0)*	*D (36.3)*	*B (16.8)*
3. US Route 1 & Swann Avenue	*A (6.9)*	*A (8.6)*	*A (9.7)*	*B (11.7)*	*A (7.9)*	*A (8.5)*

Table 1-5: Mitigation Summary of 2021 Future With Development Traffic Analysis LOS (sec/veh)

Intersection	2021 Without Development		2021 With Development		2021 With Development and Mitigation	
	AM	PM	AM	PM	AM	PM
1. US Route 1 & East Reed Avenue	*F (83.8)*	*D (42.2)*	*F (100.9)*	*D (50.8)*	*D (43.4)*	*C (34.4)*
2. US Route 1 & East Glebe Road	*E (69.1)*	*C (22.9)*	*F (83.4)*	*D (35.2)*	*E (70.3)*	*C (30.5)*
3. US Route 1 & Swann Avenue	*A (9.4)*	*B (13.3)*	*C (25.6)*	*C (29.4)*	*B (16.7)*	*B (17.5)*

Table 1-6: Mitigation Summary of 2027 Future With Development Traffic Analysis LOS (sec/veh)						
Intersection	2027 Without Development		2027 With Development		2027 With Development and Mitigation	
	AM	PM	AM	PM	AM	PM
1. US Route 1 & East Reed Avenue	***F (141.7)***	***E (74.9)***	***F (159.9)***	***F (89.4)***	***F (107.1)***	***E (55.9)***
2. US Route 1 & East Glebe Road	***F (125.7)***	***E (59.9)***	***F (148.6)***	***F (91.4)***	***F (118.1)***	***E (78.2)***
3. US Route 1 & Swann Avenue	***C (27.8)***	***B (19.4)***	***E (70.7)***	***D (54.4)***	***D (51.7)***	***C (24.3)***
4. US Route 1 & Custis Avenue	***D (44.5)***	***B (10.2)***	***E (62.7)***	***B (12.6)***	***C (22.9)***	***B (12.4)***

The analysis results indicate that in 2018 and 2021, the intersections can be improved to LOS of E or better using these mitigations, with LOS E representing an acceptable operation in most urban areas. The analysis results indicate that in 2027, while significant delay reductions can be realized, the total volume of traffic results in LOS F conditions at selected intersections along Route 1.

At Reed, Glebe, and Custis, the proposed 2027 conditions with mitigation strategies in place result in overall intersection LOS that is equivalent or better that the LOS of the 2027 conditions without development. While the LOS of the Swann Avenue intersection does not return to the without development condition, it represents a significant improvement compared to the 2027 condition with development and without mitigation and will operate at LOS D and C in the AM and PM peak hours respecticely.

As no further widening of US 1 Route 1 is planned, in order for it to have continued success as a viable north-south alternative to the I-95 corridor, traffic patterns in the Route 1 Corridor may need to change. This may be achieved naturally, as local and regional travelers make better use of the interconnected network of streets and as traffic adjusts to other north-south roads (Potomac Avenue and Main Line Boulevard). This may also be achieved by progressive emphasis on transit and other alternate modes of travel that further reduce the auto dependency of the Route 1 Corridor.

Minor traffic impacts are anticipated at other study area intersections, but these intersections will continue to operate at LOS D or better. Recognizing the interconnected nature of the study area streets, operations at the intersection are likely to be better than the calculated figures because the traffic will balance among the many intersections along US 1. Further, the global mitigation strategies suggested in this report (improving traffic signal progression and increasing traffic signal cycle length) may serve to improve the north-south throughput of all Route 1 intersections.

2. Background Introduction

2.1 PROJECT STUDY AREA

The Oakville Triangle property is located along the west side of US Route 1 (Jefferson Davis Highway) and is bounded by Calvert Avenue to the north, Fannon Street to the south, and the Mt. Jefferson Park Trail to the west. As shown on ***Figure 1-2***, the Route 1 Corridor Planning Study area surrounds the Oakville Triangle and is bounded by Lynhaven Drive to the north, East Bellefonte Avenue to the south, and the Mt. Jefferson Park Trail to the west. Adjacent to the study area, there are residential and other non-commercial properties that should be considered appropriately during the planning process.

2.2 DESCRIPTION OF ON-SITE DEVELOPMENT

The Route 1 Corridor planning area is currently a mix of Industrial (I) and Commercial Service Low (CSL)-zoned properties on the west side of Route 1. StonebridgeCarras' redevelopment of the Oakville Triangle is proposed to replace the 446,290 square feet of existing industrial and commercial land uses with mixed-use, urban walkable development. This includes approximately 85,440 square feet of retail, 56,960 square feet of restaurant, 1,074 mid-rise apartment dwelling units, and a 150-key hotel. Development is planned to occur in phases with Phase 1 anticipated completion in 2018 and full build-out of the Oakville Triangle anticipated in 2021. The concept development plan used in the preparation of this report is shown in ***Figure 2-1: Concept Development Plan***.

This traffic study was based upon an early estimate of Oakville Triangle based on the concept plan available at the inception of the study. The current concept plan (which is also subject to change) while slightly modified, has a negligible effect on the analysis results of this study. It is recognized that as the public involvement process continues, the developers of the Oakville Triangle and the City of Alexandria may refine the concepts and development levels. However, it is anticipated that the resulting density and land uses will be within the scope and magnitude of the overall quantities analyzed in this study and result in negligible differences in analysis results.

The remaining parcels of the Route 1 Corridor planning area will include a mix of 70,000 square feet of office and retail development and 720,000 square feet of residential development, resulting in approximately 576 residential units.

Development projections for the non-Oakville Triangle portions of the Route 1 Corridor Planning Study Area parcels were provided by the City and are based on 90 percent residential and 10 percent commercial (retail and office) uses. For the purposes of this analysis, the trip generation of the commercial components of the Route 1 Corridor Planning Study Area assumes all commercial is retail, as directed by City Staff. It should be noted that the development projections were provided for use by the City based on what can be considered to be a maximum planning level forecasts of the potential future development using information currently available (assuming significant assemblage occurs in the 51 commercial properties owned by 41 owners in the remaining non-Oakville Triangle portion of the study area). Further, the development projections are subject to the ongoing community planning process.

Figure 2-1: Draft Concept Development Plan

NOT TO SCALE

2.3 METHODOLOGY

This multimodal transportation study has been prepared to conform to the City of Alexandria's Transportation Planning Administrative Guidelines. The guidelines provide technical procedures to analyze and report the effects of new development on transportation facilities in Alexandria. Per the guidelines, a scoping agreement was prepared with the assistance of the City of Alexandria's Department of Transportation and Environmental Services (T&ES). A copy of the signed scoping agreement is included in ***Appendix A***.

This study has also been prepared to conform to certain previous assumptions of the completed Potomac Yard Multimodal Transportation Study (June 2010). The assumptions in that study have been previously reviewed and approved by both the City of Alexandria and the Virginia Department of Transportation; as such, the City has expressed a desire to continue to use the appropriate assumptions in order to maintain a level of consistency between Potomac Yard Multimodal Transportation Study and this analysis.

Per the scoping agreement, the following methodology was used in the preparation of this study:

- Intersection Capacity Analyses based on the Highway Capacity Manual (using the Synchro software package)
- Queuing reports for relevant study intersections/movements
- Trip credit for the removal of the trips generated by the existing development on the Oakville Triangle
- Trip generation based on Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 9th Edition*
- Phased horizon years for the Oakville Triangle Development
    - Existing Year – 2014
    - Phase 1 Year – 2018
    - Build-out Year – 2021
    - Design Year – 2027
- Regional traffic growth, trip distribution, and mode split, internal capture, and pass-by methodologies based on the previously approved assumptions of the 2010 Potomac Yard Multimodal Transportation Study
- Traffic signal timings were obtained from the City of Alexandria. These signal timings reflect the BRT operation along US Route 1.

3. Existing Conditions

3.1 OVERVIEW

This chapter of the report examines the existing multimodal transportation conditions in the Potomac Yard area. Included are descriptions of the existing transportation network, transit operations, and pedestrian/bicycle amenities.

3.2 STREET NETWORK

The existing street network examined as part of this study includes major roadways such as US Route1, E. Braddock Road, and Mt. Vernon Avenue as well as the local street grid in Del Ray and Lynhaven. The following is a brief description of the area street system, study intersections, and intersection operations.

Study Area Streets

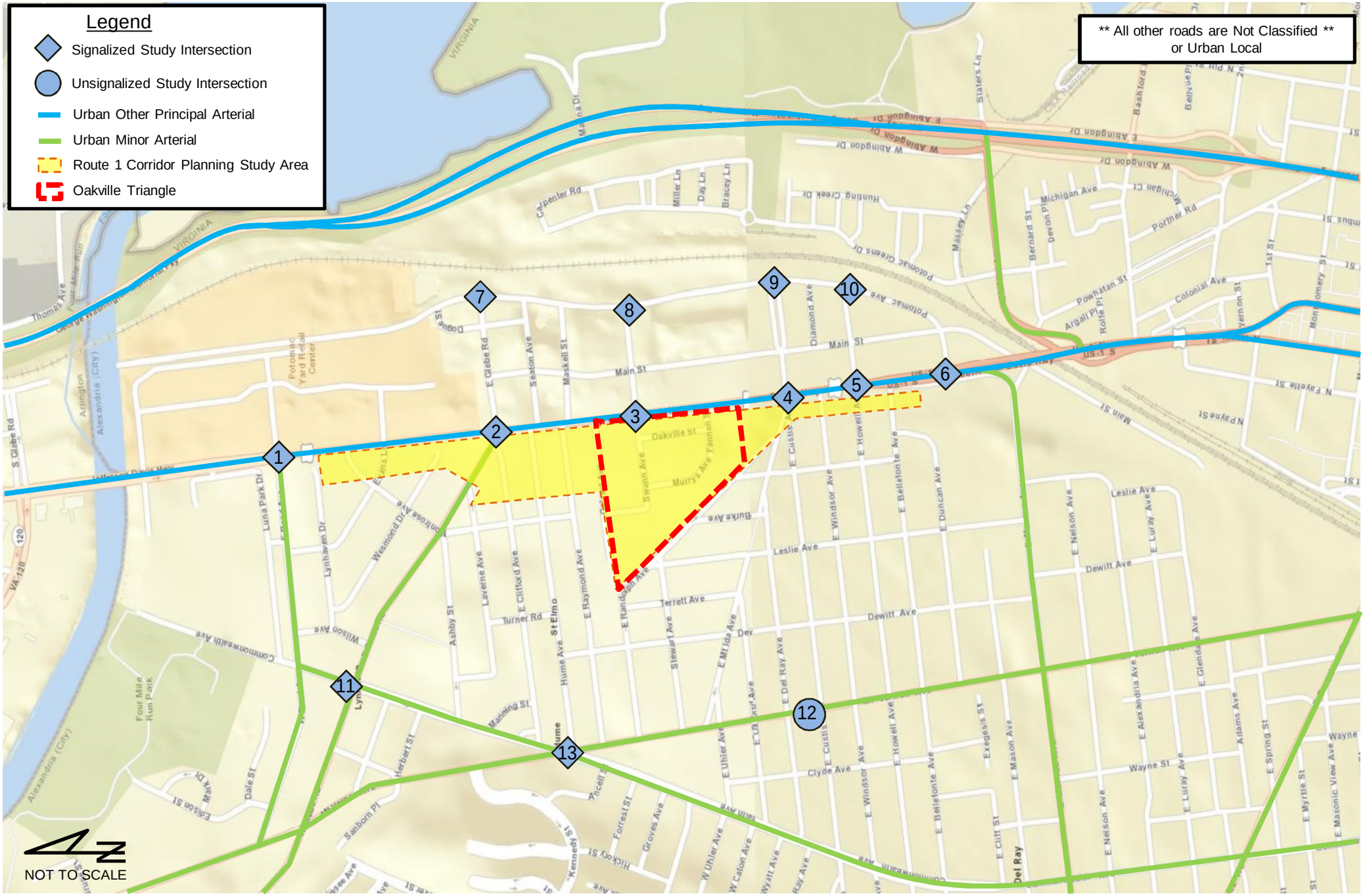
Classifications

Alexandria uses a functional classification system to characterize its streets based on connectivity and access. The classifications align with the functional classifications of the Federal Highway Administration (FHWA) and VDOT. Alexandria's system consists of expressways, arterials, primary collectors, residential collectors, and local streets. These are described briefly in the following:

- Expressways are controlled access facilities and provide movement for high volumes of people and goods over long distances. They do not provide access to adjacent properties.
- Arterials serve as primary links in Alexandria and to surrounding communities. Access is provided to adjacent land on a limited basis. Measures such as preferential signalization, signal progression, and linear continuity are provided on these streets. Arterials also may provide dedicated transit lanes.
- Primary Collectors provide access to major adjacent properties such as neighborhood shopping centers, mixed use hubs, and high schools. Primary collectors carry a mix of local and long-distance travel and provide a link between arterials.
- Residential Collectors carry relatively short trips and a large percentage of residential trips. They provide direct service to residential areas, local parks, neighborhoods, businesses, and schools. They connect local streets to higher classified streets.
- Local Streets provide direct access to homes, shopping, businesses, and other adjacent land. The local streets connect to collector streets and cut through traffic should be discouraged.

The classification of streets in the study area (per VDOT standards) is shown on ***Figure 3-1: Existing Roadway Classification.***

Figure 3-1: Existing Roadway Classification



Street Descriptions

US Route 1 is a north-south arterial that connects Alexandria to the Metropolitan Washington Region. To the north, US 1 connects to Arlington County, Washington, D.C., and Maryland. To the south, US 1 connects to Old Town Alexandria, Fort Belvoir, and Richmond. US 1 generally parallels I-95 along the entire Eastern seaboard. Traditionally, in the vicinity of the Route 1 Corridor Planning Study Area, US 1, also referred to as Jefferson Davis Highway, is primarily a four-lane divided street with traffic signals and left-turn lanes at major intersections. In the study area, the posted speed limit is 35 miles per hour (MPH). South of the study area, Route 1 has a speed limit of 25 mph.

US Route 1 has recently been widened to support the center running Metroway, a high-capacity transit service in the form of bus rapid transit (BRT) with dedicated lanes on Route 1 and Potomac Avenue. The Metroway was completed and opened for operation in August of 2014.

Mt. Vernon Avenue is a north-south arterial between Commonwealth Avenue and E. Braddock Road. North of Commonwealth Avenue, Mt. Vernon Avenue is a primary collector street. Mt. Vernon Avenue is an important corridor for the Del Ray community of the City of Alexandria. In the study area, it has a two-lane undivided cross-section with on-street parking on both sides. The posted speed limit is 25 mph.

Commonwealth Avenue is a north-south primary collector street between Reed Avenue and King Street. Between Reed Avenue and Ashby Street, it has a two-lane divided cross-section with on-street parking and bike lanes on both sides of the street. Between Ashby Street and Mt. Vernon Avenue, Commonwealth Avenue has a two-lane undivided cross-section. The posted speed limit is 25 mph.

Potomac Avenue is a new major north-south primary collector route that connects Route1 to the south with Crystal Drive to the north and provides additional north/south capacity for local and non-local trips. Potomac Avenue is located east of and is parallel to Route 1. In the study area, Potomac Avenue has a two-lane divided cross-section and accommodates on-street parking on one or both sides. The posted speed limit is 25 mph.

Glebe Road is an east-west primary collector connecting to S. Glebe Road and S. Four Mile Run Drive in Arlington County and US 1 in Alexandria. In the study area, E. Glebe Road has a two-lane undivided cross-section and accommodates on-street parking on one or both sides. The posted speed limit is 25 mph.

Monroe Avenue is an east-west primary collector street between Mt. Vernon Avenue and US Route 1. Monroe Avenue provides an important connection between Russell Road and US 1. In the study area, E. Monroe Avenue has a two-lane undivided cross-section with on-street parking. The posted speed limit is 25 mph.

Reed Avenue is an east-west residential collector connecting Mt. Vernon Avenue and US 1 in the Del Ray community of the City. In the study area, E. Reed Avenue has a two-lane undivided cross-section with on-street parking on one or both sides of the street. The posted speed limit is 25 mph.

Swann Avenue, ***Custis Avenue***, and ***Howell Avenue*** are all classified as local streets. These streets provide access to property in Del Ray and Lynhaven. Between Commonwealth Avenue, Mt. Vernon Avenue, and US 1, these roads generally have a two-lane undivided cross-section with on-street parking. Swann Avenue will serve as the primary site access and only US Route 1 median break for StonebridgeCarras' redevelopment of the Oakville Triangle.

Main Line Boulevard is a local north-south street located to the east of Route 1 and to the west of Potomac Avenue, with a connection to Monroe Avenue. This street is part of the interconnected Potomac Yard grid network.

Study Intersections
The vehicular impact of the Oakville Triangle and Route 1 Corridor Planning Study Area developments was considered quantitatively for a specific set of intersections. Existing intersections identified for quantitative study are the following:

1. U.S. 1 and E. Reed Avenue
2. U.S. 1 and E. Glebe Road
3. U.S. 1 and Swann Avenue
4. U.S. 1 and E. Custis Avenue
5. U.S. 1 and E. Howell Avenue
6. U.S. 1 and Potomac Avenue
7. Potomac Avenue and E. Glebe Road
8. Potomac Avenue and Swann Avenue
9. Potomac Avenue and E. Custis Avenue
10. Potomac Avenue and E. Howell Avenue
11. Commonwealth Avenue and E. Glebe Road
12. Mt. Vernon Avenue and E. Custis Avenue
13. Commonwealth Avenue and Mt. Vernon Avenue

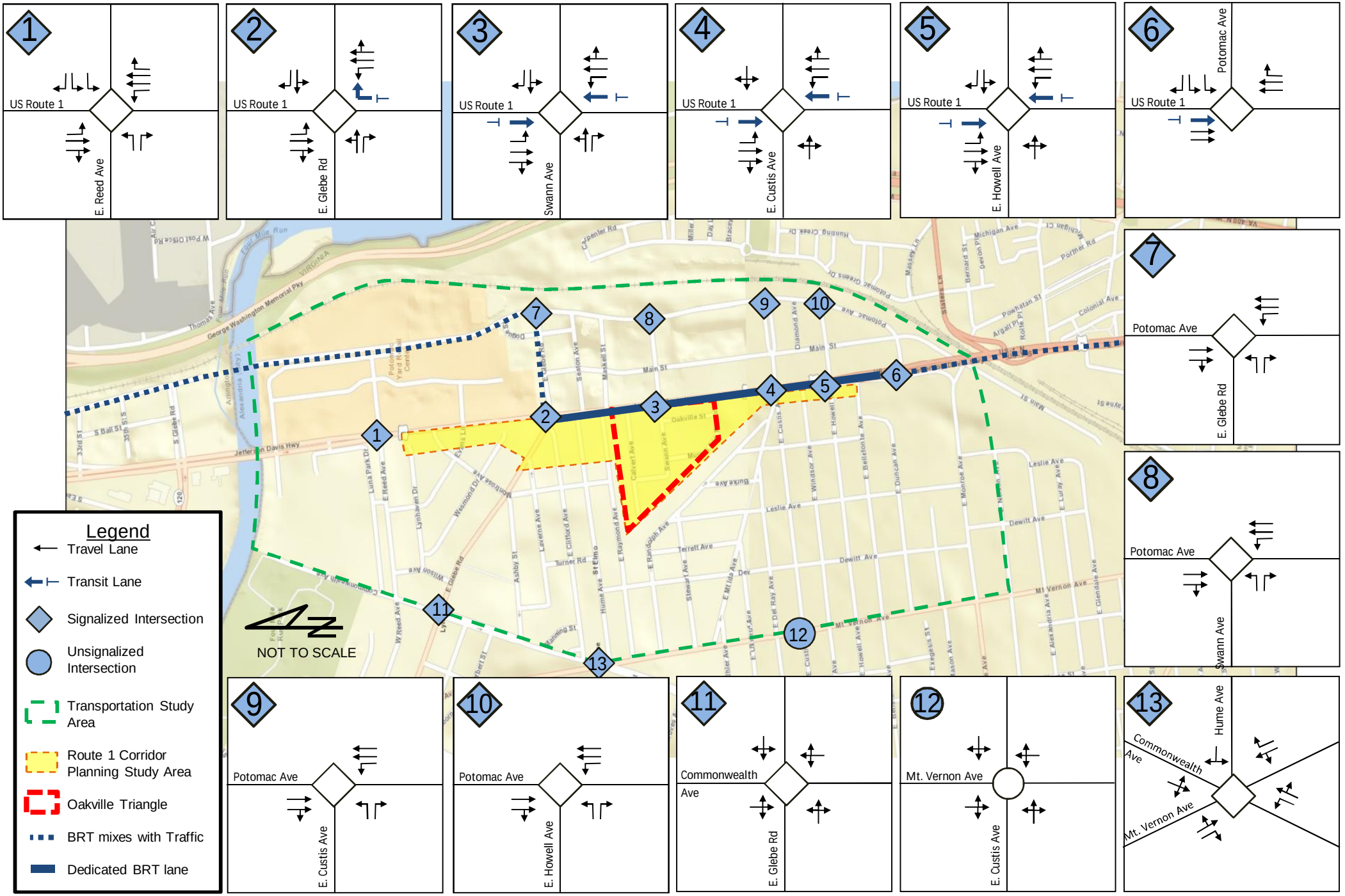
Each of these study intersections is signalized with the exception of the intersection of Mt. Vernon Avenue with E. Custis Avenue. The existing lane uses at the study intersections are shown in ***Figure 3-2: Existing Intersection Laneage and Traffic Control***. Where lane use markings or signs are not provided, the lane designations used in this report represent observed operational conditions.

3.3 TRANSIT NETWORK

The study area is directly served by commuter bus services. The area also is served indirectly by Metrorail and Virginia Railway Express. Existing transit services are described in the following section:

Metrorail Services: The Route 1 Corridor Planning study area is served by the Yellow and Blue lines via the Crystal City and Braddock Road stations. The Braddock Road station currently has short-term vehicle parking, bicycle parking, and car sharing available in addition to being served by Metrobus and DASH. The Crystal City station currently has bicycle parking and car sharing available in addition to being served by Metrobus and ART.

Figure 3-2: Existing Intersection Laneage and Traffic Control



Metrobus: Routes in the vicinity of the study area are the following:

Metrobus Route 9A (Huntington – Pentagon Line) provides service between the Huntington Metrorail station, Downtown Alexandria, Potomac Yard Center, and Pentagon Metrorail station. Route 9A runs through Old Town and the study area along US 1. Route 9A provides service every 30 minutes every weekday and Saturday and service every 30 to 60 minutes on Sunday.

Metrobus Routes 10A, 10E, 10R, 10S (Hunting Point-Pentagon Line) provides service between Hunting Pont, Braddock Road Metrorail station, Crystal City, and the Pentagon Metrorail station. Through the study area, Routes 10A, 10E, and 10R provide service along Mt. Vernon Avenue. Route 10A provides service every weekday, Saturday, and Sunday.

Metrobus Route 10B (Hunting Towers-Ballston Line) provides service between Hunting Towers, Braddock Road Metrorail station, Shirlington, and the Ballston-MU Metrorail station. Through the study area, Route 10B provides service along Mt. Vernon Avenue on weekdays, Saturdays, and Sundays.

Metrobus Route 11Y (Mt. Vernon Express Line) provides service from Mt. Vernon to Potomac Park in the District of Columbia. Through the study area, Route 11Y runs along the George Washington Memorial Parkway. This is an express service running northbound during the weekday AM peak period and southbound during the PM peak period every 15 to 20 minutes. The number of stops is restricted to reduce travel times.

DASH routes in the study area are the following:

Route AT10 provides service between the Potomac Yard shopping center and the King Street Metrorail Station. Through the study area, Route AT10 runs along Reed Avenue, Mt. Vernon Avenue, Monroe Avenue, and Commonwealth Avenue.

DOT is the City of Alexandria's paratransit service. Users must meet eligibility requirements. Trips are provided by taxis and wheelchair accessible vans. DOT provides service throughout the City of Alexandria, City of Falls Church, Arlington County, Fairfax County, and Fairfax City. DOT service operates seven days a week and is by advance reservation

Metroway recently opened for service. Metroway is a new transit service (BRT) that offers a transit trip along a dedicated lane on Route 1 between the Crystal City and Braddock Road Metrorail stations. The service replaces the current Metrobus 9S and features dedicated bus-only lanes, consolidated bus stops, and more service, seven days a week. During commuter peak hours, buses typically run every six minutes. Buses run every 12 minutes during daytime off-peak hours and every 15 minutes in the evening. On weekends, buses run every 20 minutes.

Existing transit services are shown in ***Figure 3-3: Existing Transit Network***.

Figure 3-3: Transit Network

3.4 EXISTING PEDESTRIAN AND BICYCLE MOBILITY

There are numerous existing pedestrian and bicycle facilities located in the study area. A summary of these facilities and analysis from the City of Alexandria Pedestrian and Bicycle Mobility Plan are described below.

Pedestrian Network

Pedestrian facilities include multi-use paths, sidewalks, crosswalks, pedestrian signals, and pedestrian push buttons. There are sidewalks along many streets in the study area. Table 3-1 summarizes the pedestrian amenities at the study area intersections.

Table 3-1: Study Area Pedestrian Facilities

Study Intersection	Crosswalk	Countdown Pedestrian Signals	ADA Pedestrian Pushbuttons	ADA Ramps
1. US 1 and Reed	All legs	All legs and in the median	All legs and in the median	All corners except southeast Route 1 crossing
2. US 1 and Glebe	North and south legs	In the median and all legs except south leg and east leg crossing south movement.	In the median and all legs except south leg and east leg crossing south movement.	All corners except northeast Glebe crossing and southeast corner. Southeast curb currently under construction
3. US 1 and Swann	All legs	In the median and all legs	In the median and all legs	All corners except southeast Route 1 crossing
4. US 1 and Custis	All legs	In the median and all legs	In the median and all legs	All corners
5. US 1 and Howell	All legs except East leg.	All legs (none in median)	All legs (none in median)	All corners
6. US 1 and Potomac	North and east legs	North and east legs	In median and north and east legs	Southeast, northeast, and northwest corners
7. Potomac and Glebe	North, west, and south legs	North, west, and south legs	North, west, and south legs	All corners
8. Potomac and Swann	North, west, and south legs	North, west, and south legs	North, west, and south legs	All corners and west leg median
9. Potomac and Custis	North, West, and south legs	North, west, and south legs	North, west, and south legs	All corners and west leg median
10. Potomac and Howell	North and west legs	North and west legs	North and west legs	Northeast, northwest, and southwest corners
11. Commonwealth and Glebe	All legs	All legs	All legs	None
12. Mt. Vernon and Custis	All legs	None	None	All corners
13. Commonwealth and Mt. Vernon	All legs	All legs except east leg crossing south movement	All legs except east leg crossing south movement	Northwest and northeast corners

Existing peak hour pedestrian counts at the study intersections and along study streets are shown in ***Figure 3-4: Existing Pedestrian Volumes.***

Bicycle Network

On-street facilities include bike lanes, signed bike routes, and lanes with sharrow markings. Off-street facilities include side paths, cycle tracks, and other facilities that follow the alignment of a street and trails that are separated from a street. Bicycle facilities in the study area include the following:

- Asphalt path along the east side of US 1 from Potomac Avenue to South Four Mile Run Trail.
- A path along Four-Mile Run from Mt. Vernon Avenue to US 1. This trail provides access to the Four-Mile Run trail in Arlington County, which leads to the W&OD trail.
- The Mt. Vernon Trail located east of the study area along the George Washington Memorial Parkway. There is currently no direct access from the study area in Alexandria to the Mt. Vernon Trail. The nearest access is immediately to the north in Arlington County.
- A relatively short off-street trail located in the Mt. Jefferson Park and Greenway in the Del Ray community to the west of the Oakville Triangle and Potomac Yard study area.

On-street facilities (bike lanes and sharrows) in the study area are located along the following streets:

- Commonwealth Avenue
- Mt. Vernon Avenue
- Glebe Road west of US Route 1

Additionally, in the study area, certain streets are noted as shared bikeways including: Commonwealth Avenue north of Luna Park Drive, Dewitt Avenue between Hume Avenue and Monroe Avenue, Windsor Avenue west of US Route 1, and Monroe Avenue between Leslie Avenue and Mt. Vernon Avenue.

Existing peak hour bicycle counts in the study area are shown in ***Figure 3-5: Existing Bicycle Volumes.*** Pedestrian and bicycle facilities are shown in ***Figure 3-6: Pedestrian and Bicycle Facilities.***

3.5 EXISTING TRAFFIC VOLUMES

Traffic counts were conducted at the study area intersections on weekdays in April 2014 between 6:30 AM and 9:30 AM and between 4:00 PM and 7:00 PM. These counts were used to establish a network peak hour by identifying the peak 60 minutes of traffic over the entire study area during the AM and PM peak hours. The network peak hours of study were identified as 7:45 AM to 8:45 AM for the morning peak and 5:15 PM to 6:15 PM for the afternoon peak. The weekday peak hour turning movement counts are summarized in ***Figure 3-7: Existing AM Peak Hour Traffic Volumes and Levels of Service*** and ***Figure 3-8: Existing PM Peak Hour Traffic Volumes and Levels of Service***. The traffic, pedestrian, and bicycle counts are contained in **Appendix B.**

Figure 3-4: Existing Pedestrian Volumes

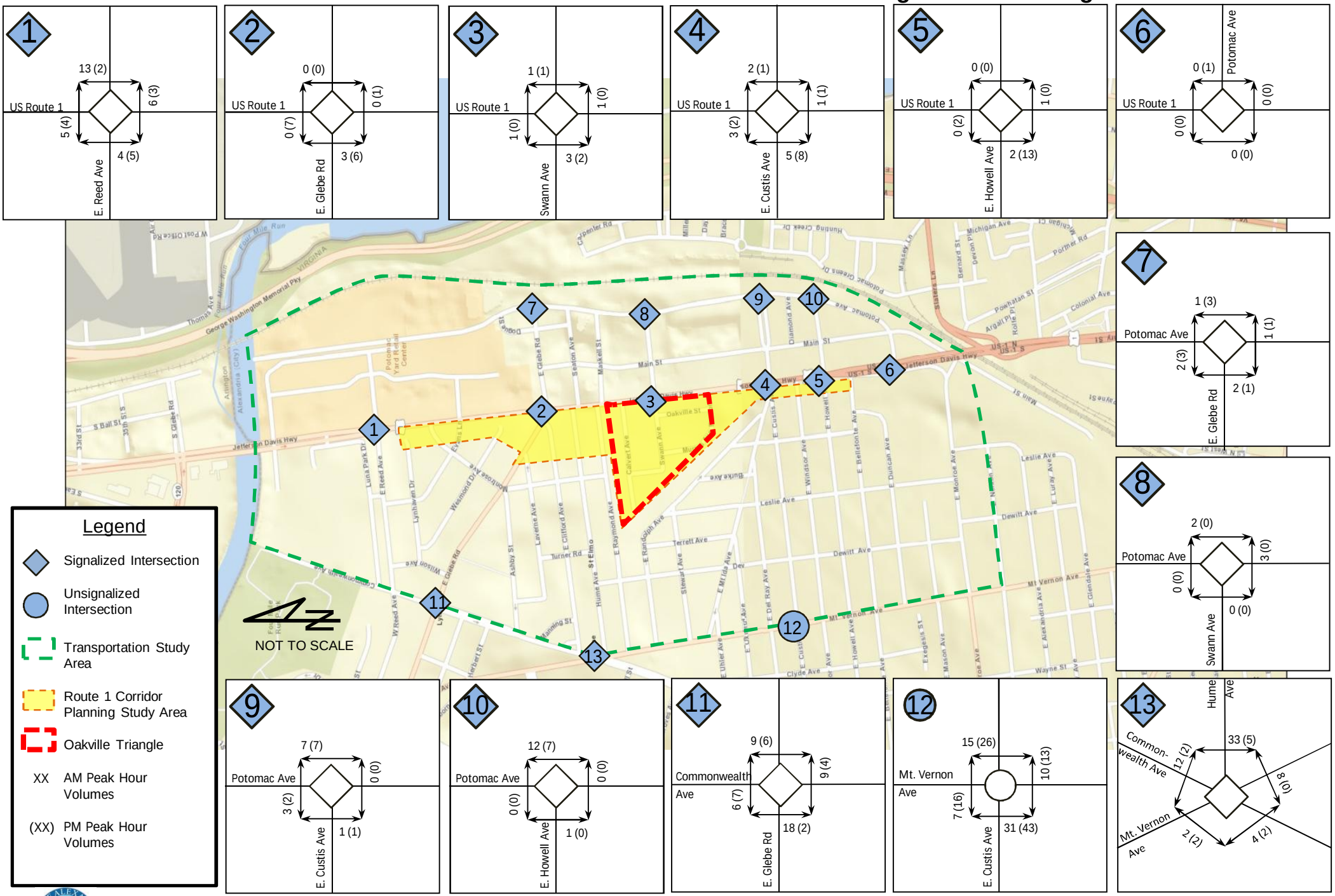


Figure 3-5: Existing Bicycle Volumes

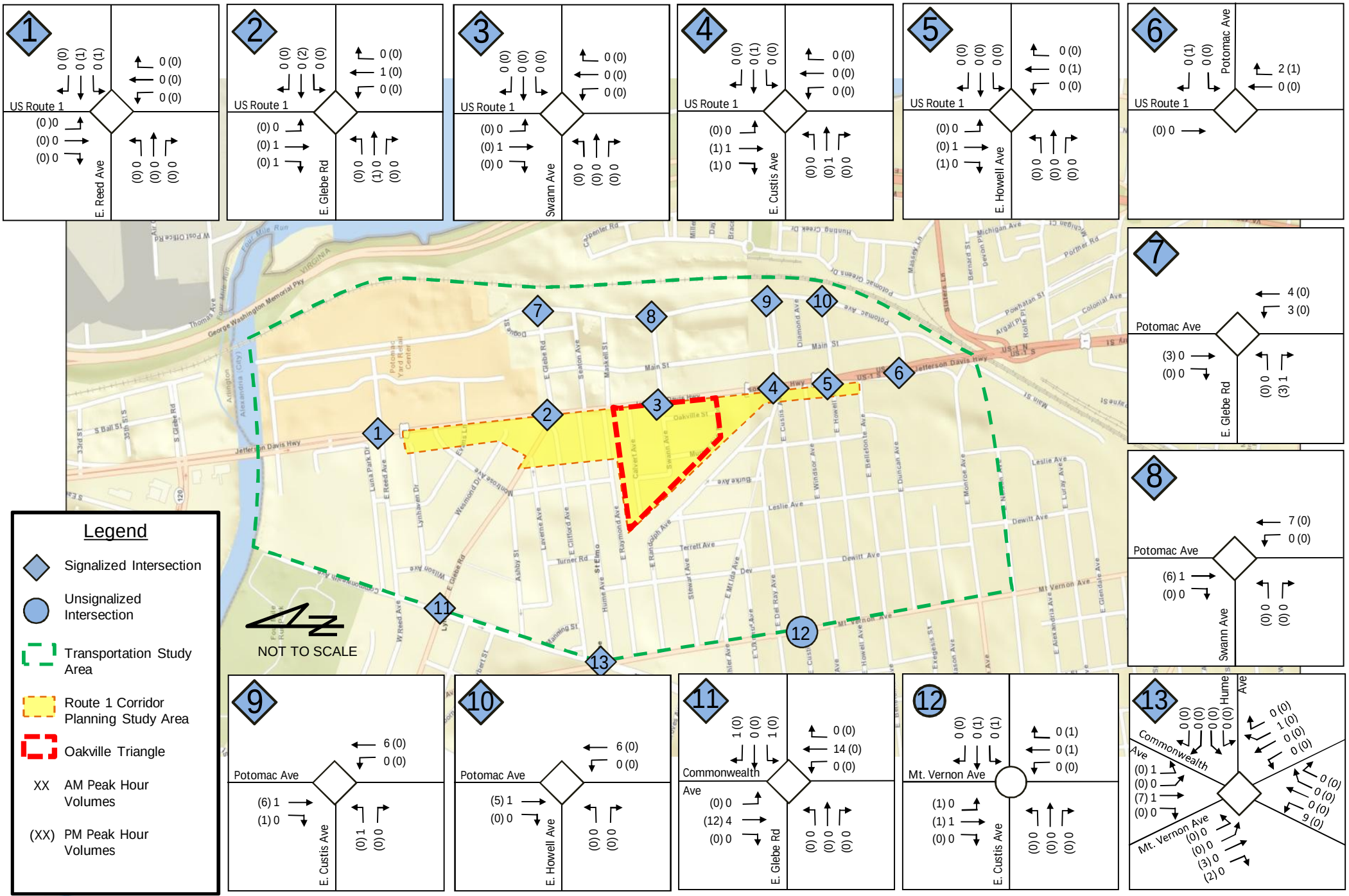


Figure 3-6: Pedestrian and Bicycle Facilities

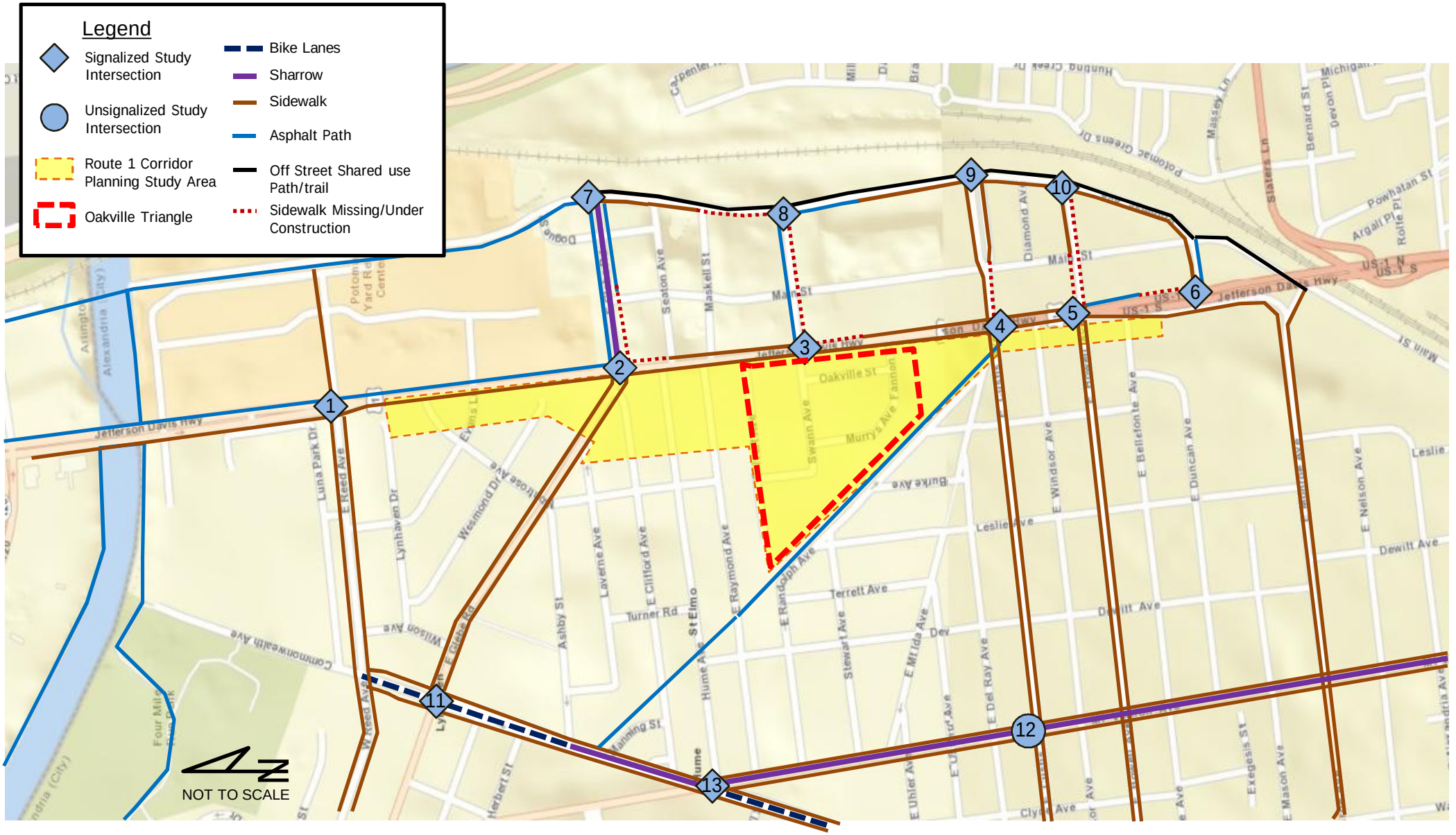


Figure 3-7: Existing AM Peak Hour Traffic Volumes and Levels of Service

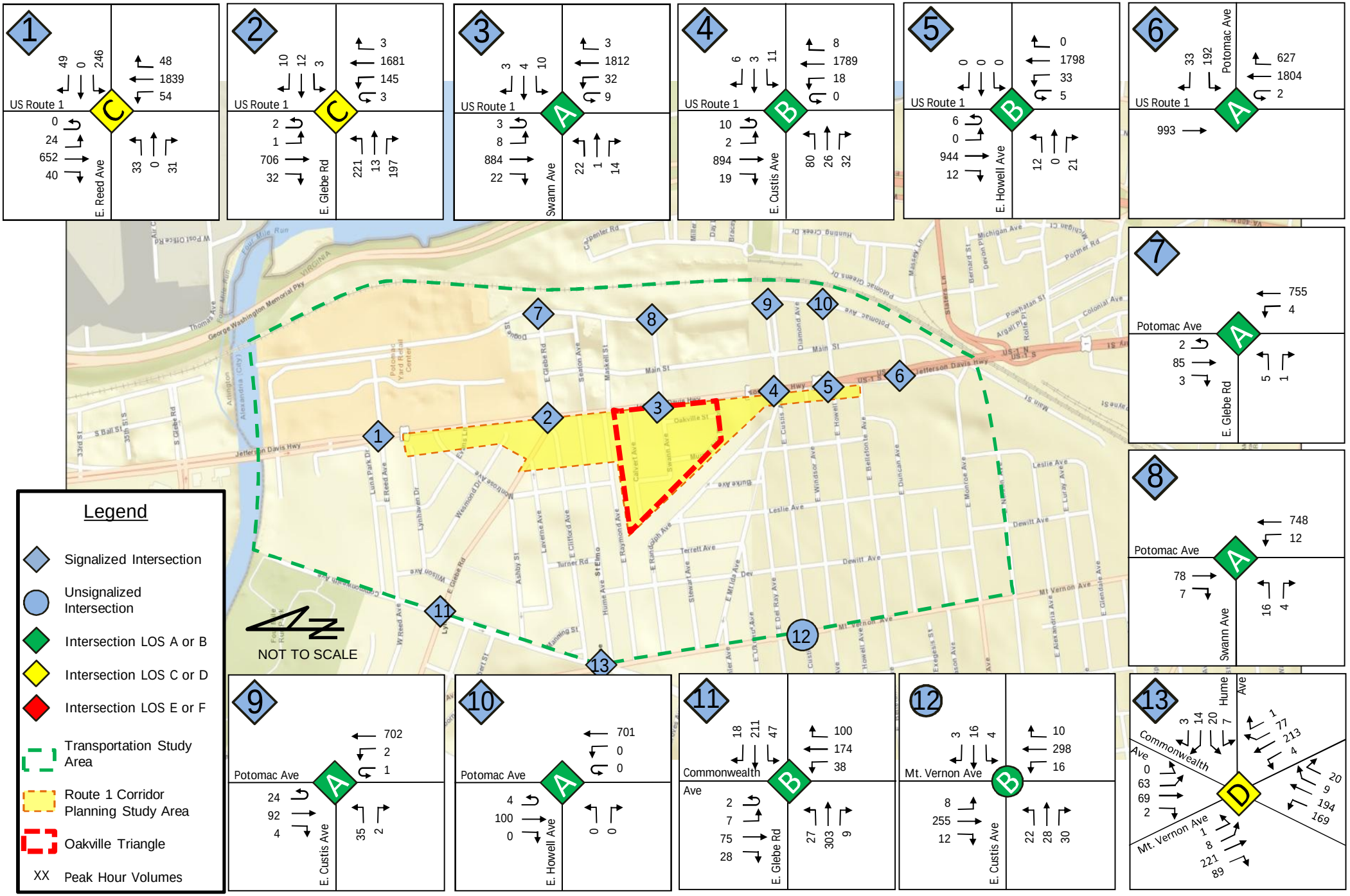
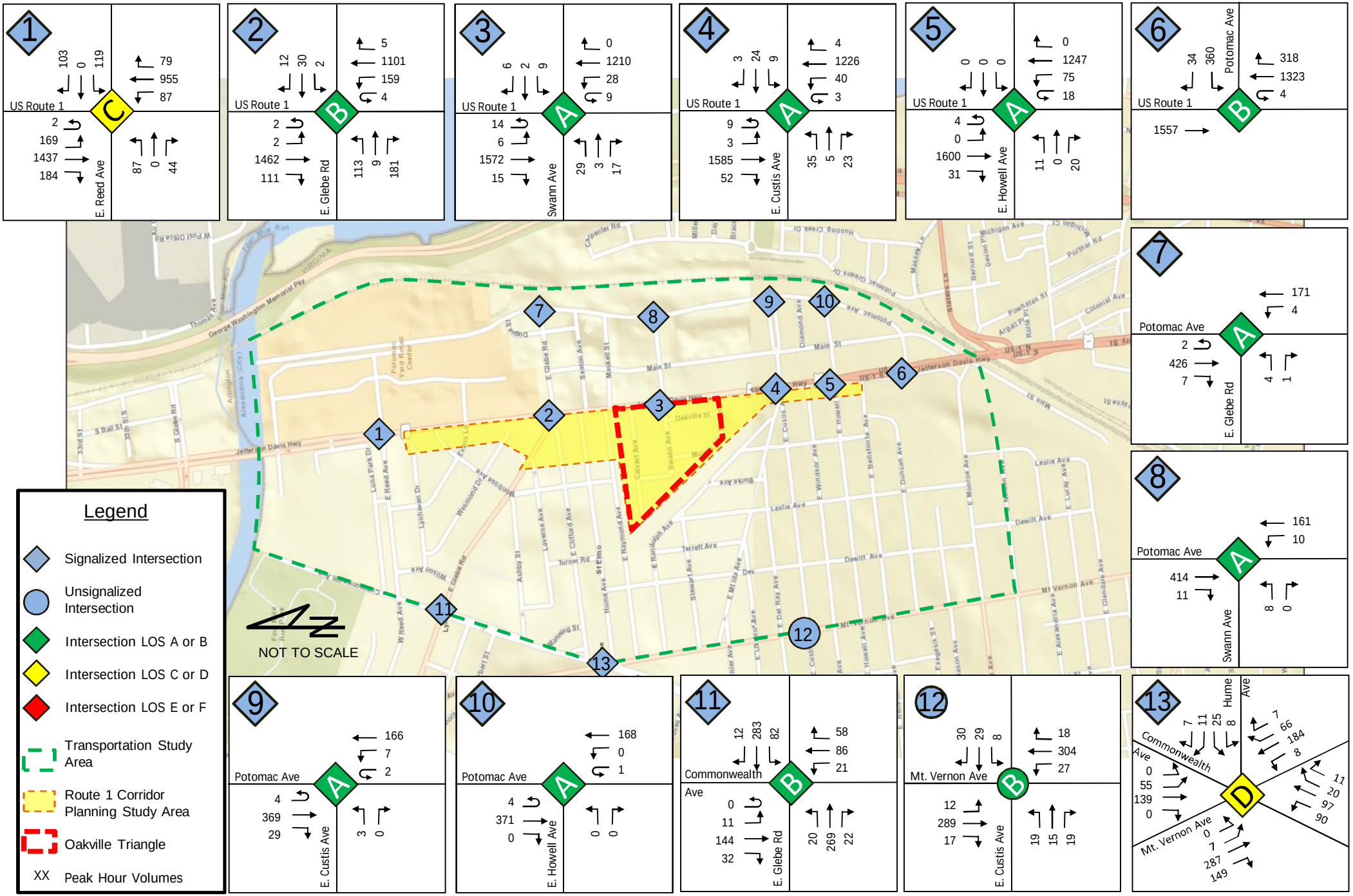


Figure 3-8: Existing PM Peak Hour Traffic Volumes and Levels of Service



Intersection Capacity Analysis

Intersection capacity analyses were conducted using the existing AM and PM peak hour turning movement volumes at the study intersections. The capacity analyses were conducted using Synchro, and based on methodologies contained in the *Highway Capacity Manual, 2000 Edition* (HCM) 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. Operational conditions are described by a level of service (LOS), which is a qualitative measure that describes the operational conditions of an intersection or street and is an indicator of motorist perceptions within a traffic stream. The HCM defines six levels of service, LOS A through F, with A as the best and F the worst. Table 3-2 shows the level of service delay per vehicle for signalized and unsignalized intersections. The City of Alexandria does not maintain a minimum LOS standard. In most urban areas, LOS D and E are considered acceptable conditions.

Table 3-2: Level of Service and Ranges of Delay

Level of Service (LOS)	Delay per Vehicle (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10	≤ 10
B	> 10 – 20	> 10 – 25
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

Source: Highway Capacity Manual, 2000 Edition

Existing conditions analysis were based on the existing peak hour turning movement volumes, laneages, peak hour factors, heavy vehicle percentages, and traffic control and signal timing at the study intersections. Results of the intersection capacity analyses are summarized in ***Figure 3-7: Existing AM Peak Hour Traffic Volumes and Levels of Service, Figure 3-8: Existing PM Peak Hour Traffic Volumes and Levels of Service,*** and Table 3-3***.*** Existing Conditions Synchro HCM and queuing reports are provided in **Appendix C**. A full queuing summary for all analysis scenarios is included in **Appendix D**.

The analysis shows that all study intersections operate at an overall acceptable LOS of D or better during both the AM and PM peak hours. The local street network to the west, north, and south of Route 1, the developing grid network of streets in the Potomac Yard, and the availability of Potomac Avenue as a viable north south alternative provide convenient opportunities for vehicle, pedestrian, bicycle, and transit travel. The interconnected network of streets allows for the efficient dispersion of traffic, reducing the automobile pressure along the Route 1 corridor and allowing the signalized and unsignalized intersections in the area to operate at acceptable levels of service.

It should be noted that there are side street approaches and movements that operate at LOS E or F. The Route 1 corridor is an essential component of north-south movements in the City of Alexandria and the greater Northern Virginia region.

In order to ensure its continued success as an alternate route to the I-95 corridor, as a connection between Fairfax County, Alexandria, and Arlington County, and as a transit-oriented corridor offering traditional (DASH and Metrobus) and enhanced (Metroway) transit options, the City has deliberately prioritized the efficient operations of the north-south movements. This approach is not uncommon in urban corridors. This prioritization may result in increased side street delays.

Table 3-3: Existing Traffic Analysis (Pre-Mitigation) LOS (sec/veh)

Intersection	Mvmt	Existing Conditions LOS	
		AM	PM
1. US Route 1 & East Reed Avenue			
Eastbound *(East Reed Avenue)*	L	E (63.6)	E (67.2)
	R	E (61.2)	E (57.0)
	Overall	*E (62.4)*	*E (63.8)*
Westbound *(East Reed Avenue)*	L	E (63.5)	E (61.5)
	R	E (55.6)	E (59.3)
	Overall	*E (62.2)*	*E (60.5)*
Northbound *(US Route 1)*	L	A (8.9)	C (26.8)
	T	B (17.3)	B (13.0)
	R	B (11.3)	B (11.4)
	Overall	*B (16.9)*	*B (13.9)*
Southbound *(US Route 1)*	L	C (21.2)	B (12.2)
	TR	B (11.6)	C (29.7)
	Overall	*B (11.9)*	*C (28.0)*
Overall Intersection		***C (21.2)***	***C (26.9)***
2. US Route 1 & East Glebe Road			
Eastbound (East Glebe Road)	TL	F (91.8)	E (57.9)
	R	D (45.4)	D (49.7)
	Overall	*E (70.6)*	*D (53.0)*
Westbound *(East Glebe Road)*	TL	D (42.7)	D (49.3)
	R	*D (42.2)*	*D (52.5)*
	Overall	*D (42.5)*	*D (50.2)*
Northbound *(US Route 1)*	L	E (75.6)	E (58.1)
	TR	C (25.1)	B (11.9)
	Overall	*C (29.2)*	*B (17.9)*
Southbound *(US Route 1)*	L	E (62.1)	D (43.3)
	TR	C (23.9)	A (8.6)
	Overall	*C (24.0)*	*A (8.7)*
Overall Intersection		***C (34.4)***	***B (17.5)***
3. US Route 1 & Swann Avenue			
Eastbound *(Swann*	TL	E (62.6)	E (65.1)

Table 3-3: Existing Traffic Analysis (Pre-Mitigation) LOS (sec/veh)			
Intersection	**Mvmt**	**Existing Conditions LOS**	
		AM	**PM**
Avenue)	R	E (60.6)	E (61.9)
	Overall	*E (61.9)*	*E (64.0)*
Westbound *(Swann Avenue)*	TL	E (61.6)	E (62.9)
	R	E (60.6)	E (61.9)
	Overall	*E (61.4)*	*E (62.5)*
Northbound *(US Route 1)*	L	F (83.1)	D (54.3)
	TR	A (2.1)	A (9.6)
	Overall	*A (3.9)*	*B (10.9)*
Southbound *(US Route 1)*	L	D (49.9)	F (92.2)
	TR	A (9.1)	A (2.8)
	Overall	*A (9.6)*	*A (3.9)*
Overall Intersection		***A (7.1)***	***A (8.4)***
4. US Route 1 & East Custis Avenue			
Eastbound *(East Cutis Avenue)*	LTR	E (73.8)	E (61.9)
	Overall	*E (73.8)*	*E (61.9)*
Westbound *(East Custis Avenue)*	LTR	D (53.0)	E (60.5)
	Overall	*D (53.0)*	*E (60.5)*
Northbound *(US Route 1)*	L	F (92.8)	E (74.8)
	TR	A (6.3)	A (1.6)
	Overall	*A (7.2)*	*A (4.1)*
Southbound *(US Route 1)*	L	E (72.8)	F (102.1)
	TR	A (4.8)	A (5.5)
	Overall	*A (5.7)*	*A (6.2)*
Overall Intersection		***B (10.4)***	***A (7.4)***
5. US Route 1 & East Howell Avenue*			
Eastbound *(East Howell Avenue)*	LTR	E (58.9)	E (61.6)
	Overall	*E (58.9)*	*E (61.6)*
Westbound *(East Howell Avenue)*	TL	A (0.0)	A (0.0)
	R	A (0.0)	A (0.0)
	Overall	*A (0.0)*	*A (0.0)*
Northbound *(US Route 1)*	L	F (133.6)	D (52.8)
	TR	A (8.8)	A (4.0)
	Overall	*B (11.4)*	*A (7.4)*
Southbound *(US Route 1)*	L	F (119.3)	F (80.0)
	TR	A (8.4)	A (2.9)
	Overall	*B (12.4)*	*A (3.1)*

Table 3-3: Existing Traffic Analysis (Pre-Mitigation) LOS (sec/veh)			
Intersection	**Mvmt**	**Existing Conditions LOS**	
		AM	**PM**
Overall Intersection		***B (12.3)***	***A (5.7)***
6. US Route 1 & Potomac Avenue			
Westbound *(Potomac Avenue)*	L	E (78.1)	D (53.3)
	R	E (60.0)	D (45.3)
	Overall	*E (75.4)*	*D (52.6)*
Northbound *(US Route 1)*	T	A (8.9)	A (6.6)
	R	A (0.1)	A (0.0)
	Overall	*A (6.7)*	*A (5.3)*
Southbound *(US Route 1)*	T	A (0.8)	A (6.1)
	Overall	*A (0.8)*	*A (6.1)*
Overall Intersection		***A (9.5)***	***B (11.4)***
7. Potomac Avenue & East Glebe Road			
Eastbound *(East Glebe Road)*	L	C (23.4)	C (23.2)
	R	C (22.9)	C (22.9)
	Overall	*C (23.3)*	*C (23.1)*
Northbound *(Potomac Avenue)*	L	A (2.2)	A (2.3)
	T	A (2.5)	A (2.1)
	Overall	*A (2.5)*	*A (2.1)*
Southbound *(Potomac Avenue)*	TR	A (4.2)	A (4.7)
	Overall	*A (4.2)*	*A (4.7)*
Overall Intersection		***A (2.9)***	***A (4.1)***
8. Potomac Avenue & Swann Avenue			
Eastbound *(Swann Avenue)*	L	C (31.7)	C (32.3)
	R	C (31.3)	A (0.0)
	Overall	*C (31.6)*	*C (32.3)*
Northbound *(Potomac Avenue)*	L	A (3.6)	A (3.0)
	T	A (4.8)	A (3.0)
	Overall	*A (4.8)*	*A (3.0)*
Southbound *(Potomac Avenue)*	TR	A (5.7)	A (5.7)
	Overall	*A (5.7)*	*A (5.7)*
Overall Intersection		***A (5.6)***	***A (5.2)***
9. Potomac Avenue & East Custis Avenue			
Eastbound *(East Custis Avenue)*	L	D (46.7)	D (46.3)
	R	D (45.2)	A (0.0)
	Overall	*D (46.7)*	*D (46.3)*
Northbound *(Potomac*	L	A (2.7)	A (2.2)

Table 3-3: Existing Traffic Analysis (Pre-Mitigation) LOS (sec/veh)			
Intersection	**Mvmt**	**Existing Conditions LOS**	
		AM	**PM**
Avenue)	T	A (3.6)	A (2.2)
	Overall	*A (3.6)*	*A (2.2)*
Southbound *(Potomac Avenue)*	TR	A (4.4)	A (4.2)
	Overall	*A (4.4)*	*A (4.2)*
Overall Intersection		***A (5.6)***	***A (3.8)***
10. Potomac Avenue & East Howell Avenue			
Eastbound *(East Howell Avenue)*	L	A (0.0)	A (0.0)
	R	A (0.0)	A (0.0)
	Overall	*A (0.0)*	*A (0.0)*
Northbound *(Potomac Avenue)*	L	A (0.0)	A (0.0)
	T	A (2.2)	A (0.0)
	Overall	*A (2.2)*	*A (0.0)*
Southbound *(Potomac Avenue)*	TR	A (1.6)	A (0.1)
	Overall	*A (1.6)*	*A (0.1)*
Overall Intersection		***A (2.2)***	***A (0.1)***
11. Commonwealth Avenue & West Glebe Road/East Glebe Road			
Eastbound *(West Glebe Road)*	LTR	B (14.4)	B (12.6)
	Overall	*B (14.4)*	*B (12.6)*
Westbound *(East Glebe Road)*	LTR	B (12.0)	B (15.1)
	Overall	*B (12.0)*	*B (15.1)*
Northbound *(Commonwealth Avenue)*	LTR	C (26.0)	B (18.5)
	Overall	*C (26.0)*	*B (18.5)*
Southbound *(Commonwealth Avenue)*	LTR	B (17.5)	B (19.6)
	Overall	*B (17.5)*	*B (19.6)*
Overall Intersection		***B (17.6)***	***B (15.8)***
12. Mt. Vernon Avenue & East Custis Avenue (Unsignalized)			
Eastbound (East Custis Avenue)	LTR	A (9.2)	A (9.2)
	Overall	*A (9.2)*	*A (9.2)*
Westbound (East Custis Avenue)	LTR	A (9.0)	A (9.3)
	Overall	*A (9.0)*	*A (9.3)*
Northbound (Mt. Vernon Avenue)	LTR	B (11.4)	B (12.4)
	Overall	*B (11.4)*	*B (12.4)*
Southbound (Mt. Vernon Avenue)	LTR	B (11.1)	B (11.7)
	Overall	*B (11.1)*	*B (11.7)*
Overall Intersection		***B (10.9)***	***B (11.6)***

Table 3-3: Existing Traffic Analysis (Pre-Mitigation) LOS (sec/veh)			
Intersection	**Mvmt**	**Existing Conditions LOS**	
		AM	**PM**
13. Commonwealth Avenue & Mt. Vernon Avenue & Hume Avenue			
Westbound (Hume Avenue)	LR	D (48.7)	D (45.7)
	Overall	*D (48.7)*	*D (45.7)*
Northbound (Mt. Vernon Avenue)	TL	C (32.1)	C (26.9)
	R	C (24.9)	C (22.0)
	Overall	*C (30.2)*	*C (25.6)*
Southbound (Mt. Vernon Avenue)	TL	D (43.2)	D (44.5)
	R	B (14.2)	B (17.0)
	Overall	*D (35.1)*	*D (35.3)*
Northeastbound (Commonwealth Avenue)	L	D (37.1)	D (39.4)
	TR	D (48.4)	D (42.1)
	Overall	*D (43.5)*	*D (41.0)*
Southwestbound (Commonwealth Avenue)	LTR	D (48.0)	D (44.3)
	Overall	*D (48.0)*	*D (44.3)*
Overall Intersection		***D (38.5)***	***D (36.0)***

*During the AM peak hour, the observed southbound left turn volumes at US Route 1 and Howell Avenue were minimal. As a result, due to low actuations, the synchro calculated delays for this movement were extremely high resulting in an Error for the overall intersection level of service. In order to calculate a realistic intersection level of service, the southbound left turn volumes at Howell Avenue were manually increased to a value of 30 vehicles for all AM scenarios. The magnitude of this value is within the range of similar movements.

3.6 EXISTING CONDITIONS SUMMARY

Existing transportation conditions in the study area still reflect a subtle yet growing shift from the previous auto-centric focus that governed much of the development along the Route 1 corridor. Whereas in the past, signal timing along US 1 were set to primarily progress thru auto traffic, the current signal timing in use along the corridor today were developed to support the thru movements and reliable headways of the Route 1 corridor's transit alternatives, particularly the Metroway, the latest in a full suite of transit alternatives in the study area that includes Metrorail, Metrobus, city bus services, and paratransit.

Intersection LOS analyses show that all study area intersections operate acceptably. It is anticipated that the current and future network of grid streets will continue to efficiently disperse traffic, attracting volumes from Route 1, and allowing intersections to operate acceptably. The study area is proximate to regional trails and has a well-developed pedestrian network that is continually improving with the ongoing redevelopment along both sides of Route 1 and the shift from auto-oriented development to mixed-use, urban, walkable neighborhoods. While there are no on-street bicycle facilities along Route 1, the regional and local trails and limited on-street facilities in the neighborhood grid system allow bicycles to divert to parallel routes.

4. Future Conditions without Development

This chapter examines future year conditions without the proposed redevelopment of the Route 1 Planning Corridor Study Area. Included in this chapter are descriptions of the future transportation network, future traffic volumes without redevelopment, and future traffic analysis results without development. Based on guidance from the City of Alexandria, this study contemplates three future years: 2018 (the year of Phase 1 development of the Oakville Triangle), 2021 (the year of full build-out for the Oakville Triangle), and 2027 (the design year for the Route 1 Planning Corridor Study Area including build-out of the rest of the Corridor Study Area).

4.1 FUTURE TRANSPORTATION NETWORK WITHOUT DEVELOPMENT

The following are planned transportation improvements that are anticipated to be completed prior to the 2018 study year:

The Metroway – The Metroway is a center running bus rapid transit (BRT) line that travels in dedicated lanes along Route 1. While the Metroway opened in August of 2014, for the purposes of this study, its effects on traffic (particularly the mode split of trips generated by future land uses) are not realized until the 2018 study year.

The Potomac Yard Metrorail Station - To improve accessibility of the study area and provide more transportation choices for current and future residents, employees, and businesses, a new station for the regional Metrorail system is planned. This additional station (the Potomac Yard Metrorail Station) will address existing and future travel demand in the area resulting from the City of Alexandria's planned development of major transit-oriented mixed-use activity centers (the Potomac Yard Landbays) in the area. For the purposes of this study, the City of Alexandria assumes the Potomac Yard Metrorail Station to be open at one of two locations east of Potomac Avenue and operational by the 2018 study year.

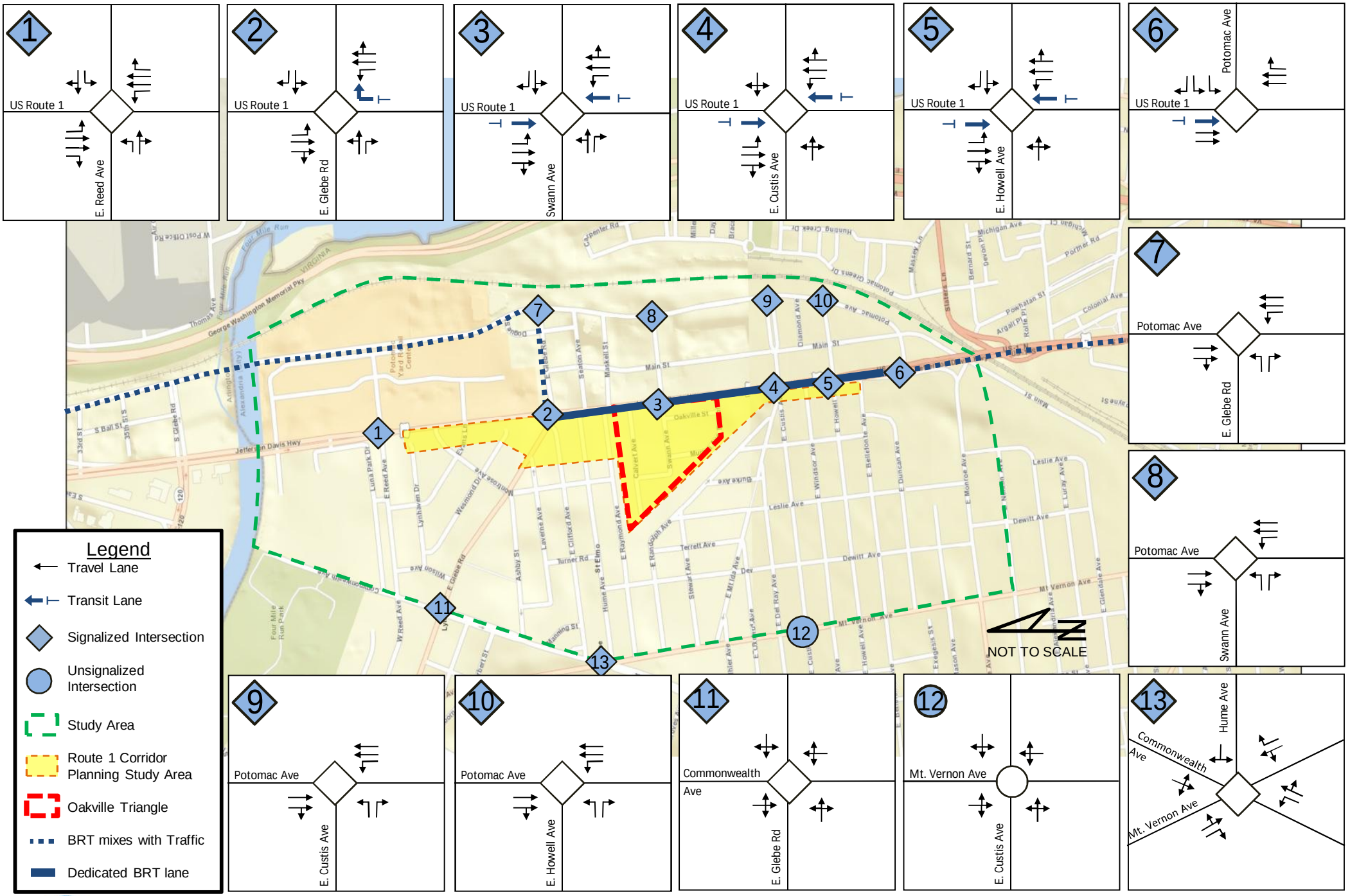
East Reed Avenue Intersection Improvements – Improvement to the lane configurations at the intersection of Reed Avenue and Route 1 including an exclusive southbound right turn lane and the modification of the east and west approaches to allow thru movements will be implemented.

Future laneages at the study intersections are shown in ***Figure 4-1: Future Intersection Laneage and Traffic Control without Development***.

4.2 FUTURE TRAFFIC VOLUMES WITHOUT DEVELOPMENT

Future weekday AM and PM peak hour turning movement volumes without development are the traffic volumes that will travel through study area intersections without the proposed redevelopment of Route 1 Planning Corridor Study Area in 2018, 2021, and 2027. Future traffic volumes without development are anticipated to increase from the existing traffic volumes due to general regional traffic growth, development activity in the Potomac Yard, and other nearby approved and unbuilt developments.

Figure 4-1: Future Intersection Laneage and Traffic Control



Regional Traffic Growth

To forecast additional traffic volumes attributed to regional traffic growth, data from VDOT daily traffic counts from 2001 to 2012 were reviewed. Table 4-1 summarizes the data available from the VDOT daily traffic counts for the study area streets. The VDOT AADT Reports are contained in **Appendix E**.

Table 4-1: VDOT Daily Traffic Volumes

			Average Daily Traffic (veh/day)					Total Annual Traffic Growth				
Street	From	To	2001	2004	2007	2010	2012	2001 to 2004	2004 to 2007	2007 to 2010	2010 to 2012	2001 to 2012
US 1	Monroe	North City line	43,000	41,000	40,000	42,000	37,000	-1.6%	-0.8%	1.6%	-6.1%	-1.4%
Commonwealth	Mt. Vernon	Reed	4,100	3,700	4,200	4,800	4,100	-3.4%	4.3%	4.6%	-7.6%	0.0%
Mt. Vernon	Braddock	Commonwealth	9,600	8,500	8,600	8,200	8,000	-4.0%	0.4%	-1.6%	-1.2%	-1.6%
Monroe	Russell	US 1	13,000	10,000	9,900	5,700	6,500	-8.4%	-0.3%	-16.8%	6.8%	-6.1%
E. Glebe	Mt. Vernon	US 1	8,500	9,600	10,000	9,500	8,900	4.1%	1.4%	-1.7%	-3.2%	0.4%
Reed	Mt. Vernon	US 1	4,100	3,600	3,500	3,400	2,800	-4.2%	-0.9%	-1.0%	-9.3%	-3.4%

Source: Kimley-Horn, Reference: VDOT AADT Reports

Based on a review of VDOT data, daily traffic volumes on study streets have not increased since 2001. This is consistent with the findings of the Potomac Yard Multimodal Transportation Study. The decline in traffic volumes may be attributed to traffic diversion to Potomac Avenue, the presence of high-quality transit, and changes in journey to work travel patterns.

Despite the lack of apparent traffic increases along US Route 1, a conservative one percent per year growth factor was applied to the existing turning movement volumes, up to a maximum growth of 10 percent. This one percent yearly growth factor is consistent with the factor used in the Potomac Yard Multimodal Transportation Study. This general growth is intended to reflect increases in traffic attributable to nonspecific growth in the City and currently unknown development in the vicinity of the Route 1 corridor. Consistent with the Potomac Yard Multimodal Transportation Study, this factor was applied only to northbound and southbound thru movements along US Route 1.

Planned Background Developments

A list of nearby approved and unbuilt developments was compiled by the City of Alexandria for inclusion in this study. This included developments in the North (NPY) and South (SPY) Potomac Yard. The forecasted peak hour person-trips generated by each development were determined using the Institute of Transportation Engineers' Trip Generation Manual, 9th Edition and mode split assumptions for the study area (described in **Chapter 5.2**). Per the methodology of the Potomac Yard Multimodal Transportation Study, the resulting auto person-trips are assumed to represent the number of vehicle trips (i.e. there is an assumed auto occupancy of 1.0).

Traffic generated by the approved and unbuilt developments is summarized in Tables 4-2, 4-3, and 4-4. The development levels and assumptions provided by the City's Planning and Zoning Department are contained in **Appendix F**.

Table 4-2: 2018 Approved and Unbuilt Development Peak Hour Person- and Vehicle-Trips

Development	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
South Potomac Yard Landbay G								
Retail	68,817 SF	47	21	26	187	82	105	2982
Transit (Metrorail - 29%)		*13*	*5*	*8*	*54*	*23*	*31*	*865*
Transit (Metrobus, Dash, Metroway - 8%)		*4*	*2*	*2*	*15*	*7*	*8*	*238*
Pedestrian & Bicycle (27%)		*13*	*6*	*7*	*51*	*22*	*29*	*805*
Auto (36%)		*17*	*8*	*9*	*67*	*30*	*37*	*1074*
Multifamily Residential	506 DU	194	60	134	232	135	97	1979
Transit (Metrorail - 29%)		*56*	*17*	*39*	*67*	*39*	*28*	*575*
Transit (Metrobus, Dash, Metroway - 8%)		*16*	*5*	*11*	*18*	*11*	*7*	*158*
Pedestrian & Bicycle (27%)		*52*	*16*	*36*	*63*	*36*	*27*	*534*
Auto (36%)		*70*	*22*	*48*	*84*	*49*	*35*	*712*
Landbay G (Auto) Total		87	30	57	151	79	72	1,786
South Potomac Yard Landbay H								
Multifamily Residential	250 DU	89	28	61	109	63	46	978
Transit (Metrorail - 29%)		*26*	*8*	*18*	*32*	*18*	*14*	*284*
Transit (Metrobus, Dash, Metroway - 8%)		*7*	*2*	*5*	*9*	*5*	*4*	*78*
Pedestrian & Bicycle (27%)		*24*	*8*	*16*	*29*	*17*	*12*	*264*
Landbay H (Auto) Total (36%)		32	10	22	39	23	16	352
South Potomac Yard Landbay I								
Townhouse	161 DU	76	13	63	89	60	29	973
Transit (Metrorail - 31%)		*23*	*4*	*19*	*28*	*19*	*9*	*302*
Transit (Metrobus, Dash, Metroway - 5%)		*4*	*1*	*3*	*4*	*3*	*1*	*49*
Pedestrian & Bicycle (10%)		*8*	*1*	*7*	*9*	*6*	*3*	*97*
Auto (54%)		*41*	*7*	*34*	*48*	*32*	*16*	*525*
Multifamily Residential	135 DU	42	13	29	54	31	23	528
Transit (Metrorail - 31%)		*13*	*4*	*9*	*17*	*10*	*7*	*164*
Transit (Metrobus, Dash, Metroway - 5%)		*2*	*1*	*1*	*3*	*1*	*2*	*26*
Pedestrian & Bicycle (10%)		*4*	*1*	*3*	*5*	*3*	*2*	*53*
Auto (54%)		*23*	*7*	*16*	*29*	*17*	*12*	*285*
Landbay I (Auto) Total		64	14	50	77	49	28	810
South Potomac Yard Landbay J								
Retail	5,000 SF	8	4	4	33	15	18	252

Table 4-2: 2018 Approved and Unbuilt Development Peak Hour Person- and Vehicle-Trips								
Development	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
Transit (Metrorail - 29%)		*2*	*1*	*1*	*10*	*5*	*5*	*73*
Transit (Metrobus, Dash, Metroway - 8%)		*1*	*1*	*0*	*2*	*1*	*1*	*20*
Pedestrian & Bicycle (27%)		*2*	*1*	*1*	*9*	*4*	*5*	*68*
Auto (36 %)		*3*	*1*	*2*	*12*	*5*	*7*	*91*
Townhouse	151 DU	72	12	60	84	56	28	921
Transit (Metrorail - 31%)		*22*	*4*	*18*	*27*	*17*	*10*	*286*
Transit (Metrobus, Dash, Metroway - 5%)		*4*	*1*	*3*	*4*	*3*	*1*	*46*
Pedestrian & Bicycle (10%)		*7*	*1*	*6*	*8*	*6*	*2*	*92*
Auto (54%)		*39*	*6*	*33*	*45*	*30*	*15*	*497*
Multifamily Residential	183 DU	62	19	43	77	45	32	716
Transit (Metrorail - 31%)		*20*	*6*	*14*	*23*	*14*	*9*	*221*
Transit (Metrobus, Dash, Metroway - 5%)		*3*	*1*	*2*	*4*	*2*	*2*	*36*
Pedestrian & Bicycle (10%)		*6*	*2*	*4*	*8*	*5*	*3*	*72*
Auto (54%)		*33*	*10*	*23*	*42*	*24*	*18*	*387*
Landbay J (Auto) Total		75	17	58	99	59	40	975
South Potomac Yard Landbay L								
Retail	5,000 SF	8	4	4	33	15	18	252
Transit (Metrorail - 29%)		*2*	*1*	*1*	*10*	*5*	*5*	*73*
Transit (Metrobus, Dash, Metroway - 8%)		*1*	*1*	*0*	*2*	*1*	*1*	*20*
Pedestrian & Bicycle (27%)		*2*	*1*	*1*	*9*	*4*	*5*	*68*
Auto (36%)		*3*	*1*	*2*	*12*	*5*	*7*	*91*
SPY Landbay L Townhouse	165 DU	77	13	64	91	61	30	994
Transit (Metrorail - 31%)		*24*	*4*	*20*	*28*	*19*	*9*	*308*
Transit (Metrobus, Dash, Metroway - 5%)		*4*	*2*	*3*	*5*	*3*	*2*	*50*
Pedestrian & Bicycle (10%)		*7*	*1*	*6*	*9*	*6*	*3*	*99*
Auto (54%)		*42*	*7*	*35*	*49*	*33*	*16*	*537*
SPY Landbay L Multifamily	276 DU	100	31	69	121	70	51	1080
Transit (Metrorail - 31%)		*31*	*10*	*21*	*38*	*22*	*16*	*335*
Transit (Metrobus, Dash, Metroway - 5%)		*5*	*1*	*4*	*6*	*3*	*3*	*54*
Pedestrian & Bicycle (10%)		*10*	*3*	*7*	*12*	*7*	*5*	*108*
Auto (54%)		*54*	*17*	*37*	*65*	*38*	*27*	*583*
Landbay L (Auto) Total		99	25	74	126	76	50	1,211
The Dorn Building	2,956 SF	11	10	1	82	14	68	90
Tony's Corner	10,525 SF	12	5	7	47	21	26	488
Transit (Metrorail - 29%)		*4*	*2*	*2*	*14*	*6*	*8*	*141*
Transit (Metrobus, Dash, Metroway - 8%)		*1*	*0*	*1*	*4*	*2*	*2*	*39*

Table 4-2: 2018 Approved and Unbuilt Development Peak Hour Person- and Vehicle-Trips								
Development	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
Pedestrian & Bicycle (27%)		*3*	*1*	*2*	*13*	*6*	*7*	*132*
Auto (36%)		*4*	*2*	*2*	*16*	*7*	*9*	*176*
Pass-by					*-10*	*-4*	*-6*	-
Tony's Corner (Auto) Total		4	2	2	6	3	3	176
Anthony's Auto Ext.	9,040 SF	20	13	7	28	13	15	-
East Reed AHC Multifamily	54 DU	9	3	6	15	9	6	211
East Reed Townhomes	5 DU	5	1	4	5	3	2	47
Marino's Restaurant Ext.	2,547 SF	28	15	13	25	15	10	324
Jefferson Davis Warehouse	11,500 SF	25	20	5	15	4	11	77
Alexandria Toyota Extension	13,000 SF	29	19	10	40	19	21	-
2018 A&U Auto Mode Total		488	179	309	719	371	348	6,059

Table 4-3: 2021 Approved and Unbuilt Development Peak Person- and Vehicle-Trips								
Development*	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
South Potomac Yard Landbay G								
SPY Landbay G Office	378,896 SF	555	488	67	503	86	417	3,613
Transit (Metrorail - 21%)		*117*	*103*	*14*	*106*	*18*	*88*	*759*
Transit (Metrobus, Dash, Metroway - 9%)		*50*	*44*	*6*	*45*	*8*	*37*	*325*
Pedestrian & Bicycle (6%)		*33*	*29*	*4*	*30*	*5*	*25*	*217*
Auto (64%)		355	312	43	322	55	267	2312
SPY Landbay G Hotel	340 DU	163	109	54	187	79	108	2,122
Transit (Metrorail - 27%)		*44*	*30*	*14*	*51*	*21*	*30*	*573*
Transit (Metrobus, Dash, Metroway - 4%)		*7*	*4*	*3*	*7*	*3*	*4*	*85*
Pedestrian & Bicycle (31%)		*50*	*34*	*16*	*58*	*25*	*33*	*658*
Auto (38 %)		62	41	21	71	30	41	806
SPY Landbay G Multifamily	140 DU	44	14	30	56	32	24	548
Transit (Metrorail - 48%)		*21*	*7*	*14*	*27*	*15*	*12*	*263*
Transit (Metrobus, Dash, Metroway - 1%)		*0*	*0*	*0*	*1*	*0*	*1*	*6*
Pedestrian & Bicycle (15%)		*7*	*2*	*5*	*8*	*5*	*3*	*82*
Auto (36%)		16	5	11	20	12	8	197
SPY Landbay G Auto Total		433	358	75	413	97	316	3,315
South Potomac Yard Landbay H								
SPY Landbay H Office	600,000 DU	802	706	96	750	128	622	5,124
Transit (Metrorail - 21%)		*169*	*148*	*21*	*157*	*27*	*130*	*1,077*

Table 4-3: 2021 Approved and Unbuilt Development Peak Person- and Vehicle-Trips								
Development*	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
Transit (Metrobus, Dash, Metroway - 9%)		*72*	*64*	*8*	*68*	*11*	*57*	*461*
Pedestrian & Bicycle (6%)		*48*	*42*	*6*	*45*	*8*	*37*	*307*
Auto (36%)		*513*	*452*	*61*	*480*	*82*	*398*	*3,279*
Retail	5,000 SF	8	4	4	33	15	18	252
Transit (Metrorail - 29%)		*2*	*1*	*1*	*10*	*5*	*5*	*73*
Transit (Metrobus, Dash, Metroway - 8%)		*1*	*1*	*0*	*2*	*1*	*1*	*20*
Pedestrian & Bicycle (27%)		*2*	*1*	*1*	*9*	*4*	*5*	*68*
Auto (36%)		*3*	*1*	*2*	*12*	*5*	*7*	*91*
Townhouse	16 DU	12	2	10	13	9	4	63
Transit (Metrorail - 48%)		*6*	*1*	*5*	*6*	*4*	*2*	*30*
Transit Metrobus, Dash, Metroway - 1%)		*0*	*0*	*0*	*0*	*0*	*0*	*1*
Pedestrian & Bicycle (15%)		*2*	*0*	*2*	*1*	*1*	*0*	*9*
Auto (36%)		*4*	*1*	*3*	*5*	*3*	*2*	*23*
Multifamily Residential	36 DU	2	1	1	6	3	3	141
Transit (Metrorail - 48%)		*1*	*1*	*0*	*3*	*2*	*1*	*68*
Transit Metrobus, Dash, Metroway - 1%)		*0*	*0*	*0*	*0*	*0*	*0*	*1*
Pedestrian & Bicycle (15%)		*0*	*0*	*0*	*1*	*0*	*1*	*21*
Auto (36%)		*1*	*0*	*1*	*2*	*1*	*1*	*51*
SPY Landbay H (Auto) Total		521	454	67	499	91	408	3,444
North Potomac Yard Landbay F								
Retail	50,000 SF	35	15	20	141	62	79	2,177
Transit (Metrorail - 29%)		*10*	*5*	*5*	*41*	*18*	*23*	*631*
Transit (Metrobus, Dash, Metroway - 8%)		*3*	*1*	*2*	*11*	*5*	*6*	*174*
Pedestrian & Bicycle (27%)		*9*	*4*	*5*	*38*	*17*	*21*	*588*
Auto (36%)		*13*	*5*	*8*	*51*	*22*	*29*	*784*
Townhouse	489 DU	187	58	129	224	130	94	1,913
Transit (Metrorail - 31%)		*58*	*18*	*40*	*70*	*40*	*30*	*593*
Transit (Metrobus, Dash, Metroway - 5%)		*9*	*3*	*6*	*11*	*7*	*4*	*96*
Pedestrian & Bicycle (10%)		*19*	*6*	*13*	*22*	*13*	*9*	*191*
Auto (54%)		*101*	*31*	*70*	*121*	*70*	*51*	*1033*
NPY Landbay F (Auto) Total		114	36	78	172	92	80	1,817
Total		1,068	848	220	1,084	280	804	8,576

* Additional development beyond 2018

Table 4-4: 2027 Approved and Unbuilt Development Peak Hour Person- and Vehicle-Trips								
Development *	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
South Potomac Yard Landbay G								
Office	602,450 SF	805	708	97	753	128	625	5,140
Transit (Metrorail - 21%)		*169*	*149*	*20*	*158*	*27*	*131*	*1,079*
Transit (Metrobus, Dash, Metroway - 9%)		*73*	*64*	*9*	*68*	*11*	*57*	*463*
Pedestrian & Bicycle (6%)		*48*	*42*	*6*	*45*	*8*	*37*	*308*
Auto (64%)		*515*	*453*	*62*	*482*	*82*	*400*	*3,290*
Retail	31,000 SF	24	11	13	96	42	54	1364
Transit (Metrorail - 29%)		*7*	*3*	*4*	*28*	*12*	*16*	*396*
Transit (Metrobus, Dash, Metrobus - 8%)		*2*	*1*	*1*	*7*	*3*	*4*	*109*
Pedestrian & Bicycle (27%)		*6*	*3*	*3*	*26*	*11*	*15*	*368*
Auto (36%)		*9*	*4*	*5*	*35*	*15*	*20*	*491*
SPY Landbay G (Auto) Total		524	457	67	517	97	420	3,781
South Potomac Yard Landbay H								
Office	500,000 SF	693	610	83	638	108	530	4,461
Transit (Metrorail - 21%)		146	128	18	134	23	111	937
Transit (Metrobus, Dash, Metroway - 9%)		62	55	7	58	10	48	401
Pedestrian & Bicycle (6%)		41	37	4	38	6	32	268
Auto (64%)		*444*	*390*	*54*	*408*	*69*	*339*	*2,855*
Retail	20,000 SF	17	7	10	69	30	39	893
Transit (Metrorail - 29%)		5	2	3	20	9	11	259
Transit (Metrobus, Dash, Metrobus - 8%)		1	0	1	6	2	4	72
Pedestrian & Bicycle (27%)		5	2	3	18	8	10	241
Auto (36%)		*6*	*3*	*3*	*25*	*11*	*14*	*321*
SPY Landbay H (Auto) Total		450	393	57	433	80	353	3,176
North Potomac Yard Landbay F								
Office	627,000 SF	831	731	100	781	133	648	5,298
Transit (Metrorail - 21%)		*174*	*153*	*21*	*164*	*28*	*136*	*1,112*
Transit (Metrobus, Dash, Metroway - 9%)		*75*	*66*	*9*	*70*	*12*	*58*	*477*
Pedestrian & Bicycle (6%)		*50*	*44*	*6*	*47*	*8*	*39*	*318*
Auto (64%)		*532*	*468*	*64*	*500*	*85*	*415*	*3,391*
Retail	70,000 SF	47	21	26	189	83	106	3,032
Transit (Metrorail - 29%)		*13*	*6*	*7*	*55*	*24*	*31*	*879*
Transit (Metrobus, Dash, Metrobus - 8%)		*4*	*2*	*2*	*15*	*7*	*8*	*242*
Pedestrian & Bicycle (27%)		*13*	*5*	*8*	*51*	*22*	*29*	*819*
Auto (36%)		*17*	*8*	*9*	*68*	*30*	*38*	*1,092*

Table 4-4: 2027 Approved and Unbuilt Development Peak Hour Person- and Vehicle-Trips								
Development *	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
NPY Landbay F Hotel	200 Rooms	96	64	32	110	46	64	1,248
Transit (Metrorail - 27%)		*26*	*17*	*9*	*29*	*12*	*17*	*337*
Transit (Metrobus, Dash, Metroway - 4%)		*4*	*3*	*1*	*5*	*3*	*2*	*50*
Pedestrian & Bicycle (31%)		*30*	*20*	*10*	*34*	*14*	*20*	*387*
Auto (38%)		*36*	*24*	*12*	*42*	*17*	*25*	*474*
NPY Landbay F Multifamily	896 DU	354	110	244	419	243	176	3,505
Transit (Metrorail - 31%)		*110*	*34*	*76*	*130*	*76*	*54*	*1,087*
Transit (Metrobus, Dash, Metroway - 5%)		*18*	*6*	*12*	*21*	*12*	*9*	*175*
Pedestrian & Bicycle (10%)		*35*	*11*	*24*	*42*	*24*	*18*	*350*
Auto (54%)		*191*	*59*	*132*	*226*	*131*	*95*	*1,893*
NPY Landbay F (Auto) Total		776	559	217	836	263	573	6,850
2027 A&U Auto Total		1,750	1,409	341	1,786	440	1346	13,807

* Additional development beyond 2018 and 2021

The locations of the approved and unbuilt developments are shown on ***Figure 4-2: Approved and Unbuilt Developments***. The assignment of the trips generated by the approved and unbuilt developments was based on an assumed trip distribution derived from the Potomac Yard Multimodal Transportation Study (see **Chapter 5.7**). The peak hour trip assignments for each development are shown in **Appendix G**. The approved and unbuilt peak hour traffic volumes are shown in ***Figure 4-3 2018 Approved and Unbuilt Development Peak Hour Volumes***, ***Figure 4-4 2021 Approved and Unbuilt Development Peak Hour Volumes***, and ***Figure 4-5 2027 Approved and Unbuilt Development Peak Hour Volumes***.

Figure 4-2: Approved & Unbuilt Developments

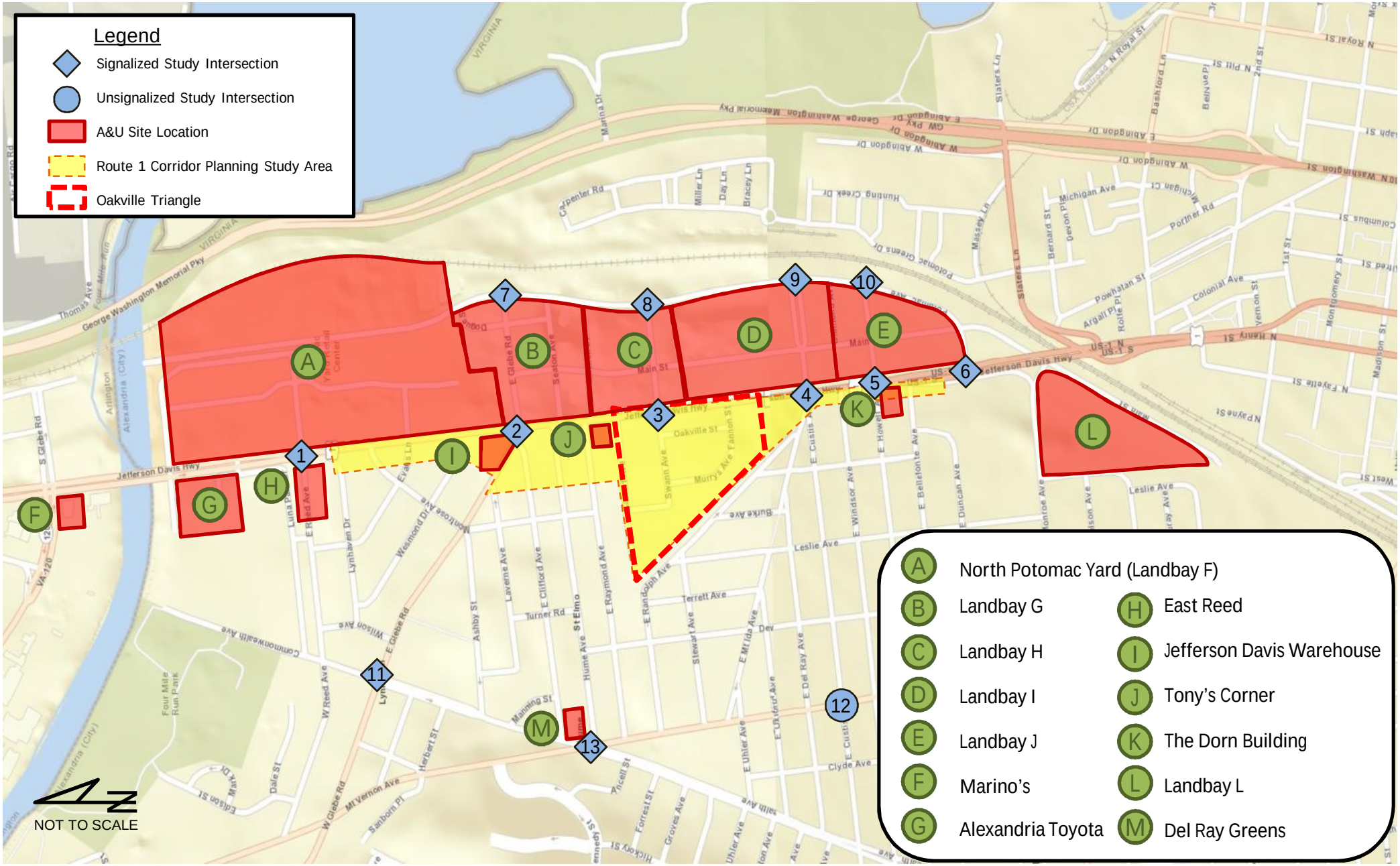


Figure 4-3: 2018 Approved & Unbuilt Development Peak Hour Volumes

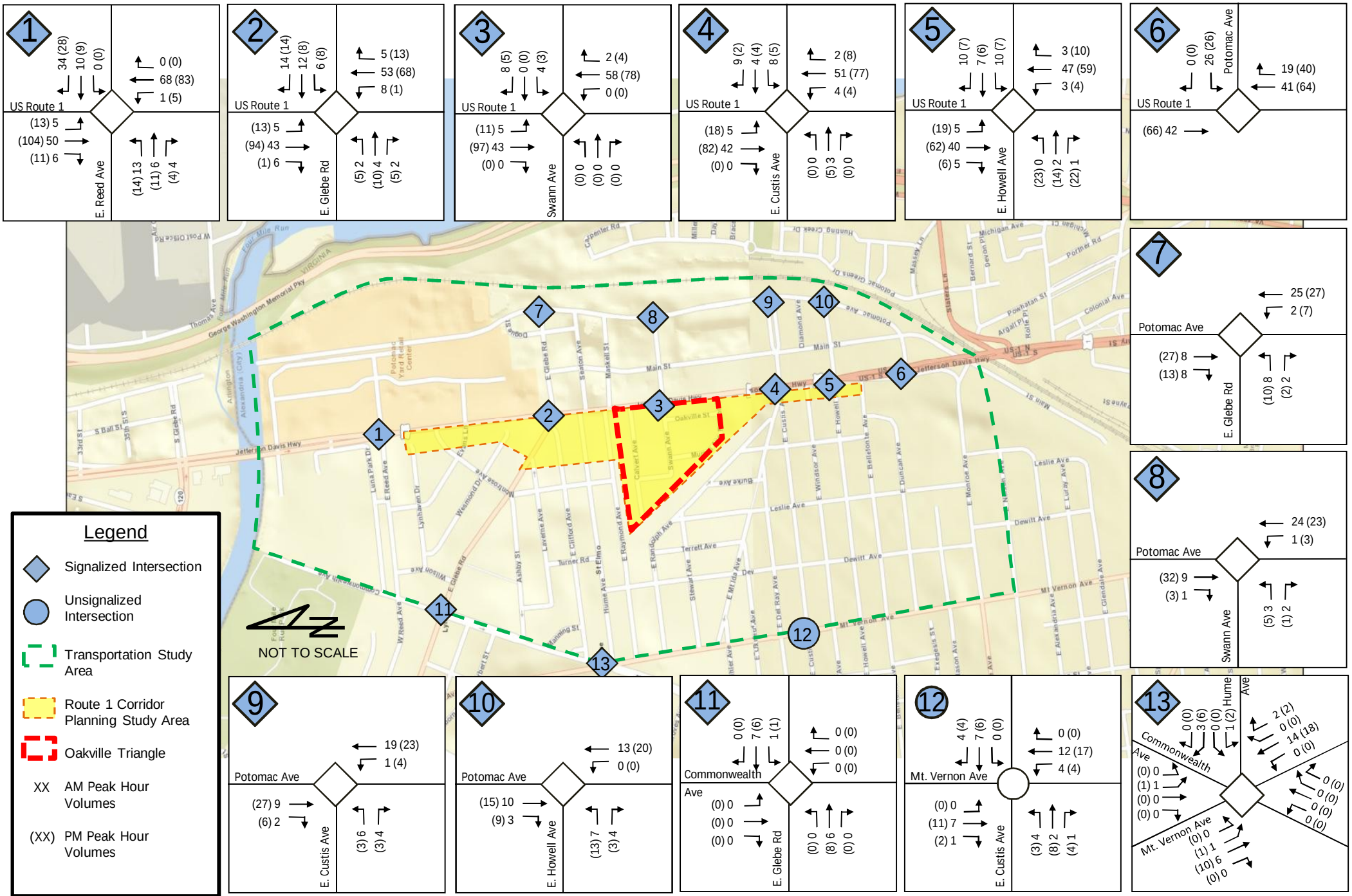


Figure 4-4: 2021 Approved & Unbuilt Development Peak Hour Volumes

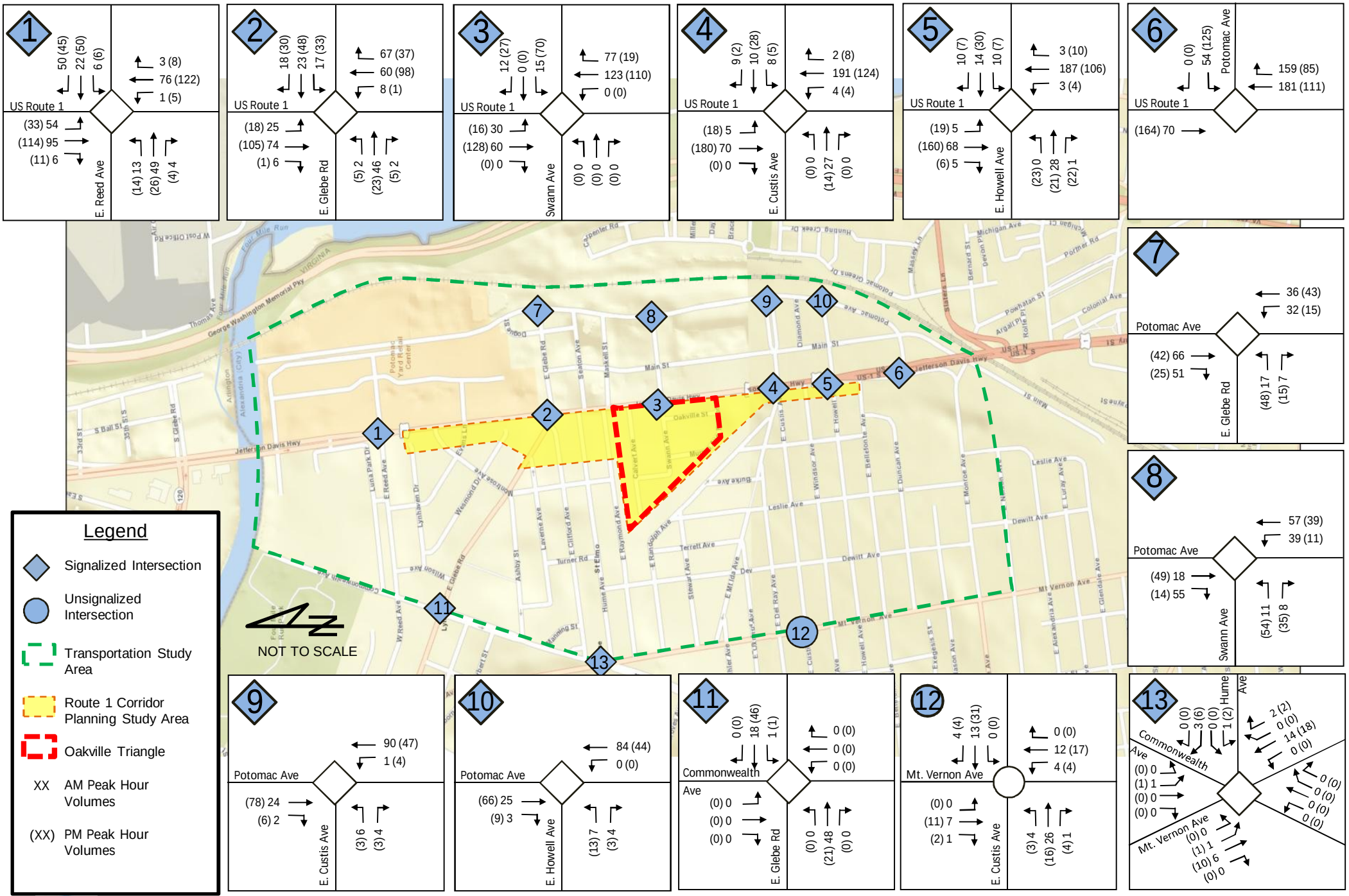
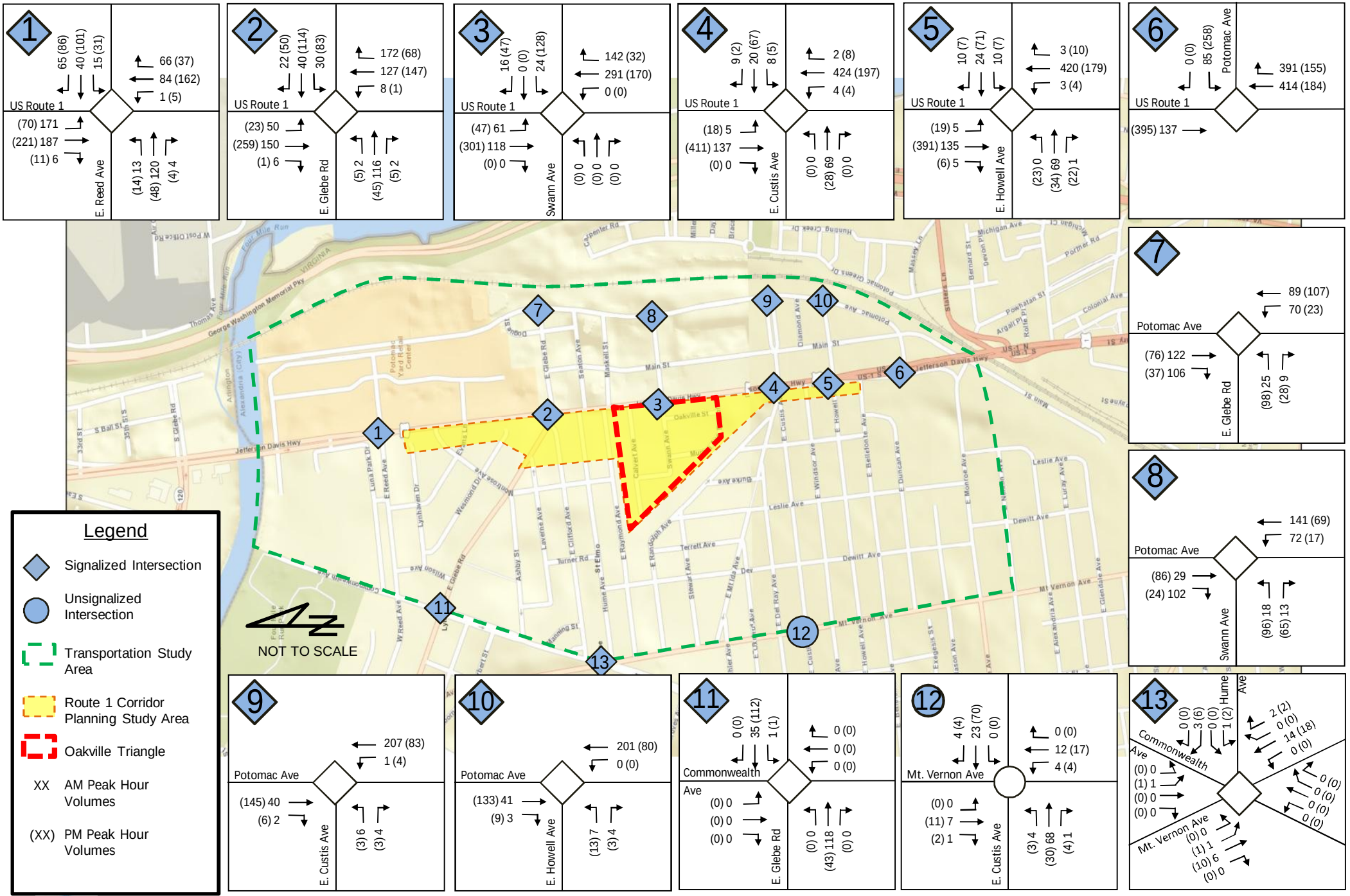


Figure 4-5: 2027 Approved & Unbuilt Development Peak Hour Volumes



Future Traffic Volumes Without Development

The future peak hour turning movement volumes without development were calculated increasing the existing traffic volumes using the north-south Route 1 growth factor and then adding these increased values to the traffic generated by the approved and unbuilt developments. The peak hour turning movement volumes at the study area intersections are shown in ***Figure 4-6: 2018 AM Future Turning Movement Volumes and Level of Service without Development***, ***Figure 4-7: 2018 PM Future Turning Movement Volumes and Level of Service without Development***, ***Figure 4-8: 2021 AM Future Turning Movement Volumes and Level of Service without Development***, ***Figure 4-9: 2021 PM Future Turning Movement Volumes and Level of Service without Development***, ***Figure 4-10: 2027 AM Future Turning Movement Volumes and Level of Service without Development,*** and ***Figure 4-11: 2027 PM Future Turning Movement Volumes and Level of Service without Development***.

Future Intersection Capacity Analyses Without Development

The analysis of future conditions without development was based on the future transportation network and the accompanying future turning movement volumes without development. The existing PHF factors were increased according to the methodologies of the City of Alexandria's Transportation Planning Administrative Guidelines and do not exceed the VDOT recommended maximum of 0.95 for future scenarios. Pedestrian volumes, bicycle volumes, and heavy vehicle percentages are consistent with those used for the existing conditions analysis. Level of service results of this analysis are summarized in Table 4-5. The Synchro HCM and queuing reports for the future conditions without development are provided in **Appendix H**.

The 2018 intersection capacity analysis results show that all intersections continue to operate at an overall LOS of D or better during the peak hours.

The 2021 future conditions without development intersection capacity analysis results show that two intersections operate at LOS E or F during the peak hours:

- US 1 and East Reed Avenue: LOS F during the AM
- US 1 and Glebe Road: LOS E during the AM

The 2027 future conditions without development intersection capacity analysis results show that two intersections operate at LOS E or F during the peak hours:

- US 1 and East Reed Avenue: LOS F during the AM and LOS E during PM
- US 1 and Glebe Road: LOS F during the AM and LOS E during PM

When comparing the results of the future without development conditions to the existing conditions, there is a general trend of increases in vehicle delay. Exceptions occur for specific movements where increases in volumes result in a better distribution of green time allocation due to more frequent phase actuations or where the positive impact of increase in volumes on critical lane groups (i.e. lane groups that weigh more heavily in the calculation of overall intersection LOS) are larger than the negative impact of other volume increases. It should also be noted that the analysis of future conditions is based on the existing signal timing; signal timing that has been reviewed and adjusted to suit the future traffic volumes would likely result in lower vehicle delays and improved LOS.

Figure 4-6: 2018 AM Future Turning Movement Volumes and Level of Service without Development

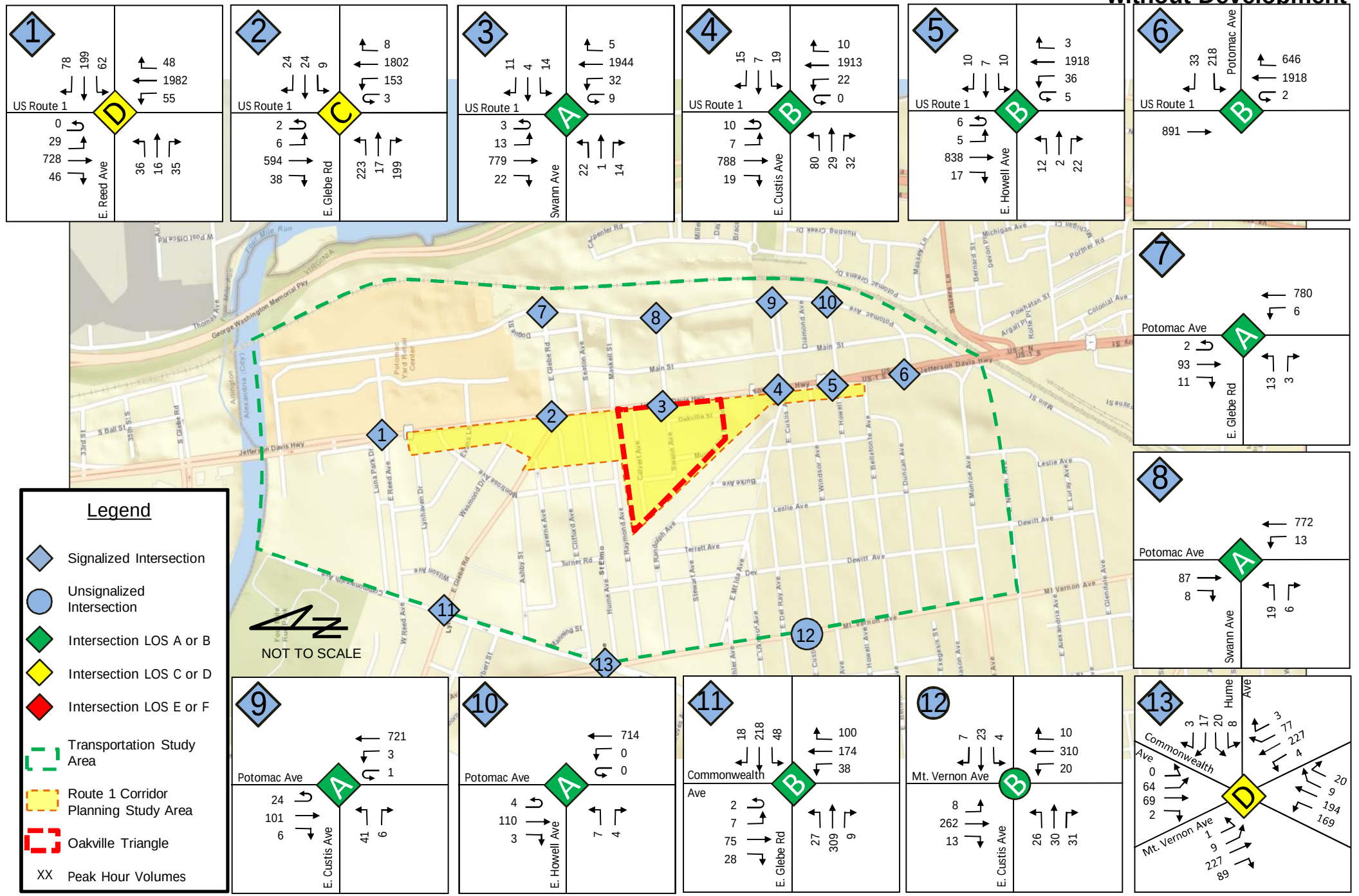


Figure 4-7: 2018 PM Future Turning Movement Volumes and Level of Service without Development

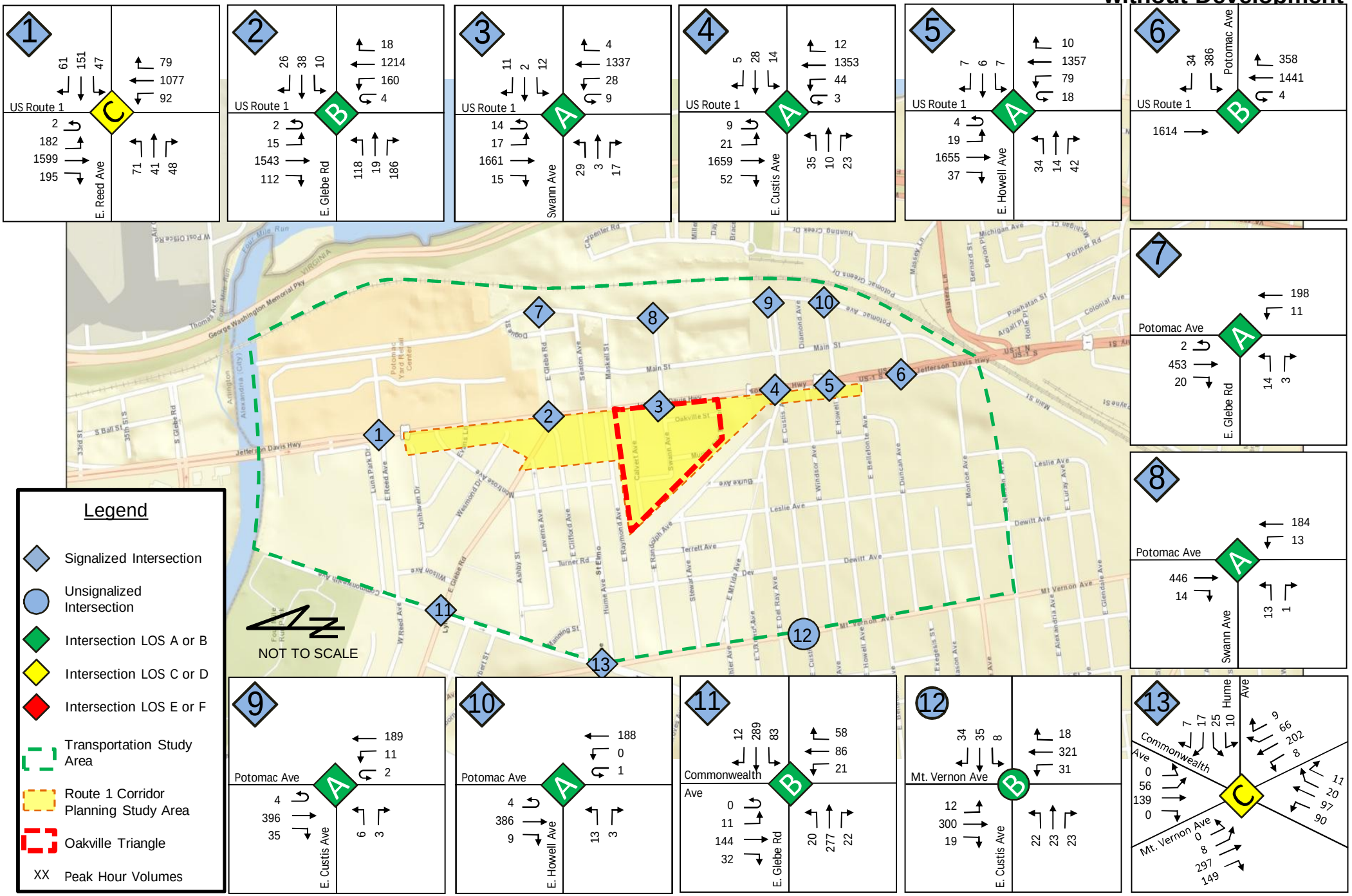


Figure 4-8: 2021 AM Future Turning Movement Volumes and Level of Service without Development

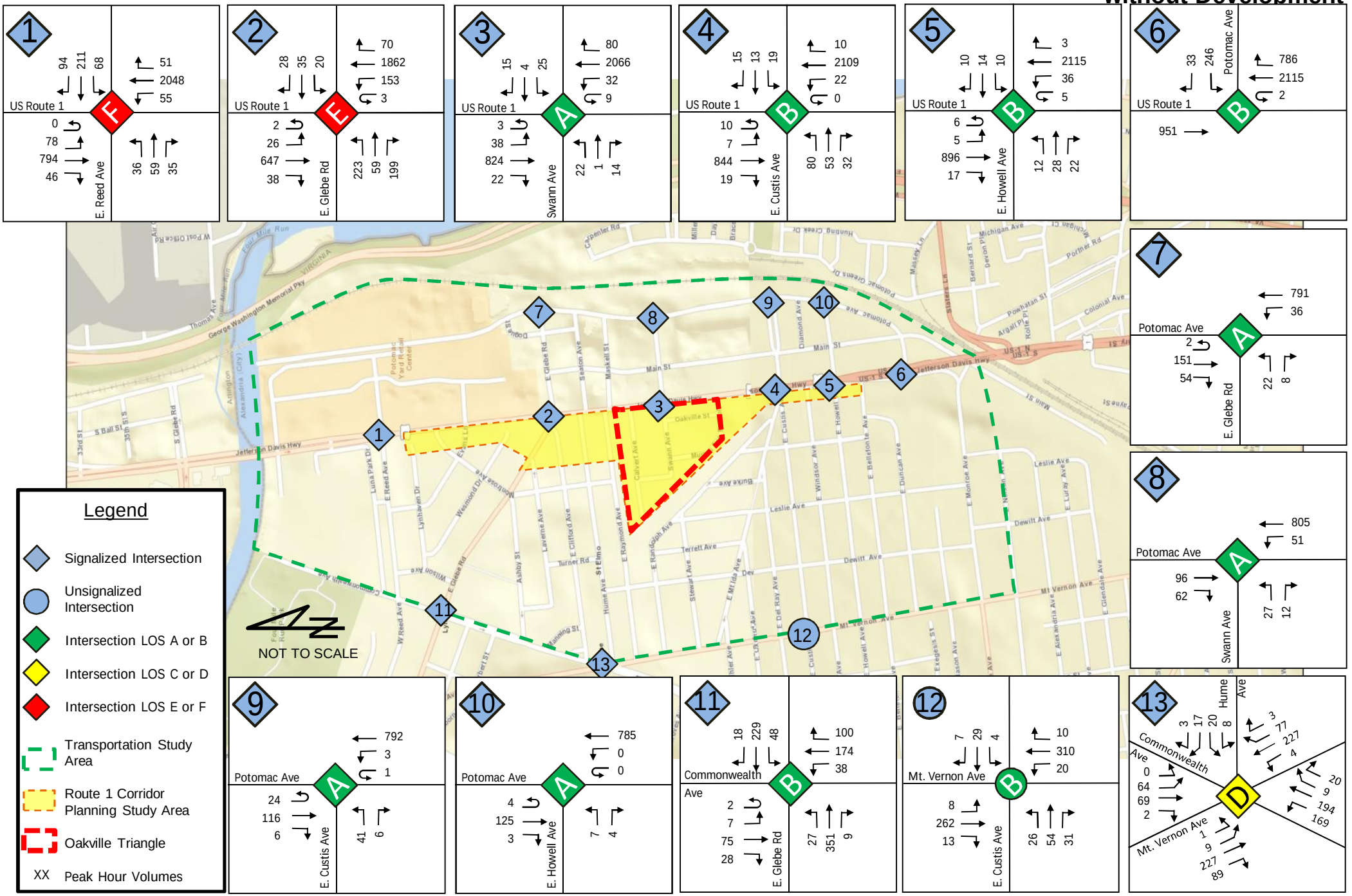


Figure 4-9: 2021 PM Future Turning Movement Volumes and Level of Service without Development

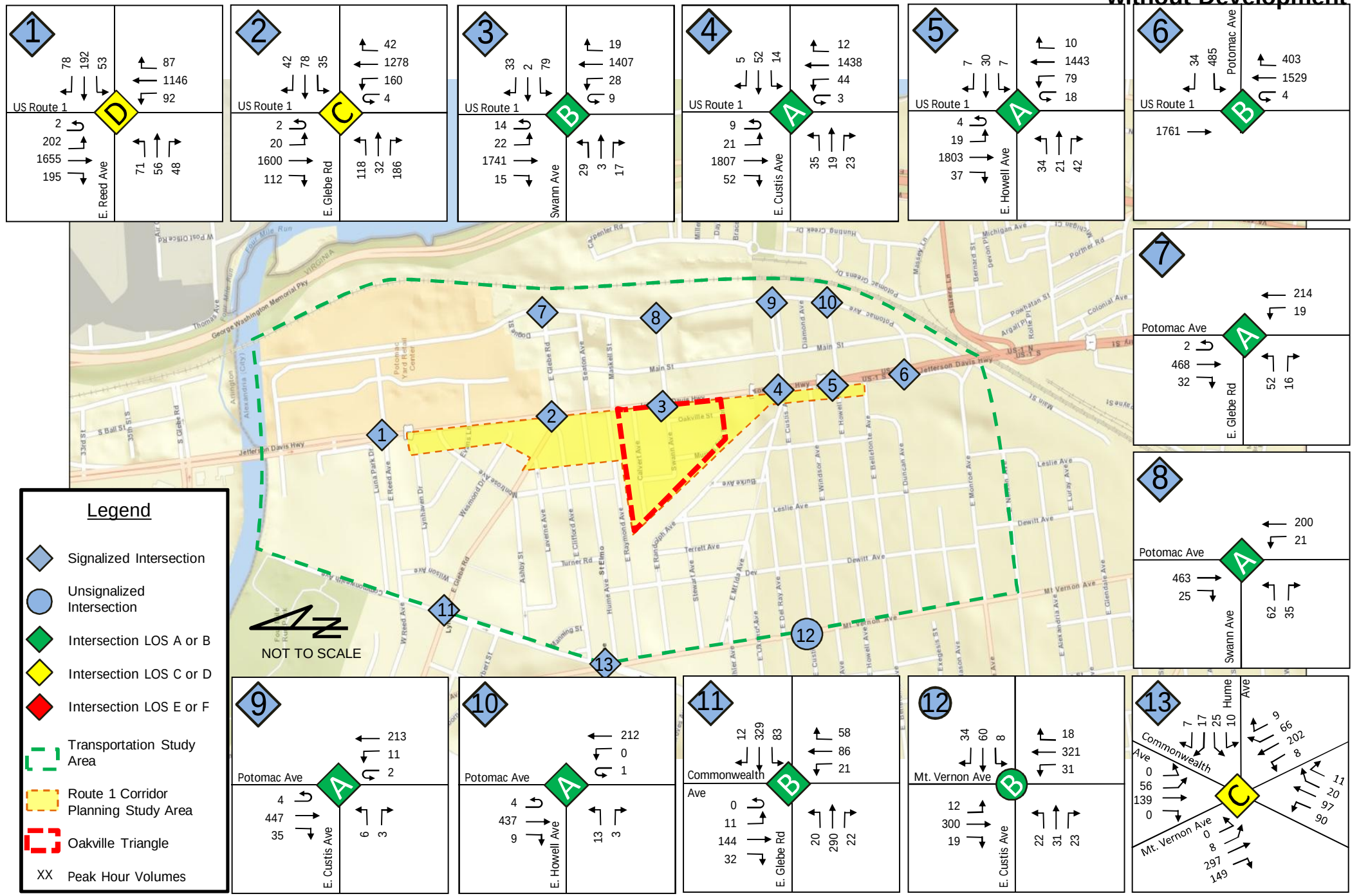


Figure 4-10: 2027 AM Future Turning Movement Volumes and Level of Service without Development

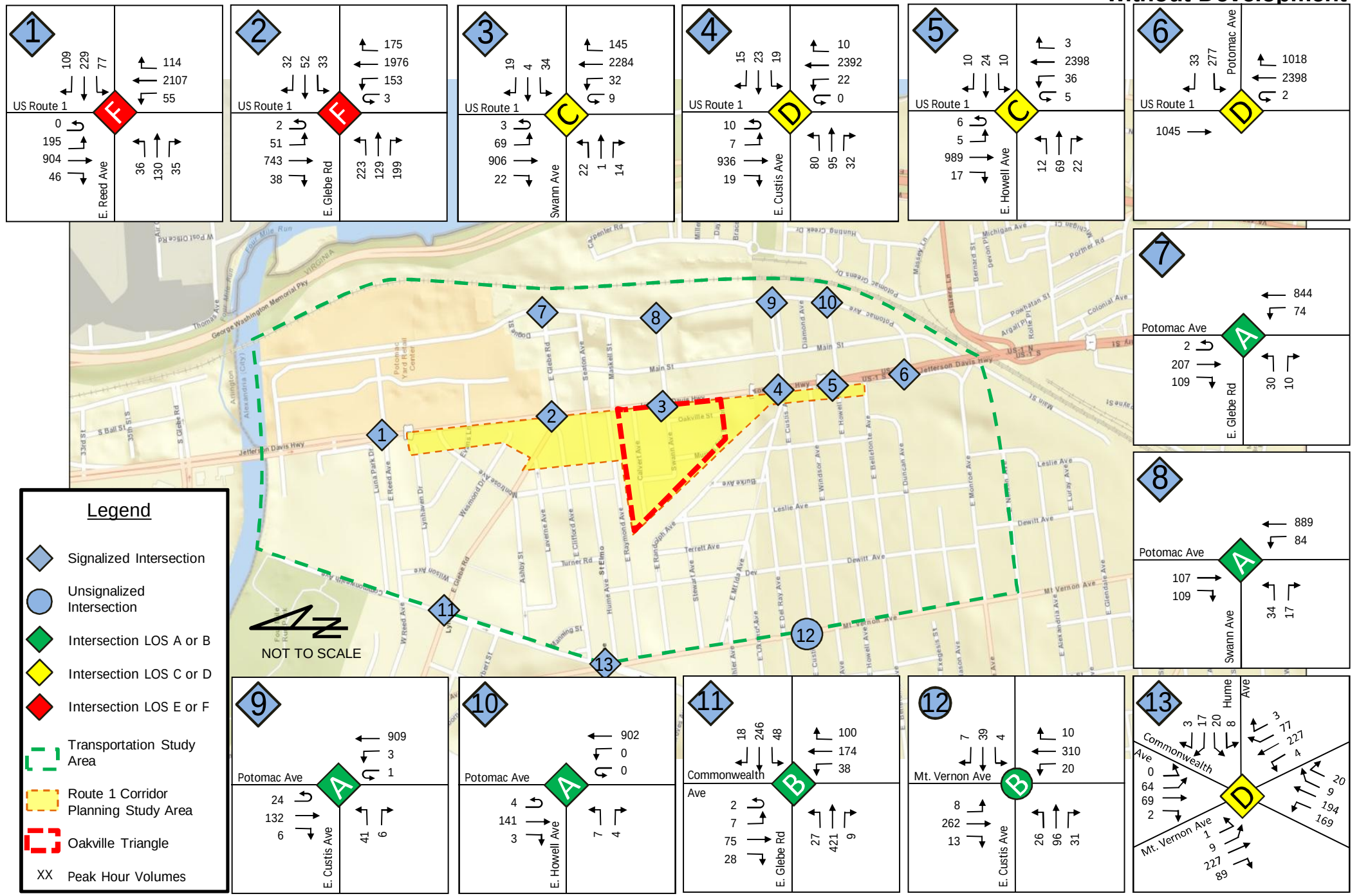


Figure 4-11: 2027 PM Future Turning Movement Volumes and Level of Service without Development

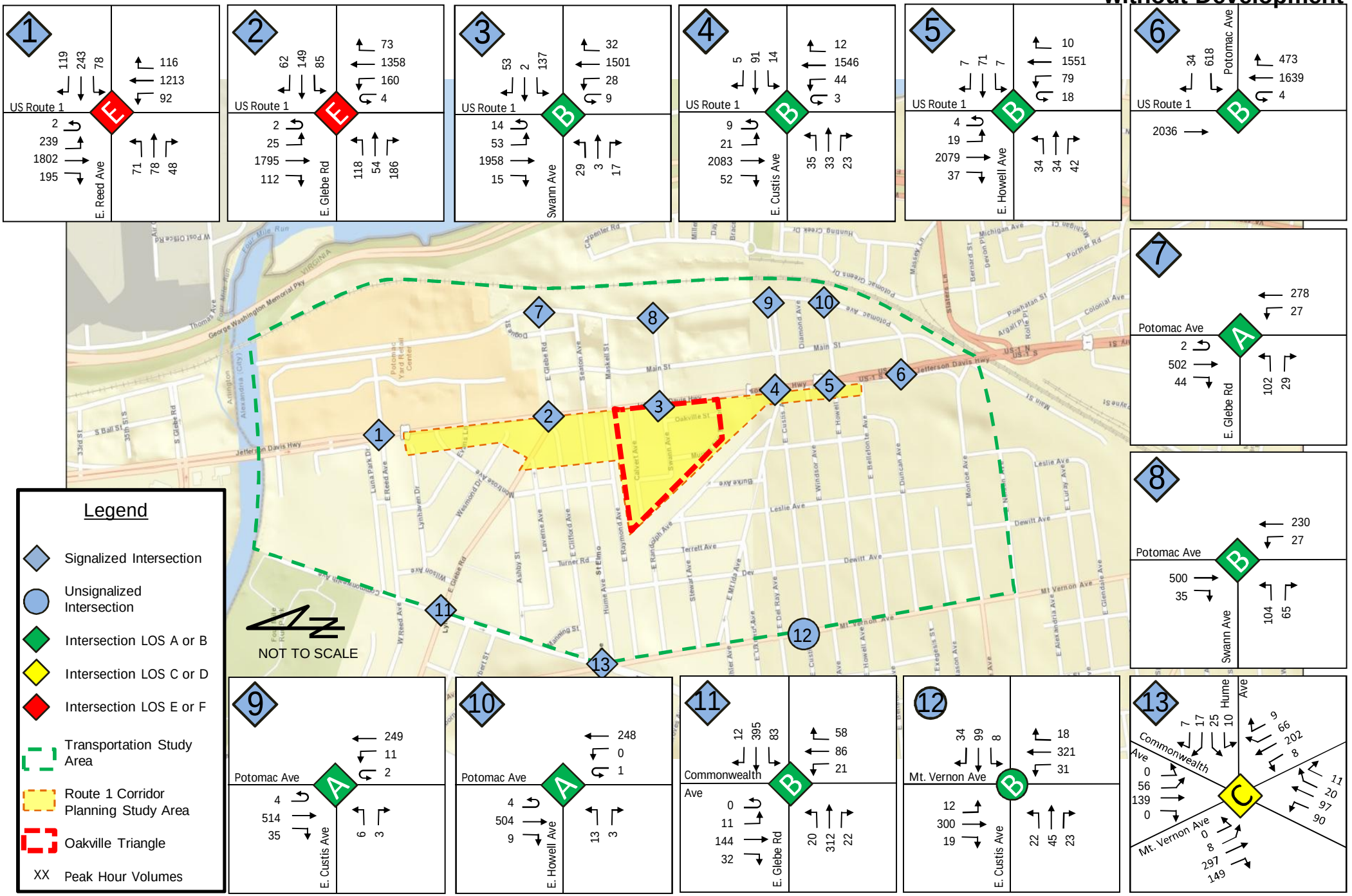


Table 4-5: Future Without Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
1. US Route 1 & East Reed Avenue							
Eastbound *(East Reed Avenue)*	L	E (63.5)	E (63.5)	E (60.3)	E (62.5)	E (55.7)	E (60.0)
	TR	E (62.0)	E (61.2)	E (63.3)	E (64.4)	E (73.0)	E (67.8)
	Overall	*E (62.7)*	*E (62.2)*	*E (62.5)*	*E (63.6)*	*E (69.9)*	*E (65.0)*
Westbound *(East Reed Avenue)*	L	D (51.7)	D (53.5)	D (52.0)	D (51.5)	D (52.3)	D (52.3)
	TR	F (110.1)	E (80.0)	F (140.9)	F (101.8)	F (186.5)	F (218.1)
	Overall	*F (99.4)*	*E (75.2)*	*F (124.6)*	*F (93.5)*	*F (161.6)*	*F (188.8)*
Northbound *(US Route 1)*	L	B (12.1)	C (29.2)	B (14.4)	C (30.5)	B (18.8)	D (35.8)
	T	E (57.8)	B (17.5)	F (110.8)	C (21.0)	F (217.1)	C (28.0)
	R	B (14.1)	B (15.0)	B (16.8)	B (17.5)	B (13.1)	F (97.2)
	Overall	*E (55.6)*	*B (18.2)*	*F (106.1)*	*C (21.4)*	*F (202.0)*	*C (34.2)*
Southbound *(US Route 1)*	L	C (29.8)	B (19.6)	C (29.8)	C (32.2)	E (57.0)	E (59.0)
	T	B (15.0)	D (37.1)	B (17.3)	D (50.8)	C (21.5)	F (88.6)
	R	B (11.4)	B (15.7)	B (12.6)	B (17.2)	B (14.8)	B (18.2)
	Overall	*B (15.4)*	*C (33.4)*	*B (18.1)*	*D (45.8)*	*C (27.2)*	*E (79.3)*
Overall Intersection		***D (50.5)***	***C (32.4)***	***F (83.8)***	***D (42.2)***	***F (141.7)***	***E (74.9)***
2. US Route 1 & East Glebe Road							
Eastbound (East Glebe Road)	TL	F (87.1)	E (59.2)	F (107.6)	E (68.9)	F (201.2)	F (162.2)
	R	D (45.4)	D (49.3)	D (43.2)	D (46.8)	D (43.2)	D (43.4)
	Overall	*E (68.3)*	*D (53.5)*	*F (81.0)*	*E (56.7)*	*F (144.3)*	*F (100.4)*
Westbound *(East Glebe Road)*	TL	D (44.3)	D (49.1)	D (43.8)	D (49.4)	E (60.1)	F (80.4)
	R	D (43.2)	D (52.0)	D (41.1)	D (49.5)	D (41.1)	D (46.0)
	Overall	*D (43.9)*	*D (50.1)*	*D (42.9)*	*D (49.4)*	*D (54.9)*	*E (73.1)*
Northbound *(US Route 1)*	L	E (72.4)	E (55.7)	E (71.3)	D (48.8)	E (68.2)	D (42.6)
	TR	C (27.2)	B (14.4)	F (84.9)	C (25.5)	F (169.0)	F (39.4)
	Overall	*C (30.8)*	*B (19.2)*	*F (83.9)*	*C (28.1)*	*F (162.2)*	*F (39.7)*
Southbound *(US Route 1)*	L	D (48.9)	D (37.4)	D (45.6)	D (36.2)	D (44.6)	D (36.1)
	TR	B (18.4)	A (5.8)	B (19.6)	A (9.2)	C (21.0)	E (67.4)
	Overall	*B (18.7)*	*A (6.1)*	*C (20.6)*	*A (9.5)*	*C (22.5)*	*E (67.0)*
Overall Intersection		***C (33.8)***	***B (16.8)***	***E (69.1)***	***C (22.9)***	***F (125.7)***	***E (59.9)***
3. US Route 1 & Swann Avenue							
Eastbound *(Swann Avenue)*	TL	E (62.3)	E (64.9)	E (60.3)	E (57.9)	E (60.2)	D (52.1)
	R	E (60.6)	E (62.0)	E (58.8)	E (56.1)	E (58.7)	D (50.4)
	Overall	*E (61.7)*	*E (63.9)*	*E (59.7)*	*E (57.3)*	*E (59.6)*	*D (51.5)*
Westbound *(Swann Avenue)*	TL	E (61.8)	E (63.2)	E (60.6)	E (69.8)	E (61.3)	E (77.0)
	R	E (60.6)	E (62.0)	E (58.8)	E (56.1)	E (58.7)	D (50.6)

Table 4-5: Future Without Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
	Overall	*E (61.4)*	*E (62.6)*	*E (60.0)*	*E (65.8)*	*E (60.4)*	*E (69.7)*
Northbound *(US Route 1)*	L	F (83.1)	D (54.1)	F (83.6)	D (53.1)	F (80.4)	D (52.7)
	TR	A (2.4)	A (9.9)	A (5.4)	B (15.0)	C (32.0)	B (17.5)
	Overall	*A (4.1)*	*B (11.0)*	*A (6.9)*	*B (15.9)*	*C (32.8)*	*B (18.3)*
Southbound *(US Route 1)*	L	D (52.7)	F (90.0)	D (50.1)	F (93.1)	E (56.7)	F (92.4)
	TR	A (8.3)	A (2.6)	A (9.4)	A (4.8)	A (9.0)	B (12.1)
	Overall	*A (9.2)*	*A (4.2)*	*B (11.3)*	*A (6.6)*	*B (12.4)*	*B (14.8)*
Overall Intersection		***A (6.9)***	***A (8.6)***	***A (9.4)***	***B (13.3)***	***C (27.8)***	***B (19.4)***
4. US Route 1 & East Custis Avenue							
Eastbound *(East Cutis Avenue)*	LTR	E (69.5)	E (61.9)	E (71.4)	E (60.4)	E (72.1)	E (66.8)
	Overall	*E (69.5)*	*E (61.9)*	*E (71.4)*	*E (60.4)*	*E (72.1)*	*E (66.8)*
Westbound *(East Custis Avenue)*	LTR	D (54.3)	E (61.0)	D (53.2)	E (59.7)	D (50.7)	E (62.2)
	Overall	*D (54.3)*	*E (61.0)*	*D (53.2)*	*E (59.7)*	*D (50.7)*	*E (62.2)*
Northbound *(US Route 1)*	L	F (92.2)	E (80.1)	F (89.9)	E (78.0)	F (90.4)	E (78.9)
	TR	A (6.4)	A (1.5)	A (9.9)	A (1.9)	E (57.3)	A (2.4)
	Overall	*A (7.3)*	*A (4.1)*	*B (10.7)*	*A (4.3)*	*E (57.6)*	*A (4.6)*
Southbound *(US Route 1)*	L	E (71.9)	F (94.5)	E (70.0)	F (90.0)	E (64.7)	F (81.2)
	TR	A (3.5)	A (4.9)	A (3.9)	A (6.3)	A (4.6)	A (8.2)
	Overall	*A (4.9)*	*A (6.5)*	*A (5.1)*	*A (7.6)*	*A (5.7)*	*A (9.2)*
Overall Intersection		***B (10.3)***	***A (7.4)***	***B (12.9)***	***A (8.4)***	***D (44.5)***	***B (10.2)***
5. US Route 1 & East Howell Avenue*							
Eastbound *(East Howell Avenue)*	LTR	E (59.5)	E (64.7)	E (61.0)	E (67.8)	E (60.2)	E (74.1)
	Overall	*E (59.5)*	*E (64.7)*	*E (61.0)*	*E (67.8)*	*E (60.2)*	*E (74.1)*
Westbound *(East Howell Avenue)*	TL	E (59.4)	E (59.4)	E (59.7)	E (60.0)	E (56.9)	E (60.8)
	R	E (58.7)	E (56.2)	E (58.7)	E (55.9)	E (55.7)	E (55.1)
	Overall	*E (59.2)*	*E (58.3)*	*E (59.4)*	*E (59.4)*	*E (56.6)*	*E (60.3)*
Northbound *(US Route 1)*	L	F (131.8)	D (52.4)	F (118.8)	D (49.4)	E (77.2)	D (44.0)
	TR	A (8.1)	A (6.3)	A (9.6)	A (7.0)	C (30.8)	A (10.0)
	Overall	*B (10.6)*	*A (9.3)*	*B (11.6)*	*A (9.7)*	*C (31.6)*	*B (12.0)*
Southbound *(US Route 1)*	L	F (119.6)	E (73.5)	F (117.7)	E (72.5)	F (115.5)	E (68.5)
	TR	A (7.4)	A (3.9)	A (7.8)	A (4.3)	B (9.2)	A (7.2)
	Overall	*B (11.9)*	*A (4.8)*	*B (12.0)*	*A (5.1)*	*B (12.9)*	*A (7.8)*
Overall Intersection		***B (12.1)***	***A (8.8)***	***B (13.2)***	***A (9.5)***	***C (27.3)***	***B (12.5)***
6. US Route 1 & Potomac Avenue							
Westbound *(Potomac*	L	E (76.7)	D (53.2)	E (68.8)	D (51.3)	D (51.3)	D (49.2)

Table 4-5: Future Without Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
Avenue)	R	E (59.5)	D (45.7)	E (57.3)	D (42.1)	D (47.5)	D (37.9)
	Overall	*E (74.4)*	*D (52.6)*	*E (67.4)*	*D (50.7)*	*D (50.9)*	*D (48.6)*
Northbound *(US Route 1)*	T	B (10.8)	A (7.0)	B (16.0)	A (9.7)	E (73.0)	B (15.7)
	R	A (0.1)	A (0.0)	A (0.2)	A (0.0)	A (1.1)	A (0.1)
	Overall	*A (8.1)*	*A (5.6)*	*B (11.7)*	*A (7.7)*	*D (51.6)*	*B (12.2)*
Southbound *(US Route 1)*	T	A (1.1)	A (5.6)	A (1.3)	A (9.1)	A (1.6)	B (18.1)
	Overall	*A (1.1)*	*A (5.6)*	*A (1.3)*	*A (9.1)*	*A (1.6)*	*B (18.1)*
Overall Intersection		***B (10.9)***	***B (10.8)***	***B (13.1)***	***B (13.6)***	***D (40.6)***	***B (19.6)***
7. Potomac Avenue & East Glebe Road							
Eastbound *(East Glebe Road)*	L	C (22.7)	C (22.1)	C (21.0)	B (18.9)	C (21.0)	B (16.3)
	R	C (21.6)	C (21.3)	C (20.1)	B (17.9)	B (19.8)	B (14.9)
	Overall	*C (22.5)*	*C (22.0)*	*C (20.8)*	*B (18.7)*	*C (20.7)*	*B (16.0)*
Northbound *(Potomac Avenue)*	L	A (2.4)	A (2.5)	A (3.0)	A (3.8)	A (3.2)	A (5.2)
	T	A (2.8)	A (2.3)	A (3.4)	A (3.6)	A (3.5)	A (4.9)
	Overall	*A (2.8)*	*A (2.3)*	*A (3.4)*	*A (3.6)*	*A (3.5)*	*A (5.0)*
Southbound *(Potomac Avenue)*	TR	A (4.6)	A (5.3)	A (5.6)	A (7.5)	A (8.7)	A (9.7)
	Overall	*A (4.6)*	*A (5.3)*	*A (5.6)*	*A (7.5)*	*A (8.7)*	*A (9.7)*
Overall Intersection		***A (3.3)***	***A (4.8)***	***A (4.3)***	***A (7.3)***	***A (5.3)***	***A (9.1)***
8. Potomac Avenue & Swann Avenue							
Eastbound *(Swann Avenue)*	L	C (31.8)	C (32.4)	C (30.8)	C (33.3)	C (30.4)	C (34.5)
	R	C (31.3)	C (32.1)	C (30.1)	C (31.6)	C (29.6)	C (31.4)
	Overall	*C (31.6)*	*C (32.4)*	*C (30.6)*	*C (32.7)*	*C (30.1)*	*C (33.3)*
Northbound *(Potomac Avenue)*	L	A (3.6)	A (3.0)	A (3.9)	A (3.1)	A (4.0)	A (3.4)
	T	A (4.8)	A (3.0)	A (5.0)	A (3.1)	A (5.3)	A (3.4)
	Overall	*A (4.7)*	*A (3.0)*	*A (4.9)*	*A (3.1)*	*A (5.2)*	*A (3.4)*
Southbound *(Potomac Avenue)*	TR	A (5.7)	A (5.7)	A (6.8)	A (6.4)	A (7.5)	A (6.9)
	Overall	*A (5.7)*	*A (5.7)*	*A (6.8)*	*A (6.4)*	*A (7.5)*	*A (6.9)*
Overall Intersection		***A (5.6)***	***A (5.5)***	***A (6.1)***	***A (8.7)***	***A (6.6)***	***B (10.6)***
9. Potomac Avenue & East Custis Avenue							
Eastbound *(East Custis Avenue)*	L	D (46.8)	D (46.4)	D (46.8)	D (46.4)	D (46.8)	D (46.4)
	R	D (45.2)	D (46.2)	D (45.2)	D (46.2)	D (45.2)	D (46.2)
	Overall	*D (46.6)*	*D (46.3)*	*D (46.6)*	*D (46.3)*	*D (46.6)*	*D (46.3)*
Northbound *(Potomac Avenue)*	L	A (2.7)	A (2.2)	A (2.7)	A (2.2)	A (2.7)	A (2.2)
	T	A (3.5)	A (2.2)	A (3.7)	A (2.3)	A (3.9)	A (2.3)
	Overall	*A (3.5)*	*A (2.2)*	*A (3.7)*	*A (2.3)*	*A (3.9)*	*A (2.3)*
Southbound *(Potomac*	TR	A (4.4)	A (4.3)	A (4.5)	A (4.4)	A (4.5)	A (4.5)

Table 4-5: Future Without Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
Avenue)	*Overall*	*A (4.4)*	*A (4.3)*	*A (4.5)*	*A (4.4)*	*A (4.5)*	*A (4.5)*
Overall Intersection		***A (5.9)***	***A (4.2)***	***A (5.8)***	***A (4.2)***	***A (5.8)***	***A (4.2)***
10. Potomac Avenue & East Howell Avenue							
Eastbound *(East Howell Avenue)*	L	C (30.1)	D (46.6)	C (30.1)	D (46.6)	C (30.1)	D (46.6)
	R	C (29.9)	C (30.5)	C (29.9)	C (30.5)	C (29.9)	C (30.5)
	Overall	*C (30.1)*	*D (43.8)*	*C (30.1)*	*D (43.8)*	*C (30.1)*	*D (43.8)*
Northbound *(Potomac Avenue)*	L	A (0.0)	A (1.1)	A (0.0)	A (1.1)	A (0.0)	A (1.1)
	T	A (2.4)	A (1.2)	A (2.5)	A (1.3)	A (2.6)	A (1.3)
	Overall	*A (2.4)*	*A (1.2)*	*A (2.5)*	*A (1.3)*	*A (2.6)*	*A (1.3)*
Southbound *(Potomac Avenue)*	TR	A (1.8)	A (1.4)	A (1.8)	A (1.5)	A (1.8)	A (1.5)
	Overall	*A (1.8)*	*A (1.4)*	*A (1.8)*	*A (1.5)*	*A (1.8)*	*A (1.5)*
Overall Intersection		***A (2.6)***	***A (2.5)***	***A (2.7)***	***A (2.4)***	***A (2.8)***	***A (2.3)***
11. Commonwealth Avenue & West Glebe Road/East Glebe Road							
Eastbound *(West Glebe Road)*	LTR	B (13.4)	B (12.7)	B (14.5)	B (13.0)	B (16.9)	B (13.6)
	Overall	*B (13.4)*	*B (12.7)*	*B (14.5)*	*B (13.0)*	*B (16.9)*	*B (13.6)*
Westbound *(East Glebe Road)*	LTR	B (12.2)	B (15.0)	B (12.4)	B (16.3)	B (12.9)	B (19.2)
	Overall	*B (12.2)*	*B (15.0)*	*B (12.4)*	*B (16.3)*	*B (12.9)*	*B (19.2)*
Northbound *(Commonwealth Avenue)*	LTR	C (24.8)	B (17.9)	C (24.8)	B (17.9)	C (24.8)	B (17.9)
	Overall	*C (24.8)*	*B (17.9)*	*C (24.8)*	*B (17.9)*	*C (24.8)*	*B (17.9)*
Southbound *(Commonwealth Avenue)*	LTR	B (17.1)	B (19.3)	B (17.1)	B (19.3)	B (17.1)	B (19.3)
	Overall	*B (17.1)*	*B (19.3)*	*B (17.1)*	*B (19.3)*	*B (17.1)*	*B (19.3)*
Overall Intersection		***B (16.8)***	***B (15.5)***	***B (17.1)***	***B (16.1)***	***B (17.9)***	***B (17.4)***
12. Mt. Vernon Avenue & East Custis Avenue (*Unsignalized*)							
Eastbound *(East Custis Avenue)*	LTR	A (9.3)	A (9.4)	A (9.7)	A (9.7)	B (10.5)	B (10.2)
	Overall	*A (9.3)*	*A (9.4)*	*A (9.7)*	*A (9.7)*	*B (10.5)*	*B (10.2)*
Westbound *(East Custis Avenue)*	LTR	A (9.0)	A (9.4)	A (9.2)	A (9.9)	A (9.6)	B (10.8)
	Overall	*A (9.0)*	*A (9.4)*	*A (9.2)*	*A (9.9)*	*A (9.6)*	*B (10.8)*
Northbound *(Mt. Vernon Avenue)*	LTR	B (11.8)	B (12.9)	B (12.3)	B (13.5)	B (13.0)	B (14.6)
	Overall	*B (11.8)*	*B (12.9)*	*B (12.3)*	*B (13.5)*	*B (13.0)*	*B (14.6)*
Southbound *(Mt. Vernon Avenue)*	LTR	B (11.0)	B (12.2)	B (11.3)	B (12.7)	B (12.0)	B (13.7)
	Overall	*B (11.0)*	*B (12.2)*	*B (11.3)*	*B (12.7)*	*B (12.0)*	*B (13.7)*
Overall Intersection		***B (11.1)***	***B (12.1)***	***B (11.4)***	***B (12.5)***	***B (12.0)***	***B (13.3)***
13. Commonwealth Avenue & Mt. Vernon Avenue & Hume Avenue							
Westbound (Hume Avenue)	LR	D (47.7)	D (44.8)	D (47.7)	D (44.8)	D (47.7)	D (44.8)
	Overall	*D (47.7)*	*D (44.8)*	*D (47.7)*	*D (44.8)*	*D (47.7)*	*D (44.8)*
Northbound (Mt. Vernon	TL	C (30.3)	C (25.8)	C (30.3)	C (25.8)	C (30.3)	C (25.8)

Table 4-5: Future Without Development Traffic Analysis (Pre-Mitigation)
LOS (sec/veh)

Intersection	Mvmt	2018 Conditions		2021 Conditions		2027 Conditions	
		AM	PM	AM	PM	AM	PM
Avenue)	R	C (24.0)	C (21.2)	C (24.0)	C (21.2)	C (24.0)	C (21.2)
	Overall	*C (28.7)*	*C (24.6)*	*C (28.7)*	*C (24.6)*	*C (28.7)*	*C (24.6)*
Southbound (Mt. Vernon Avenue)	TL	D (39.1)	D (40.7)	D (39.1)	D (40.7)	D (39.1)	D (40.7)
	R	B (13.8)	B (16.6)	B (13.8)	B (16.6)	B (13.8)	B (16.6)
	Overall	*C (32.2)*	*C (32.8)*	*C (32.2)*	*C (32.8)*	*C (32.2)*	*C (32.8)*
Northeastbound (Commonwealth Avenue)	L	D (36.6)	D (38.9)	D (36.6)	D (38.9)	D (36.6)	D (38.9)
	TR	D (46.9)	D (41.4)	D (46.9)	D (41.4)	D (46.9)	D (41.4)
	Overall	*D (42.4)*	*D (40.4)*	*D (42.4)*	*D (40.4)*	*D (42.4)*	*D (40.4)*
Southwestbound (Commonwealth Avenue)	LTR	D (46.4)	D (43.3)	D (46.4)	D (43.3)	D (46.4)	D (43.3)
	Overall	*D (46.4)*	*D (43.3)*	*D (46.4)*	*D (43.3)*	*D (46.4)*	*D (43.3)*
Overall Intersection		***D (36.8)***	***C (34.5)***	***D (36.8)***	***C (34.5)***	***D (36.8)***	***C (34.5)***

*During the AM peak hour, the observed southbound left turn volumes at US Route 1 and Howell Avenue were minimal. As a result, due to low actuations, the synchro calculated delays for this movement were extremely high resulting in an Error for the overall intersection level of service. In order to calculate a realistic intersection level of service, the southbound left turn volumes at Howell Avenue were manually increased to a value of 30 vehicles for all AM scenarios. The magnitude of this value is within the range of similar movements.

4.3 FUTURE CONDITIONS WITHOUT DEVELOPMENT SUMMARY

The analysis of future conditions without development considers the combined effects of the additional traffic generated by approved and unbuilt developments, regional traffic growth, and programmed transportation improvements. Analysis results indicated that while most study intersections will continue to operate at LOS D or better, beginning in 2021 the intersections of US Route 1 with Glebe Road and with Reed Avenue will operate at LOS of E or F in one or both peak hours. This gives an indication of intersections that may need operational improvements to improve level of service. Based on the findings, even prior to the development of the Oakville Triangle and the Route 1 Corridor Planning Study Area, for the area to continue to accommodate increases in traffic due to approved and unbuilt developments and regional growth and to maintain an adequately functioning vehicular transportation network, measures to encourage non-auto mode share along with vehicular capacity-enhancing modifications to area streets and intersections will need to be considered.

5. Site Generated Trips

This chapter examines calculation of site generated trips for proposed redevelopment of the Route 1 Planning Corridor Study Area. Included in this chapter are descriptions of the credit for trips generated by existing development on the site, the site generated future traffic volumes, the mode split, pass-by, internal capture assumptions, the trip distribution, and the trip assignment.

5.1 EXISTING OAKVILLE TRIANGLE TRIPS TO BE REMOVED

Redevelopment of the Oakville Triangle will result in the removal of trips generated by the existing 446,290 square foot mix of retail, service, and light industrial uses. The trip generation of this level of development, based on the Institute of Transportation Engineers' Trip Generation Manual, 9th Edition, is shown in Table 5-1.

Table 5-1: Existing Oakville Triangle Trip Generation based on ITE Trip Generation Manual

Land Use	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
446,290 SF Industrial Park (Land Use Code 130)	366	322	44	379	80	299

Recognizing that some of the existing land uses of the Oakville Triangle are not currently active and occupied it was determined that the trip generation shown above would have been an overestimation of the trips currently entering and exiting the site. Based on engineering judgment, the existing turning movement counts at the intersection of US Route 1 and Swann Avenue were assumed to represent one-half of the actual trip generation for the existing Oakville Triangle (the other half of the trips would be entering and exiting the site via three right-in, right-out streets). Accordingly, the total estimated trips generated by the existing Oakville Triangle uses are shown in Table 5-2.

Table 5-2: Existing Oakville Triangle Trip Generation based on Existing Traffic Volumes at Swann Avenue

Intersection	AM Peak Hour			PM Peak Hour		
	Total	In	Out	Total	In	Out
Fannon Street	31	19	12	31	15	16
Calvert Avenue	48	29	19	47	23	24
Raymond Avenue	16	10	6	16	7	9
Swann Avenue	95	58	37	94	45	49
Total	190	116	74	188	90	98

It is noted that the total trip value reflected in Table 5-2 is less than the trips calculated using the ITE methodology. As a result this is a more conservative assumption of the existing trip credit. The existing trip credit (i.e. the removal of existing Oakville Triangle trips from the network) is shown in **Appendix I**. These assumptions and calculations were agreed to by City staff.

5.2 MODE SPLIT ASSUMPTIONS

To accurately represent the anticipated trip-making patterns associated with the redevelopment of the Oakville Triangle and Route 1 Corridor Planning Study Area, the mode split assumptions developed for the Potomac Yard Multimodal Transportation Study were applied to this analysis. This mode split recognizes the redevelopment of Route 1 as a transit-oriented corridor. As a result, site trip generation is assumed to be accommodated by regional (Metrorail) and local transit (DASH, Metrobus, Metroway), pedestrian and bicycle, and by autos.

The general assumptions for mode split are shown in Table 5-3. The appropriate mode split percentages were applied to the trips generated by both the approved and unbuilt developments and the site developments based on land uses and proximity to the proposed Metrorail Station. The location of the two proposed Metrorail Station location alternatives (A and B) in relation to the Route 1 Corridor Planning Study Area are shown in ***Figure 5-1: Proximity to Preferred Potomac Yard Metrorail Alternative***.

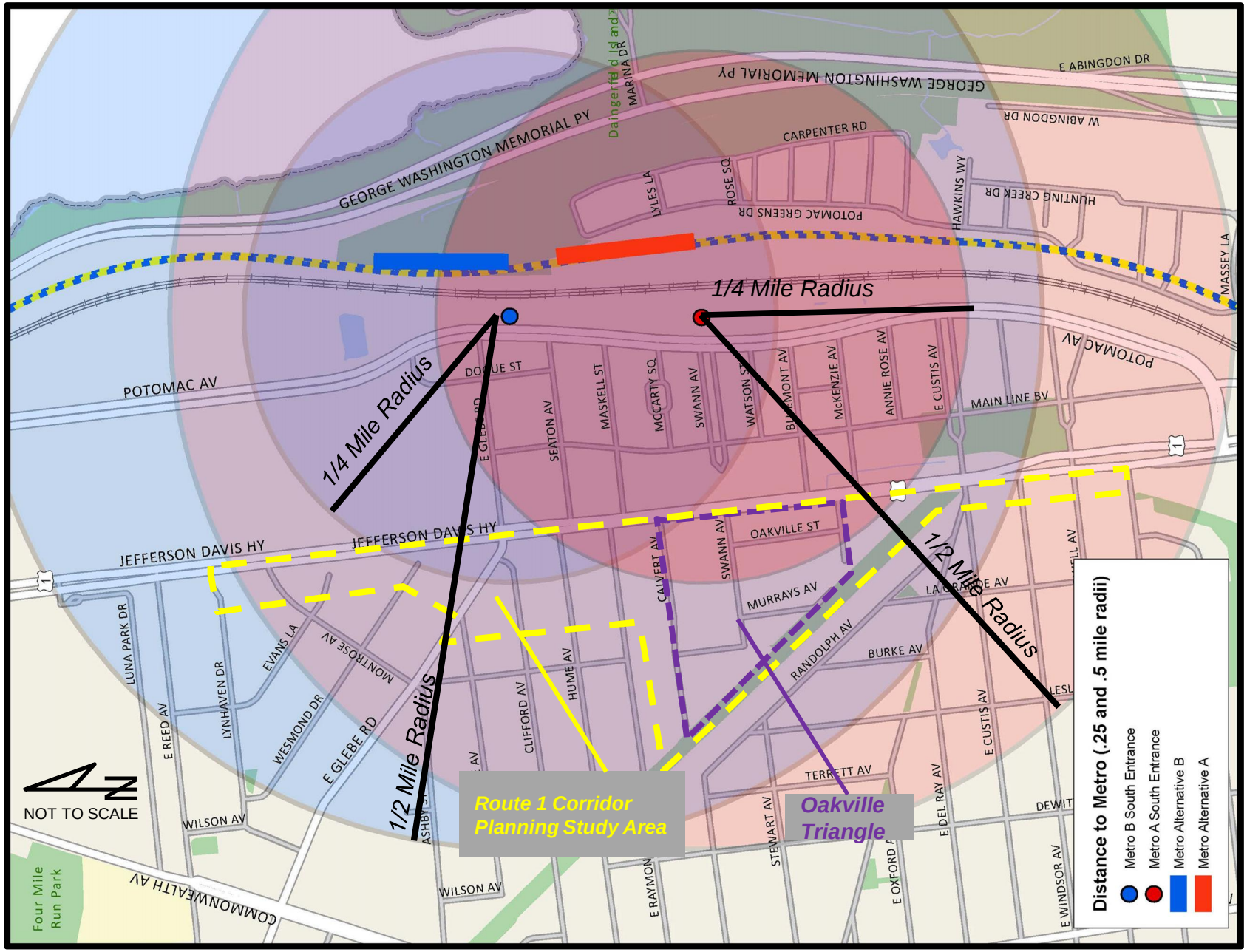
Table 5-3: Mode Split Assumptions

Land Use and Transit Proximity		Transit (Metrorail)	Transit (Metrobus, Dash, Metroway)	Pedestrian and Bicycle (non-auto)	Auto	Total
1	Office adjacent to a transit station	35%	11%	6%	48%	100%
2	Office within ¼ mile of a transit station	21%	9%	6%	64%	100%
3	Residential adjacent to a transit station	54%	1%	16%	29%	100%
4	Residential within ¼ mile of a transit station	48%	1%	15%	36%	100%
5	Residential within ¼ to ½ mile of Transit	31%	5%	10%	54%	100%
6	Hotel	27%	4%	31%	38%	100%
7	Retail and Restaurant (excluding large format retail)	29%	8%	27%	36%	100%

5.3 INTERNAL CAPTURE

Based on the City-approved mode choice assumptions described above, it was determined that the internal capture of trips between land uses in the Route 1 Planning Corridor Study is contained within the pedestrian and bicycle mode split percentages. In order to avoid double counting of internally captured trips, no other internal capture factors were applied to the site trip generation. This is consistent with the methodology of the Potomac Yard Multimodal Transportation Study.

Figure 5-1: Proximity to Proposed Potomac Yard Metrorail Station Alternative A and Alternative B



Source: City of Alexandria

5.4 PASS-BY

Pass-by represents those trips that are not new to the network, but instead vehicles that would have already been traveling along the Route 1 Corridor that will be attracted to the site during the primary trip. A pass-by factor of 43% was applied only to the PM peak hour trips for the restaurant land uses of the Oakville Triangle. This represents the average pass-by factor for the High-Turnover Sit-Down Restaurant land use as contained in the ITE Trip Generation Handbook. No other land uses were assigned a pass-by factor in this study. Site generated pass-by trips are shown in **Appendix I.**

5.5 SITE TRIP GENERATION

Site person-trip generation figures are based on the rates found in the 9th Edition of the Institute of Transportation Engineers' Trip Generation Manual.

The developer plans on implementing a two-phased construction and opening of the Oakville Triangle property. Phase 1 is planned to be completed by 2018 and Phase 2 (full build-out) is planned to be completed by 2021.

For analysis purposes, the City has agreed that the Oakville Triangle and the majority of the Route 1 Corridor Planning Study Area will be located between ¼ mile and ½ mile (and not less than ¼ mile) from the currently considered Metrorail Station locations as shown on ***Figure 5-1: Proximity to Proposed Potomac Yard Metrorail Station Alternative A and Alternative B***. Accordingly, mode split assumptions 5, 6, and 7 from Table 5-3 were applied to the residential, hotel, and retail/restaurant land uses, respectively, of the Oakville Triangle and Route 1 Planning Study Area developments.

Per the assumptions of the Potomac Yard Multimodal Transportation Study, the resulting auto person-trips were assumed to represent the number of vehicle trips (i.e. the analysis assumes an auto occupancy of 1.0).

2018 Phase 1 development levels and person- and vehicle-trip generation figures for the Oakville Triangle are provided in Table 5-4.

Table 5-4: 2018 Phase I Oakville Triangle Peak Hour Person- and Vehicle-Trip Generation

Development	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
Oakville Triangle (Phase 1)								
Mid Rise Apartments	550 DU	212	66	146	253	147	106	2,151
Transit (Metro Rail - 31%)		66	20	46	78	46	32	666
Transit (Metrobus, Dash, Metroway - 5%)		11	3	7	13	7	5	108
Pedestrian & Bicycle (10%)		21	7	15	25	15	11	215
Auto (54%)		114	36	78	137	79	58	1,162
Specialty Retail	45,000 SF	32	14	18	129	57	72	1,963

Table 5-4: 2018 Phase I Oakville Triangle Peak Hour Person- and Vehicle-Trip Generation								
Transit (Metro Rail - 29%)		9	4	5	37	16	21	569
Transit (Metrobus, Dash, Metroway - 8%)		2	1	1	11	5	6	157
Pedestrian & Bicycle (27%)		9	4	5	35	15	20	530
Auto (36%)		12	5	7	46	21	25	707
High Turnover Restaurant	3,0000 SF	324	178	146	296	178	118	3,815
Transit (Metro Rail - 29%)		94	52	42	85	52	33	1,106
Transit (Metrobus, Dash, Metroway - 8%)		26	14	12	24	14	10	305
Pedestrian & Bicycle (27%)		87	48	39	80	48	32	1,030
Auto (36%)		117	64	53	107	64	43	1,374
Pass-by Auto (43% of Auto)					-46	-23	-23	
Total Oakville Triangle (New Auto) trips		243	105	138	244	141	103	3,242

*The sum of the highlighted rows equals the total Oakville Triangle new auto trips

2021 full build-out development levels and person- and vehicle-trip generation figures for the Oakville Triangle are provided in Table 5-5. Table 5-5 also contains the development levels and person- and vehicle-trip generation figures for the portions of the remaining parcels of the Route 1 Corridor Planning Study Area, to be developed "by-Others." Development projections for the non-Oakville Triangle portions of the Route 1 Corridor Planning Study Area parcels are based on 90 percent residential, 10 percent commercial (retail and office) uses. It should be noted that the development projections were provided for use by the City based on what can be considered to be a maximum planning level forecast of the potential future development using information currently available (assuming significant assemblage occurs in the 51 commercial properties owned by 41 owners in the remaining non-Oakville Triangle portion of the study area). Further, the development projections are subject to the ongoing community planning process. For the purposes of this study, Planning and Zoning contemplated a level of development in 2021 and a level of additional development in 2027. The additional person- and vehicle-trips associated with Route 1 Corridor Planning Study Area "By-Others" development in the year 2027 are shown in Table 5-6.

Table 5-5: 2021 Route 1 Planning Corridor Study Area Peak Hour Person- and Vehicle- Trip Generation								
Development	**Size**	**AM Peak Hour**			**PM Peak Hour**			**Daily**
		Total	**In**	**Out**	**Total**	**In**	**Out**	
Oakville Triangle (Full Build-Out)								
Mid Rise Apartments	1,074 DU	427	132	295	504	292	212	4,201
Transit (Metro Rail - 31%)		132	41	91	156	90	66	1302
Transit (Metrobus, Dash, Metroway - 5%)		21	7	14	26	15	11	210
Pedestrian & Bicycle (10%)		43	13	30	50	29	21	420
Auto (54%)		231	71	160	272	158	114	2,269

Table 5-5: 2021 Route 1 Planning Corridor Study Area Peak Hour Person- and Vehicle- Trip Generation								
Hotel	150 Rooms	72	48	24	83	35	48	936
Transit (Metro Rail - 27%)		20	13	7	22	9	13	253
Transit (Metrobus, Dash, Metroway - 4%)		3	2	1	3	1	2	37
Pedestrian & Bicycle (31%)		22	15	7	26	12	14	290
Auto (38%)		27	18	9	32	13	19	356
Specialty Retail	85,440 SF	57	25	32	227	100	127	3,693
Transit (Metro Rail - 29%)		16	7	9	66	29	37	1,071
Transit (Metrobus, Dash, Metroway - 8%)		5	2	3	18	8	10	296
Pedestrian & Bicycle (27%)		15	7	8	61	27	34	997
Auto (36%)		21	9	12	82	36	46	1,329
High Turnover Restaurant	56,960 SF	616	339	277	561	337	224	7,242
Transit (Metro Rail - 29%)		179	98	81	163	98	65	2,100
Transit (Metrobus, Dash, Metroway - 8%)		49	27	22	45	27	18	580
Pedestrian & Bicycle (27%)		166	92	74	151	91	60	1955
Auto (36%)		222	122	100	202	121	81	2,607
Pass-by Auto (43% of Auto)					87	44	43	
Total Oakville Triangle (New Auto) trips		501	220	281	501	285	216	6,561
2021 Route 1 Planning Corridor Study Area (by others)								
Mid-rise Apartments	198 DU	68	21	47	84	49	35	775
Transit (Metro Rail - 31%)		21	7	14	26	15	11	240
Transit (Metrobus, Dash, Metroway - 5%)		3	1	2	5	4	1	38
Pedestrian & Bicycle (10%)		7	2	5	8	4	4	78
Auto (54%)		37	11	26	45	26	19	419
Townhouse	66 DU	37	6	31	43	29	14	448
Transit (Metro Rail - 31%)		11	1	10	13	9	4	139
Transit (Metrobus, Dash, Metroway - 5%)		2	1	1	3	1	2	22
Pedestrian & Bicycle (10%)		4	1	3	4	3	1	45
Auto (54%)		20	3	17	23	16	7	242
Specialty Retail	30,000 SF	23	10	13	93	41	52	1321
Transit (Metro Rail - 29%)		7	3	4	27	12	15	383
Transit (Metrobus, Dash, Metroway - 8%)		2	1	1	7	3	4	106
Pedestrian & Bicycle (27%)		6	2	4	26	11	15	356
Auto (36%)		*8*	*4*	*4*	*33*	*15*	*18*	*476*
By Others (Auto) Trips		65	18	47	101	57	44	1137

Table 5-5: 2021 Route 1 Planning Corridor Study Area Peak Hour Person- and Vehicle- Trip Generation							
Route 1 Corridor Planning Study Area 2021 Total Auto Trips	566	238	328	602	342	260	7698

*The sum of the highlighted rows equals the total new trips for the Oakville Triangle, the "By-Others" development, and the Route 1 Corridor Planning study area at large

Table 5-6: 2027 Route 1 Planning Corridor Study Area Additional* Peak Hour Person- and Vehicle-Trip Generation (by-Others)								
Development	Size	AM Peak Hour			PM Peak Hour			Daily
		Total	In	Out	Total	In	Out	
2027 Route 1 Planning Corridor Study Area (by others)								
By Others Multifamily	234 DU	83	26	57	101	59	42	915
Transit (Metro Rail - 31%)		26	8	18	31	18	13	284
Transit (Metrobus, Dash, Metroway - 5%)		4	2	2	5	3	2	45
Pedestrian & Bicycle (10%)		8	2	6	10	6	4	92
Auto (54%)		45	14	31	55	32	23	494
By Others Townhouse	78 DU	42	7	35	49	33	16	518
Transit (Metro Rail - 31%)		13	2	11	15	10	5	161
Transit (Metrobus, Dash, Metroway - 5%)		2	0	2	3	2	1	25
Pedestrian & Bicycle (10%)		4	1	3	5	3	2	52
Auto (54%)		23	4	19	26	18	8	280
By Others Specialty Retail	40,000 SF	29	13	16	117	51	66	1749
Transit (Metro Rail - 29%)		8	3	5	34	15	19	507
Transit (Metrobus, Dash, Metroway - 8%)		3	1	2	9	4	5	140
Pedestrian & Bicycle (27%)		8	4	4	32	14	18	472
Auto (36%)		10	5	5	42	18	24	630
By Others (Auto) Trips		78	23	55	123	68	55	1404

*Additional Development beyond 2021
**The sum of the highlighted rows equals the additional total new trips resulting from the "By-Others" development of the Route 1 Corridor Planning study area beyond the year 2021

5.6 SITE ACCESS

The Oakville Triangle will primarily be accessed from US Route 1 at its intersection with Swann Avenue, the only median break along US Route 1 for the Oakville Triangle. Additional trips will enter and exit the Oakville property via right-in, right-out local streets (Calvert Avenue and Fannon Street) and driveways. Site access volume figures for Oakville Triangle are included in the **Appendix I**.

Because the density and land uses of the remaining parcels of the Route 1 Corridor Planning Study Area are speculative, established access points or driveway locations do not yet exist. For the purposes of this analysis, site access points for the trips generated by the "By-Others" development are assumed to be the study area intersections of US Route 1 with Reed Avenue, Glebe Road, Custis Avenue, and Howell Avenue.

5.7 SITE TRIP DISTRIBUTION

Vehicle trips were assigned to the study street network based on the distribution methodology developed for the Potomac Yard Multimodal Transportation Study. The distributions are shown in Table 5-12 and graphically on ***Figure 5-2: Trip Distributions***. These trip distributions were used to assign approved and unbuilt development trips and trips generated by Oakville Triangle and the entire Route 1 Corridor Planning Study Area.

Table 5-7: Trip Distribution

Direction	Distribution
To/From North on Route 1	26%
To/From Northwest on S. Glebe Road	7%
To/From North on George Washington Memorial Parkway	3%
To/From West on Reed Avenue and E. Glebe Road	10%
To/From West on Custis Avenue and Monroe Avenue	12%
To/From South on Route 1 and Washington Street	30%
To/From North on Potomac Avenue	12%
Total	100%

The trip distributions were further refined to reflect the grid network of neighborhood streets and equally distribute trips among the east-west streets. For example, the 10 percent of trips to and from the west along Reed Avenue and Glebe Road, was spilt equally (i.e. it was assumed that 5 percent of total trips are to/from Glebe and 5 percent of total trips are to/from Reed). Similarly, the 12 percent of trips that are to and from the west along Custis Avenue and Monroe Avenue was also split (i.e. it was assumed that 6 percent of total trips are to/from Monroe, 3 percent of total trips are to/from Custis, and 3 percent of total trips are to/from Howell)

5.8 SITE TRIP ASSIGNMENT

The assignment of the Oakville Triangle and the rest of the Route 1 Corridor Planning Study Area peak hour traffic volumes to the area roadways is based on the trip distributions described above and is shown in ***Figure 5-3: Oakville Triangle and Route 1 Corridor Planning Study Area 2018 Peak Hour Traffic Volumes***, ***Figure 5-4: Oakville Triangle and Route 1 Corridor Planning Study Area 2021 Peak Hour Traffic Volumes,*** and ***Figure 5-5: Oakville Triangle and Route 1 Corridor Planning Study Area 2027 Peak Hour Traffic Volumes***. Individual figures depicting the trip assignment of the Oakville Triangle Development and the "By-Others" Route 1 Corridor Planning Study Area developments are shown in **Appendix I**.

Figure 5-2: Site Trip Distribution

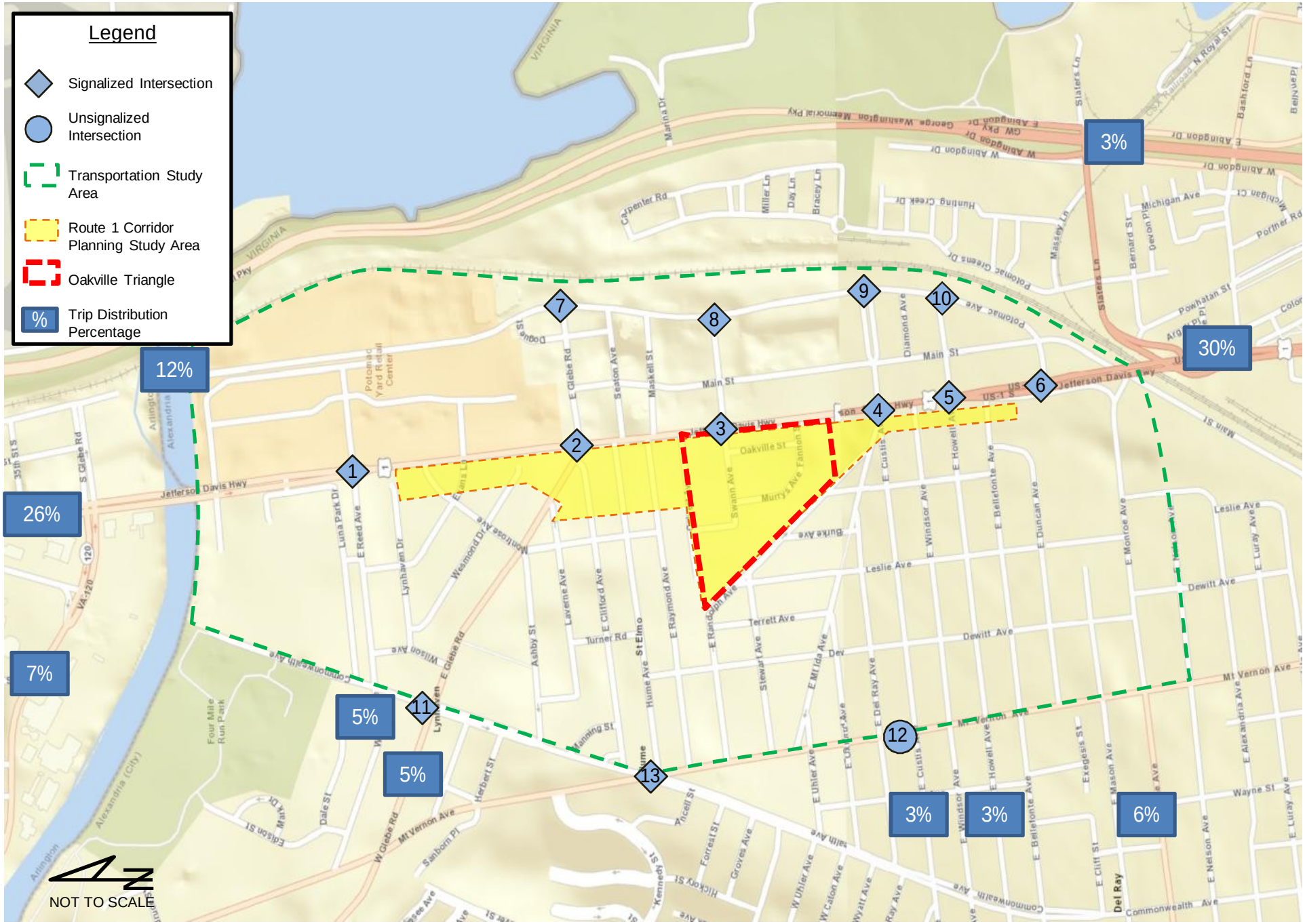


Figure 5-3: 2018 Oakville Triangle and Route 1 Corridor Planning Study Area Peak Hour Traffic Volumes

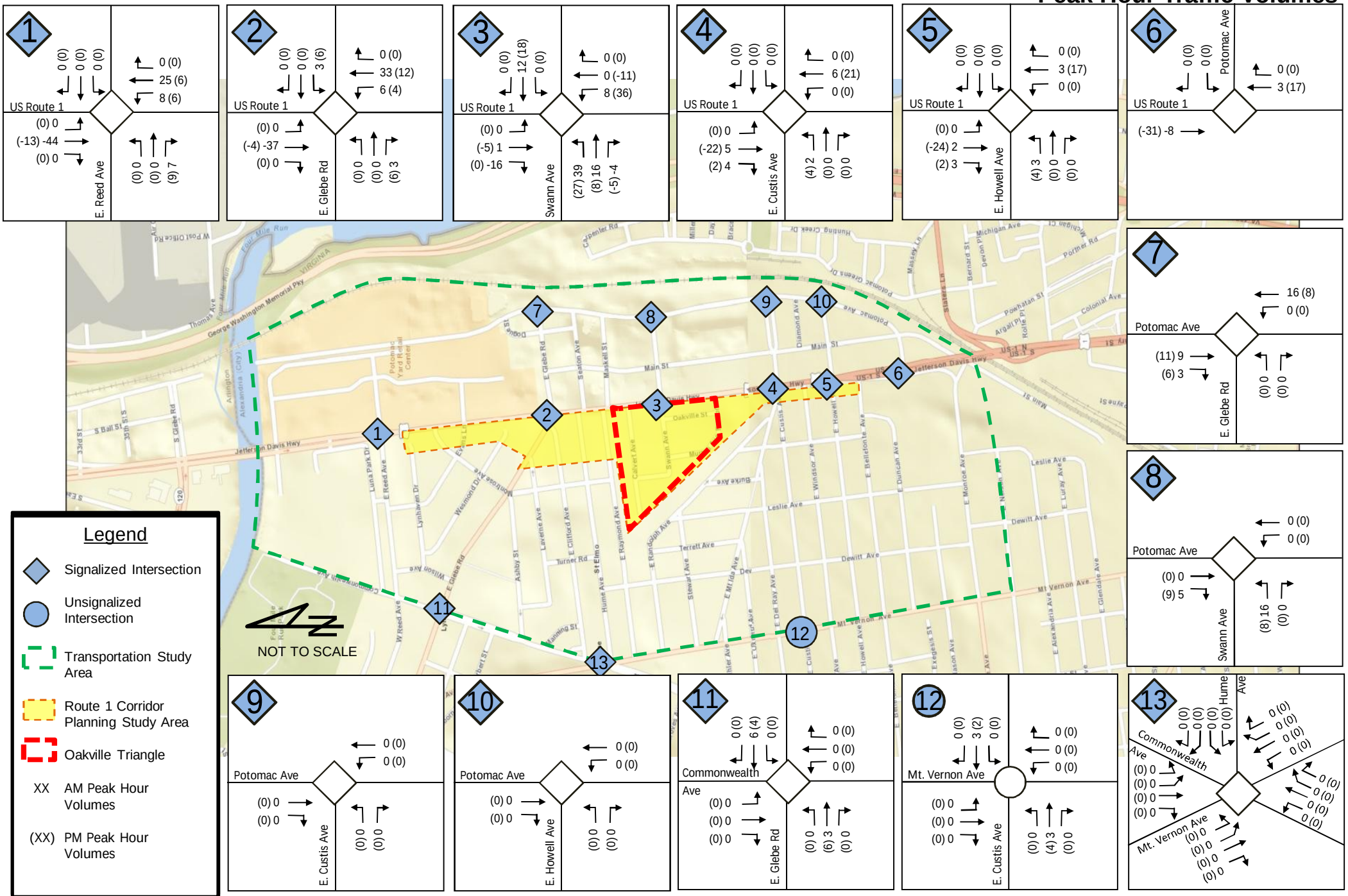


Figure 5-4: 2021 Oakville Triangle and Route 1 Corridor Planning Study Area Peak Hour Traffic Volumes

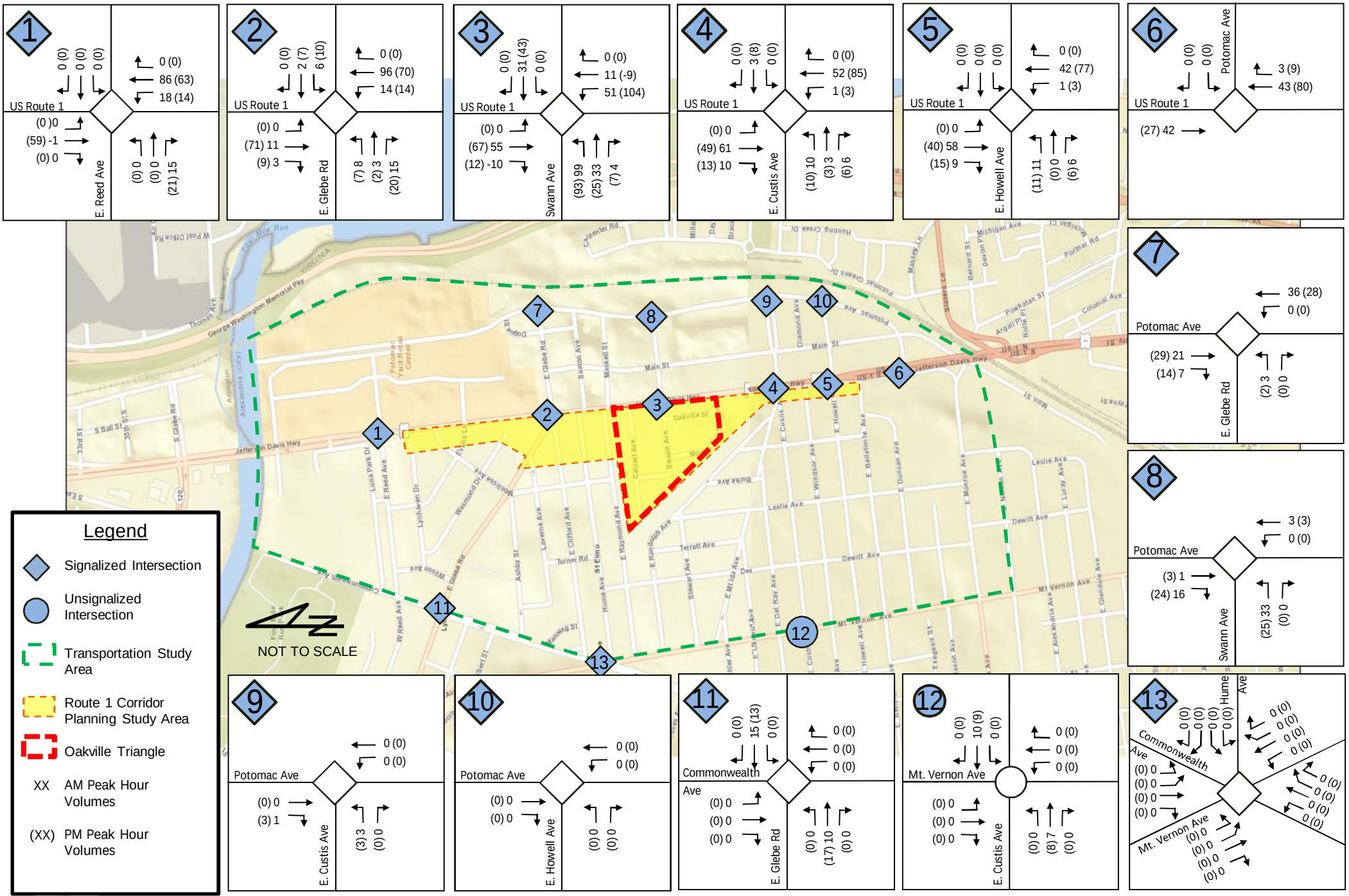
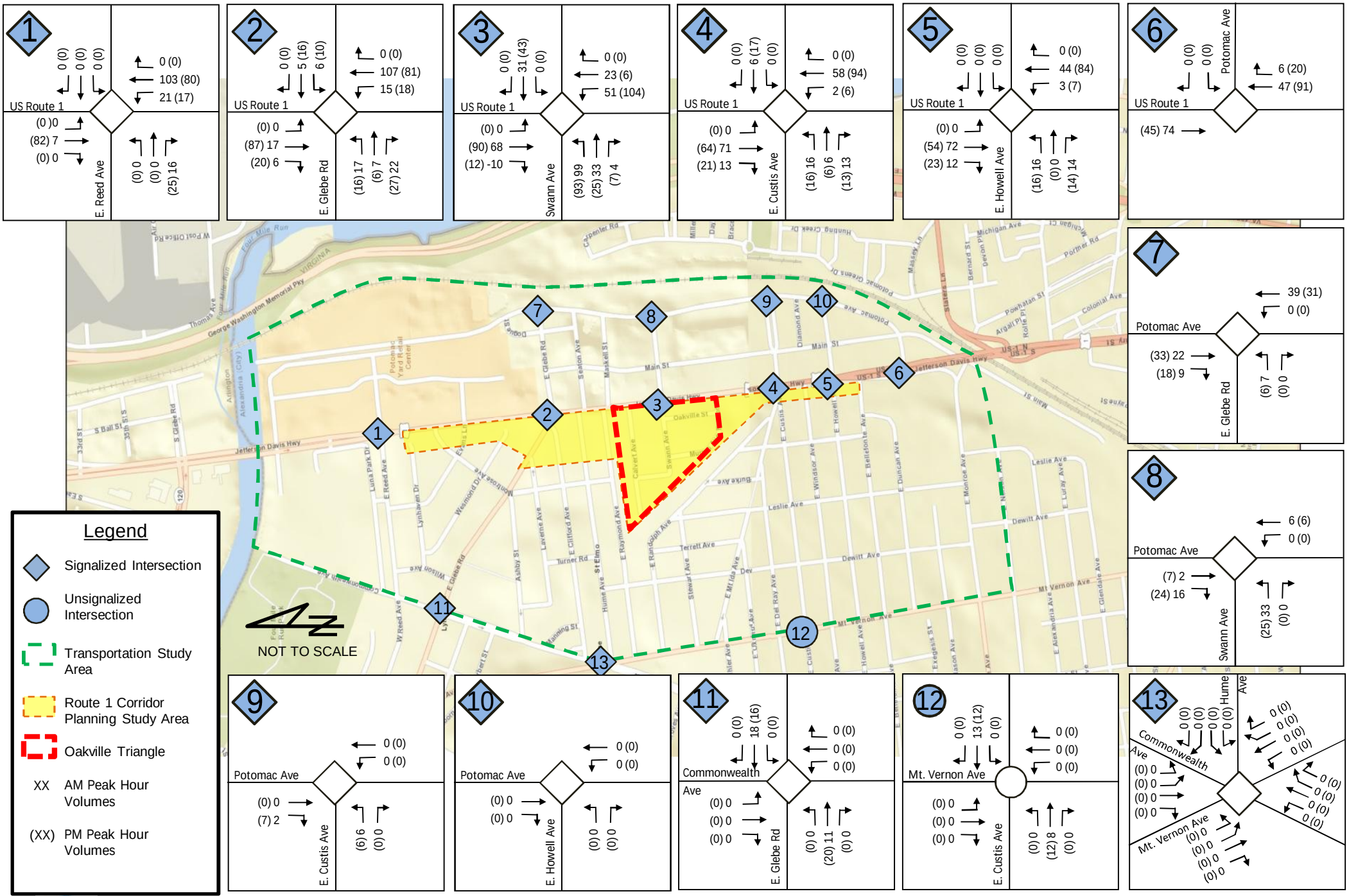


Figure 5-5: 2027 Oakville Triangle and Route 1 Corridor Planning Study Area Peak Hour Traffic Volumes



6. Future Conditions with Development Traffic Volumes

6.1 FUTURE TRANSPORTATION NETWORK WITH DEVELOPMENT

The future transportation network with development considers the same laneage and traffic signalization as the future transportation network without development condition (***Figure 4-1***) with the additional traffic generated by the site.

6.2 FUTURE TRAFFIC VOLUMES WITH DEVELOPMENT

Weekday peak hour traffic volumes in this scenario were created by aggregating future volumes without development and volumes generated by the Oakville Triangle and Route 1 Corridor Planning Study Area developments and subtracting the volumes generated by the existing development on the Oakville Triangle site. The volumes are shown in Figure ***6-1: 2018 AM Total Future Peak Hour Turning Movement Volumes***, ***Figure 6-2: 2018 PM Total Future Peak Hour Turning Movement Volumes***, ***Figure 6-3: 2021 AM Total Future Peak Hour Turning Movement Volumes***, ***Figure 6-4: 2021 PM Total Future Peak Hour Turning Movement Volumes***, ***Figure 6-5: 2027 AM Total Future Peak Hour Turning Movement Volumes,*** and ***Figure 6-6: 2027 PM Total Future Peak Hour Turning Movement Volumes.***

Intersection Capacity Analysis

The analysis of future conditions with development was based on the future transportation network and the accompanying future turning movement volumes with development. The existing PHF factors were increased according to the methodologies of the City of Alexandria's Transportation Planning Administrative Guidelines and do not exceed the VDOT recommended maximum of 0.95 for future scenarios. Pedestrian volumes, bicycle volumes, and heavy vehicle percentages are consistent with those used for the existing conditions analysis. Level of service results of this analysis are summarized in Table 6-1. The Synchro HCM and queuing reports for future conditions with development are provided in **Appendix J**.

The 2018 future conditions with development (Phase I of Oakville Triangle) intersection capacity analysis results show that all intersections continue to operate at an overall LOS of D or better during the peak hours.

The 2021 future conditions with development intersection capacity analysis results show that two intersections operate at LOS E or F during the peak hours:

- US 1 and East Reed Avenue: LOS F during the AM
- US 1 and Glebe Road: LOS F during the AM

The 2027 future conditions with development intersection capacity analysis show that four intersections operate at LOS E or F during the peak hours:

- US 1 and East Reed Avenue: LOS F during the AM and PM
- US 1 and Glebe Road: LOS F during the AM and PM
- US 1 and Swann Avenue: LOS E during the AM
- US 1 and Custis Avenue: LOS E during the AM

When comparing the results of the future with development conditions to the future without development conditions, there is a general trend of increases in vehicle delay. Exceptions occur for specific movements where increases in volumes result in a better distribution of green time allocation due to more frequent phase actuations or where the positive impact of increase in volumes on critical lane groups (i.e. lane groups that weigh more heavily in the calculation of overall intersection LOS) are larger than the negative impact of other volume increases. It should also be noted that the analysis of future conditions is based on the existing signal timing; signal timing that has been reviewed and adjusted to suit the future traffic volumes would likely result in lower vehicle delays and improved LOS.

6.3 FUTURE TRAFFIC VOLUMES WITH DEVELOPMENT SUMMARY

The analysis of future conditions with development considers the combined effects of the additional traffic generated by approved and unbuilt developments, regional growth, and programmed transportation improvements. Analysis results indicated that while most study intersections will continue to operate at LOS D or better, beginning in 2021 the intersections of US Route 1 with Glebe Road and with Reed Avenue will operate at LOS of E or F in one or both peak hours. In 2027, the intersection of US Route 1 with Swann Avenue and with Custis Avenue will each operate at LOS E during the AM peak hour.

For the projected level of development to be accommodated with reductions in delays at the various Route 1 intersections, and assuming that vehicle trip assignments occur as rigidly as assumed in this analysis, intersection improvements may be needed.

At East Glebe Road, for example, potential operational improvements could be realized with lane configuration modifications for the eastbound and westbound movements. It is recognized that a challenge to this type improvement is the need to widen or obtain additional right-of-way.

Without the further widening of the intersections and streets, future traffic may also be accommodated by a more even distribution of traffic among all intersections and streets along US Route 1. Understanding that the interconnected network of neighborhood streets facilitates the balancing of traffic, the future grid network of the Potomac Yard and the existing grid network west of Route 1 will serve to support this balance. It is generally recognized that this distribution of traffic will occur naturally as local and regional drivers seek lesser congested routes.

To provide further efficiency within and progression through the street network, the traffic signals could be retimed and better coordinated to accommodate both auto and transit vehicles.

Chapter 7 of this report presents potential mitigation strategies to address intersections that operate at LOS E or F. The mitigations proposed in that chapter are illustrative of strategies that may be applied to improve the Route 1 corridor driving experience

Figure 6-1: 2018 AM Peak Hour Turning Movement Volumes and Level of Service With Development

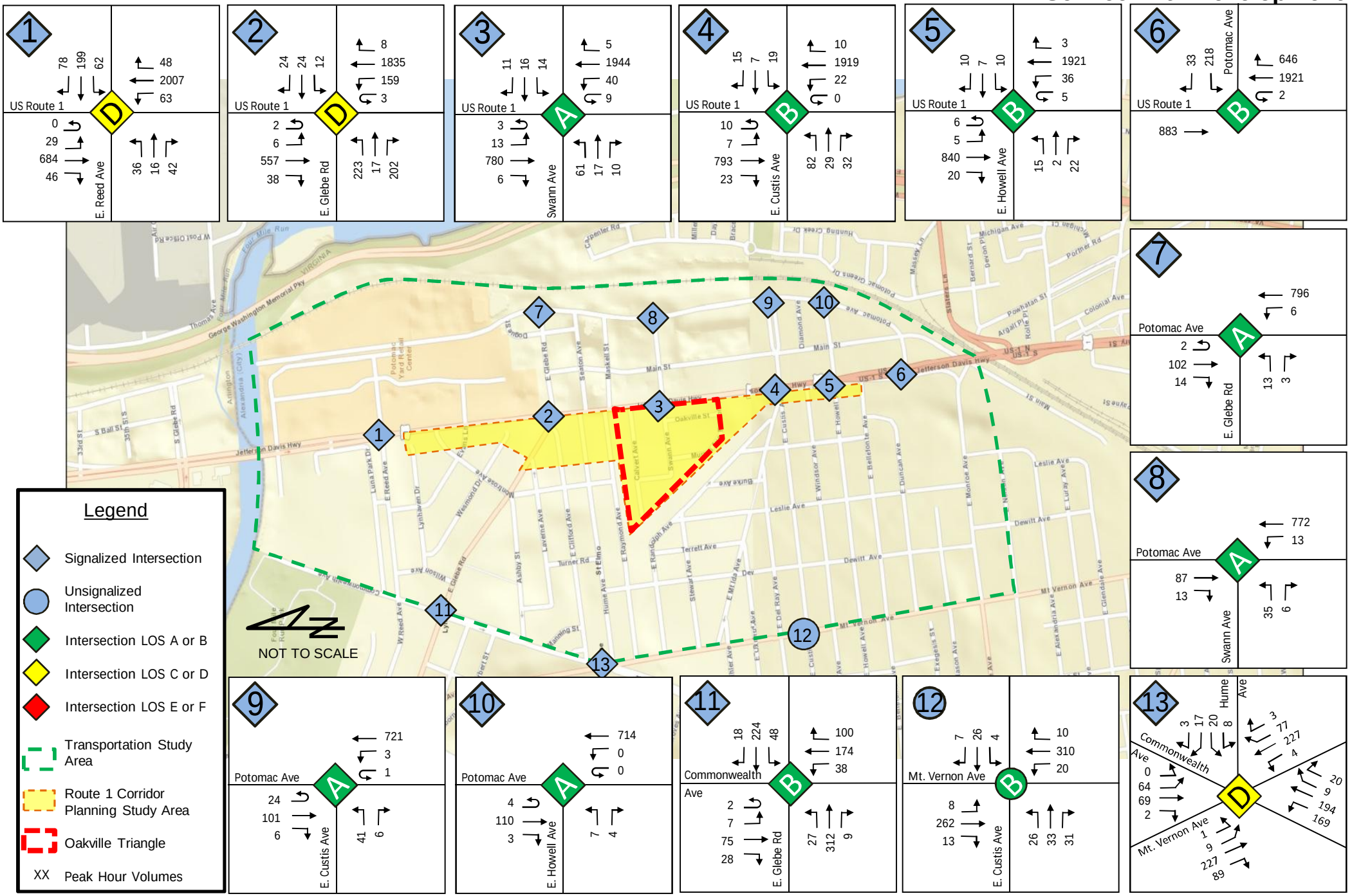


Figure 6-2: 2018 PM Peak Hour Turning Movement Volumes and Level of Service With Development

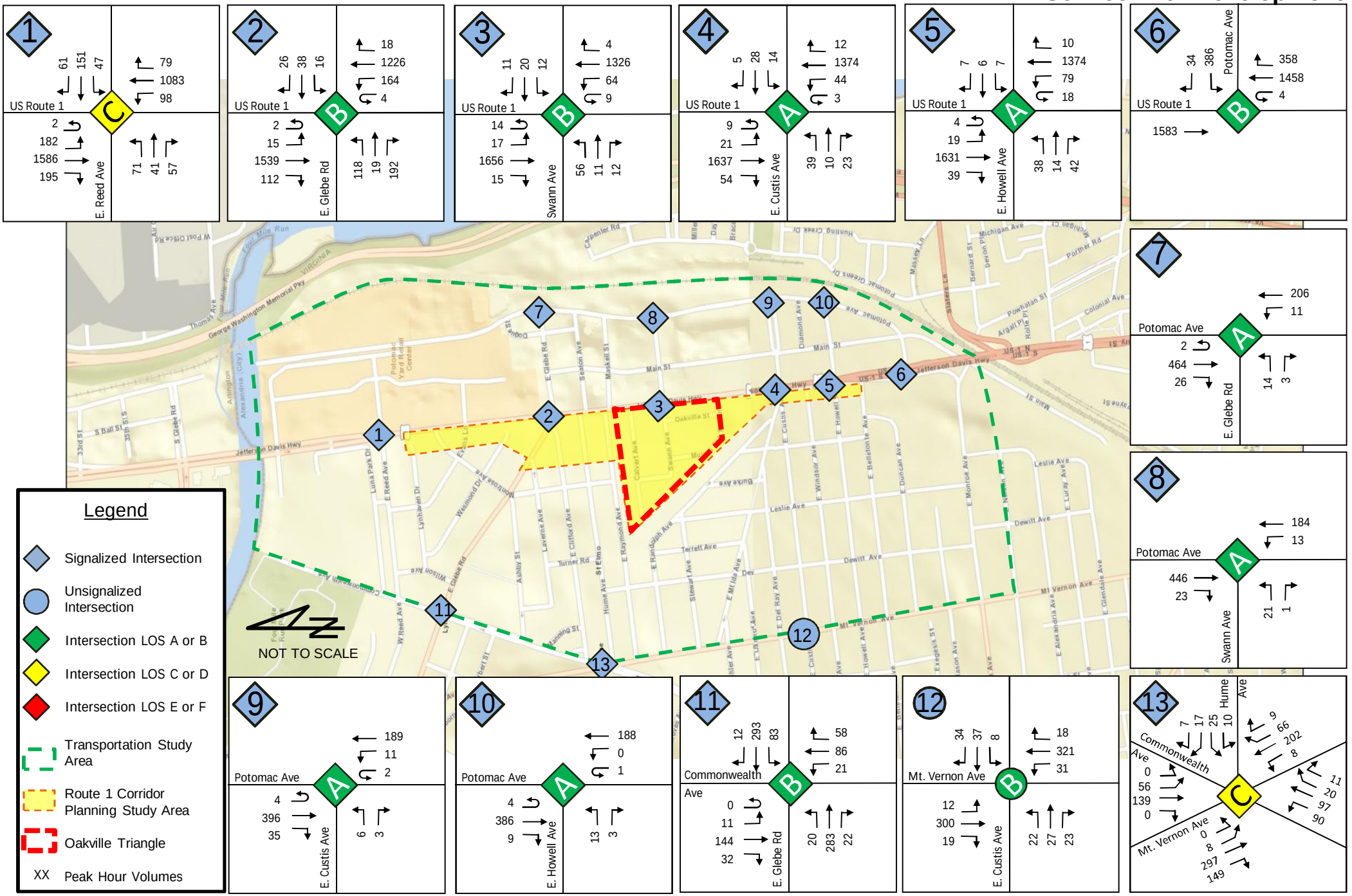


Figure 6-3: 2021 AM Peak Hour Turning Movement Volumes and Level of Service With Development

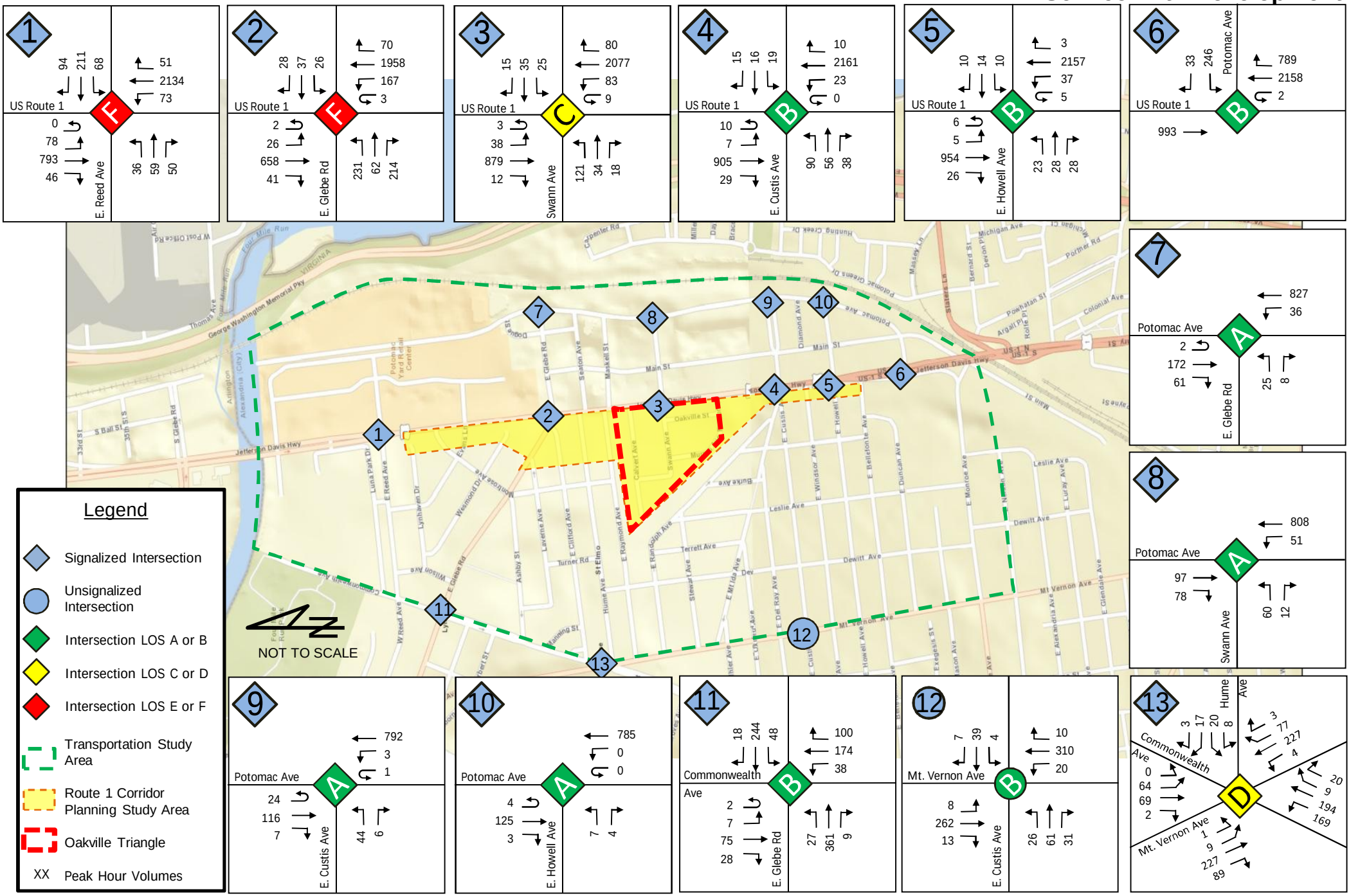


Figure 6-4: 2021 PM Peak Hour Turning Movement Volumes and Level of Service With Development

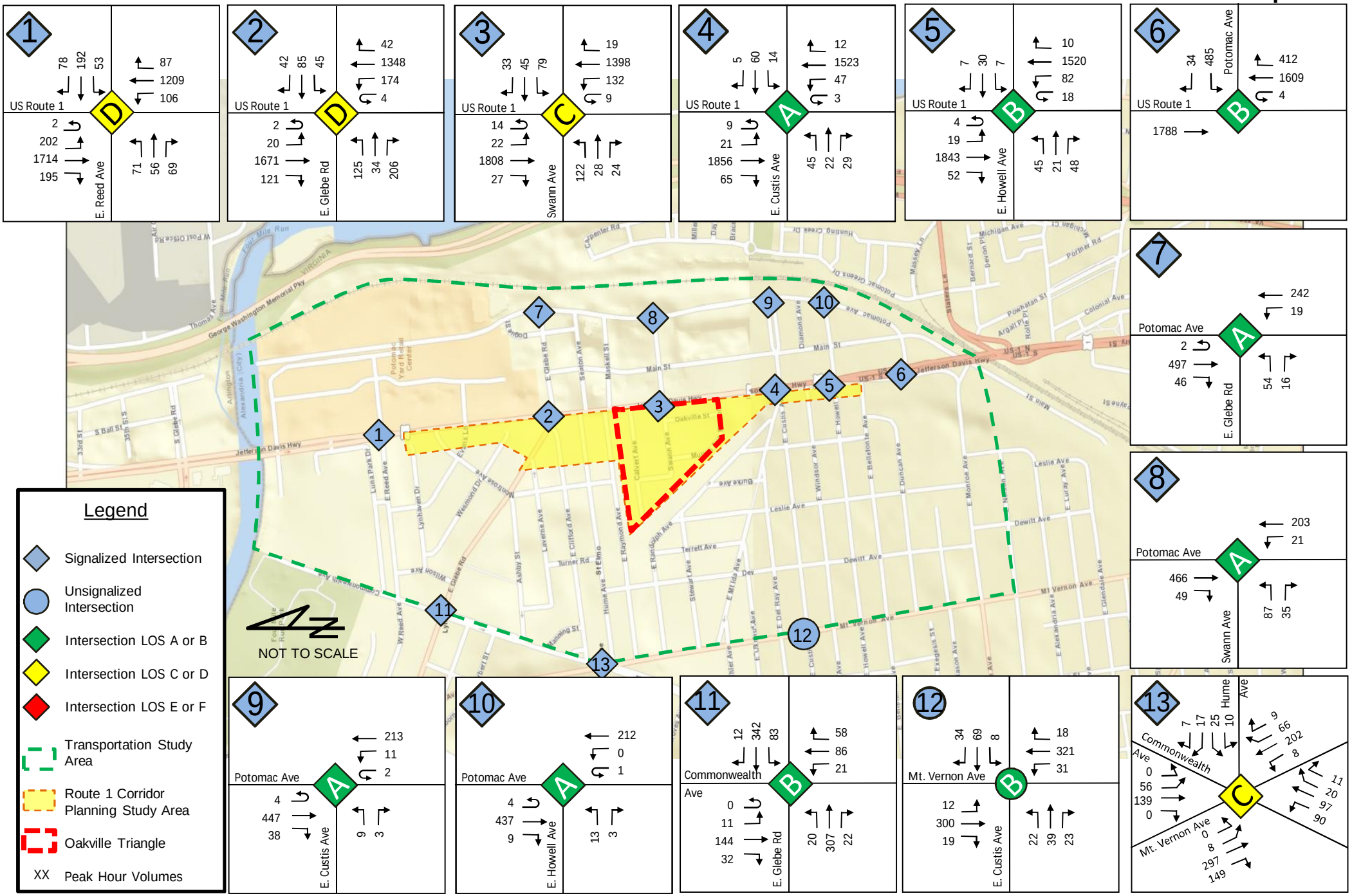


Figure 6-5: 2027 AM Peak Hour Turning Movement Volumes and Level of Service With Development

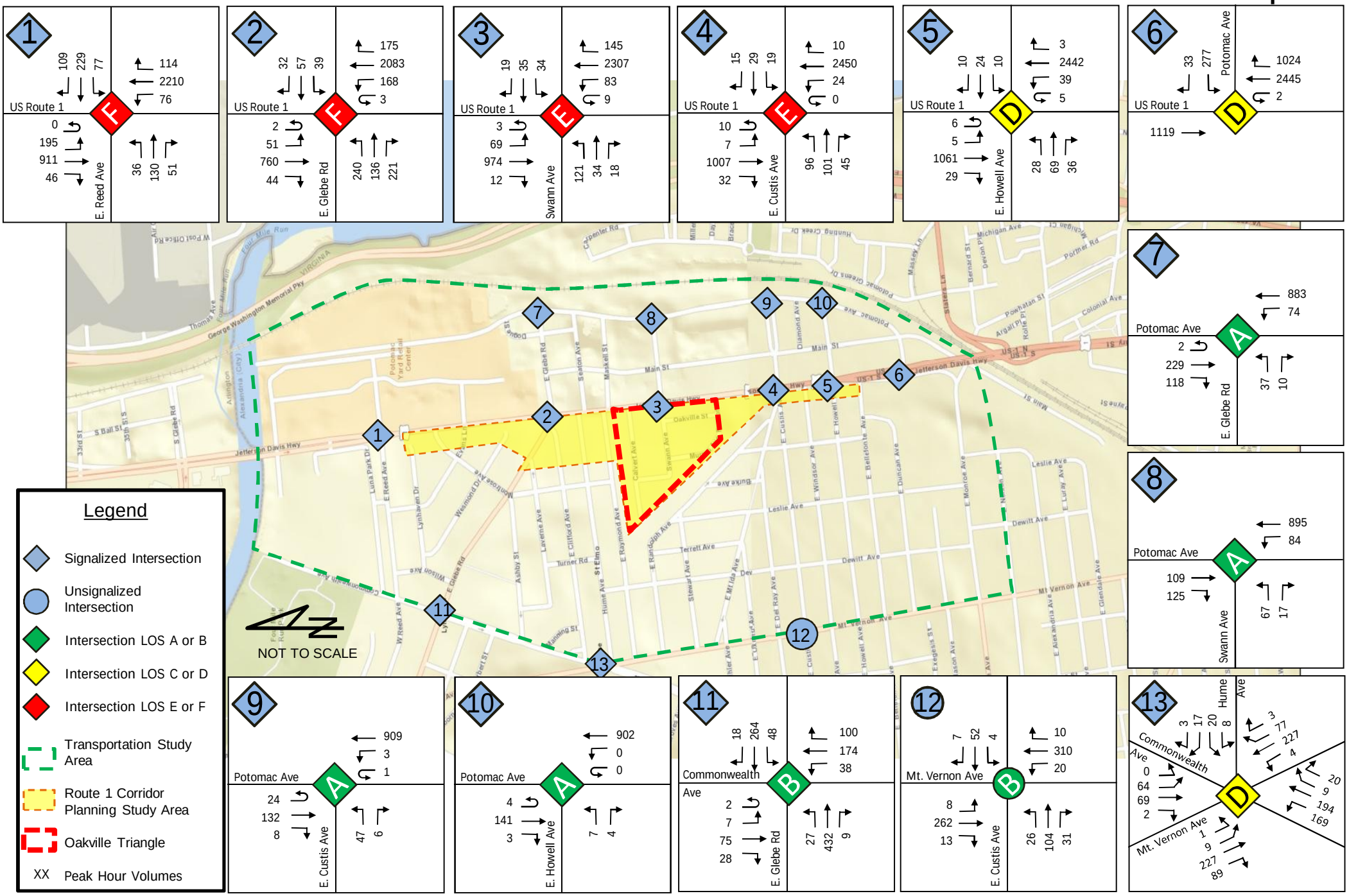


Figure 6-6: 2027 PM Peak Hour Turning Movement Volumes and Level of Service With Development

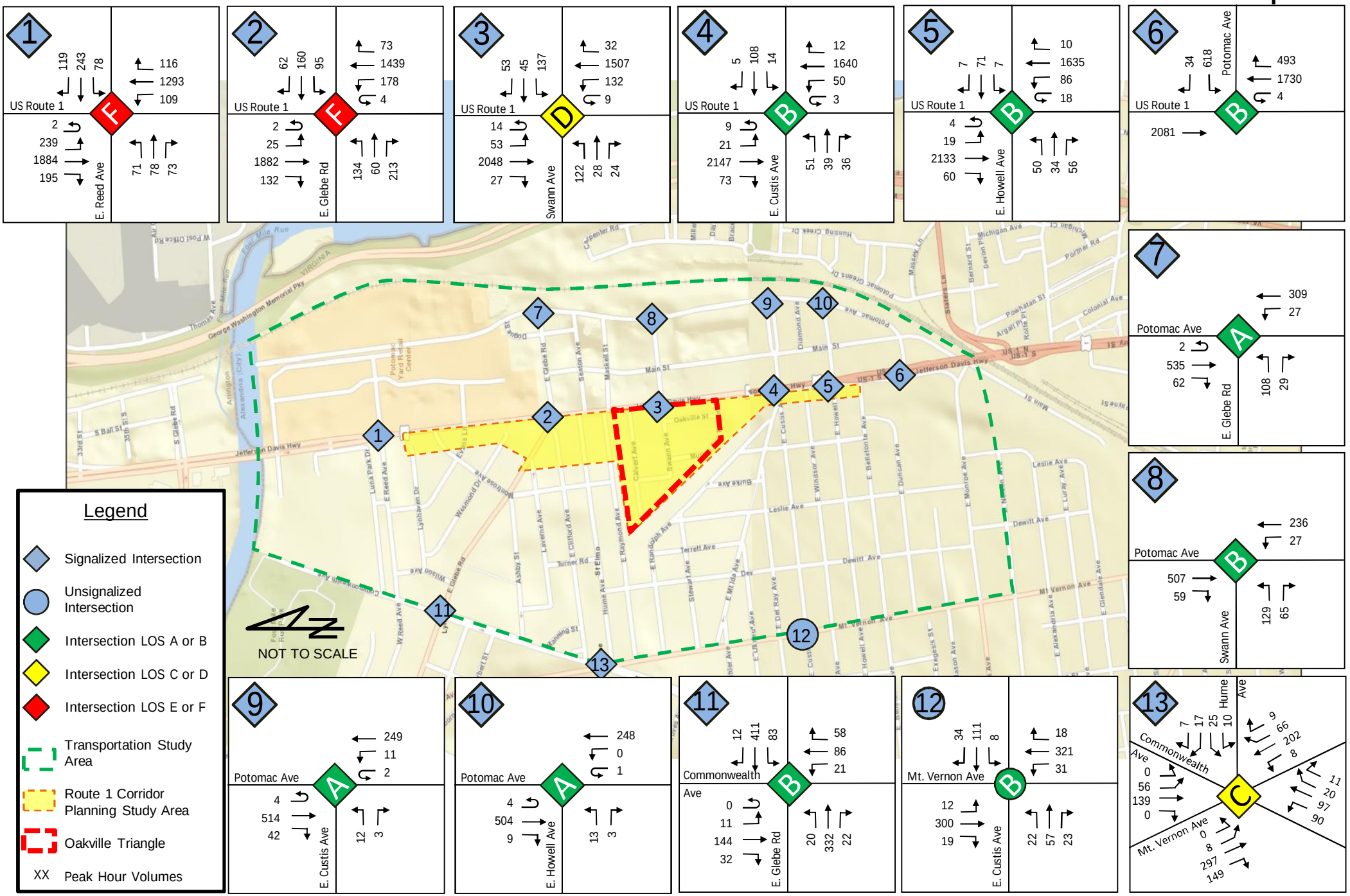


Table 6-1: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
1. US Route 1 & East Reed Avenue							
Eastbound *(East Reed Avenue)*	L	E (63.5)	E (63.5)	E (59.8)	E (61.1)	D (54.9)	E (58.8)
	TR	E (62.1)	E (61.5)	E (64.7)	E (66.6)	E (75.9)	E (71.5)
	Overall	*E (62.6)*	*E (62.3)*	*E (63.5)*	*E (64.6)*	*E (72.4)*	*E (67.4)*
Westbound *(East Reed Avenue)*	L	D (51.7)	D (53.5)	D (52.0)	D (51.5)	D (52.3)	D (52.3)
	TR	F (110.1)	E (80.0)	F (140.9)	F (101.8)	F (186.5)	F (218.1)
	Overall	*F (99.4)*	*E (75.2)*	*F (124.6)*	*F (93.5)*	*F (161.6)*	*F (188.8)*
Northbound *(US Route 1)*	L	B (12.5)	C (31.0)	B (13.8)	D (38.4)	B (17.0)	D (37.2)
	T	E (63.5)	B (18.2)	F (139.4)	C (25.2)	F (248.7)	C (32.2)
	R	B (14.1)	B (15.0)	B (17.1)	B (17.9)	B (12.9)	F (107.4)
	Overall	*E (60.8)*	*B (19.0)*	*F (132.6)*	*C (25.8)*	*F (230.2)*	*D (38.3)*
Southbound *(US Route 1)*	L	C (29.8)	B (19.8)	C (29.5)	D (43.1)	E (61.7)	E (62.5)
	T	B (14.8)	D (36.9)	B (18.4)	E (66.2)	C (23.0)	F (120.8)
	R	B (11.4)	B (15.9)	B (13.5)	B (17.9)	B (15.7)	B (19.0)
	Overall	*B (15.2)*	*C (33.2)*	*B (19.1)*	*E (59.5)*	*C (29.2)*	*F (106.2)*
Overall Intersection		***D (54.4)***	***C (32.6)***	***F (100.9)***	***D (50.8)***	***F (159.9)***	***F (89.4)***
2. US Route 1 & East Glebe Road							
Eastbound (East Glebe Road)	TL	F (87.1)	E (59.9)	F (120.1)	E (76.5)	F (249.0)	F (328.3)
	R	D (45.5)	D (49.5)	D (43.8)	D (46.5)	D (44.2)	D (44.5)
	Overall	*E (68.1)*	*D (53.8)*	*F (87.9)*	*E (59.6)*	*F (173.1)*	*F (179.7)*
Westbound *(East Glebe Road)*	TL	D (44.5)	D (49.3)	D (44.9)	D (49.2)	F (146.2)	F (145.3)
	R	D (43.1)	D (51.9)	D (41.1)	D (48.2)	D (41.1)	D (46.0)
	Overall	*D (44.0)*	*D (50.1)*	*D (43.8)*	*D (49.0)*	*F (119.8)*	*F (126.0)*
Northbound *(US Route 1)*	L	E (68.0)	D (55.5)	E (67.5)	D (48.4)	E (68.1)	D (42.0)
	TR	C (31.4)	B (16.8)	F (107.4)	C (32.9)	F (197.1)	D (41.4)
	Overall	*C (34.4)*	*C (21.4)*	*F (104.3)*	*C (34.7)*	*F (188.1)*	*D (41.5)*
Southbound *(US Route 1)*	L	D (49.8)	D (37.9)	D (45.6)	D (35.4)	D (44.3)	D (35.8)
	TR	B (18.9)	A (6.2)	C (20.9)	C (29.3)	C (22.5)	F (110.8)
	Overall	*B (19.3)*	*A (6.5)*	*C (21.8)*	*C (29.4)*	*C (23.8)*	*F (109.8)*
Overall Intersection		***D (36.4)***	***B (18.0)***	***F (83.4)***	***D (35.2)***	***F (148.6)***	***F (91.4)***
3. US Route 1 & Swann Avenue							
Eastbound *(Swann Avenue)*	TL	E (61.6)	E (78.5)	E (75.9)	F (90.2)	E (75.9)	F (87.1)
	R	E (55.4)	E (59.9)	D (49.8)	D (48.9)	D (49.8)	D (44.5)
	Overall	*E (60.9)*	*E (75.7)*	*E (73.2)*	*F (84.5)*	*E (73.2)*	*F (81.3)*
Westbound *(Swann Avenue)*	TL	E (56.8)	E (61.8)	D (52.5)	E (79.2)	E (53.5)	F (101.0)
	R	E (55.4)	E (59.9)	D (49.8)	D (49.0)	D (49.8)	D (44.7)

Table 6-1: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
	Overall	*E (56.4)*	*E (61.3)*	*D (51.9)*	*E (72.8)*	*D (52.7)*	*F (88.2)*
Northbound *(US Route 1)*	L	F (88.8)	E (51.5)	F (81.8)	D (50.4)	F (80.9)	E (67.5)
	TR	A (3.3)	B (10.4)	C (20.3)	B (18.5)	F (92.0)	C (21.8)
	Overall	*A (5.4)*	*B (12.5)*	*C (22.8)*	*C (21.4)*	*F (91.6)*	*C (25.6)*
Southbound *(US Route 1)*	L	D (51.3)	F (93.2)	D (47.1)	F (92.5)	D (49.8)	F (89.9)
	TR	B (11.4)	A (5.1)	C (20.2)	C (26.1)	B (19.5)	E (70.6)
	Overall	*B (12.2)*	*A (6.7)*	*C (21.4)*	*C (27.4)*	*C (21.6)*	*E (71.2)*
Overall Intersection		***A (9.7)***	***B (11.7)***	***C (25.6)***	***C (29.4)***	***E (70.7)***	***D (54.4)***
4. US Route 1 & East Custis Avenue							
Eastbound *(East Cutis Avenue)*	LTR	E (70.2)	E (59.9)	E (71.9)	E (63.9)	E (75.4)	F (102.8)
	Overall	*E (70.2)*	*E (59.9)*	*E (71.9)*	*E (63.9)*	*E (75.4)*	*F (102.8)*
Westbound *(East Custis Avenue)*	LTR	D (54.1)	E (58.8)	D (51.7)	E (59.3)	*D (48.5)*	*E (62.1)*
	Overall	*D (54.1)*	*E (58.8)*	*D (51.7)*	*E (59.3)*	*D (48.5)*	*E (62.1)*
Northbound *(US Route 1)*	L	F (91.9)	F (80.2)	F (90.9)	E (79.5)	F (92.1)	F (81.7)
	TR	A (6.6)	A (1.7)	B (13.8)	A (2.2)	F (85.9)	A (2.9)
	Overall	*A (7.5)*	*A (4.3)*	*B (14.6)*	*A (4.6)*	*F (85.9)*	*A (5.4)*
Southbound *(US Route 1)*	L	E (70.3)	F (94.9)	E (61.4)	E (77.3)	E (58.7)	E (76.8)
	TR	A (3.6)	A (3.5)	A (4.2)	A (3.9)	A (5.3)	A (9.3)
	Overall	*A (5.0)*	*A (5.1)*	*A (5.3)*	*A (5.0)*	*A (6.2)*	*B (10.2)*
Overall Intersection		***B (10.5)***	***A (6.7)***	***B (15.7)***	***A (7.5)***	***E (62.7)***	***B (12.6)***
5. US Route 1 & East Howell Avenue*							
Eastbound *(East Howell Avenue)*	LTR	E (59.7)	E (66.8)	E (59.5)	E (74.2)	E (63.6)	F (88.4)
	Overall	*E (59.7)*	*E (66.8)*	*E (59.5)*	*E (74.2)*	*E (63.6)*	*F (88.4)*
Westbound *(East Howell Avenue)*	TL	E (59.5)	E (59.2)	E (57.4)	E (59.0)	E (55.4)	E (58.8)
	R	E (58.7)	E (56.0)	E (56.6)	D (54.9)	D (54.3)	D (53.5)
	Overall	*E (59.2)*	*E (58.1)*	*E (57.2)*	*E (58.4)*	*E (55.2)*	*E (58.4)*
Northbound *(US Route 1)*	L	F (131.7)	D (52.3)	F (122.5)	D (48.7)	F (81.4)	D (42.1)
	TR	A (8.1)	A (6.4)	B (11.9)	A (8.0)	D (46.4)	B (12.0)
	Overall	*B (10.6)*	*A (9.4)*	*B (14.0)*	*B (10.5)*	*D (47.0)*	*B (13.8)*
Southbound *(US Route 1)*	L	F (117.7)	E (73.2)	F (109.8)	E (64.2)	F (108.0)	E (66.4)
	TR	A (7.5)	A (3.8)	B (14.0)	A (7.3)	B (16.5)	B (12.6)
	Overall	*B (12.0)*	*A (4.7)*	*B (17.4)*	*A (7.9)*	*B (19.5)*	*B (13.1)*
Overall Intersection		***B (12.2)***	***A (8.9)***	***B (16.6)***	***B (11.7)***	***D (39.5)***	***B (16.9)***
6. US Route 1 & Potomac Avenue							
Westbound *(Potomac*	L	E (76.7)	D (53.2)	E (67.3)	D (51.3)	D (51.0)	D (49.2)

Table 6-1: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
Avenue)	R	E (59.5)	D (45.7)	E (57.0)	D (42.1)	D (47.3)	D (38.0)
	Overall	*E (74.4)*	*D (52.6)*	*E (66.1)*	*D (50.7)*	*D (50.6)*	*D (48.6)*
Northbound *(US Route 1)*	T	B (10.8)	A (7.1)	B (17.4)	B (10.3)	F (83.5)	B (18.5)
	R	A (0.1)	A (0.0)	A (0.2)	A (0.0)	A (1.2)	A (0.1)
	Overall	*A (8.1)*	*A (5.7)*	*B (12.8)*	*A (8.3)*	*E (59.2)*	*B (14.4)*
Southbound *(US Route 1)*	T	A (1.1)	A (4.9)	A (1.5)	A (7.6)	A (5.9)	B (16.1)
	Overall	*A (1.1)*	*A (4.9)*	*A (1.5)*	*A (7.6)*	*A (5.9)*	*B (16.1)*
Overall Intersection		***B (10.9)***	***B (10.5)***	***B (13.7)***	***B (13.1)***	***D (46.5)***	***B (19.6)***
7. Potomac Avenue & East Glebe Road							
Eastbound *(East Glebe Road)*	L	C (22.7)	C (22.1)	C (21.1)	B (19.0)	C (21.3)	B (16.5)
	R	C (21.6)	C (21.3)	C (20.1)	B (18.0)	B (19.7)	B (15.0)
	Overall	*C (22.5)*	*C (22.0)*	*C (20.8)*	*B (18.8)*	*C (20.9)*	*B (16.2)*
Northbound *(Potomac Avenue)*	L	A (2.4)	A (2.5)	A (3.0)	A (3.8)	A (3.3)	A (5.4)
	T	A (2.8)	A (2.3)	A (3.5)	A (3.6)	A (3.6)	A (5.0)
	Overall	*A (2.8)*	*A (2.3)*	*A (3.4)*	*A (3.6)*	*A (3.6)*	*A (5.1)*
Southbound *(Potomac Avenue)*	TR	A (4.6)	A (5.3)	A (5.7)	A (7.6)	A (8.9)	A (9.9)
	Overall	*A (4.6)*	*A (5.3)*	*A (5.7)*	*A (7.6)*	*A (8.9)*	*A (9.9)*
Overall Intersection		***A (3.3)***	***A (4.8)***	***A (4.4)***	***A (7.3)***	***A (5.6)***	***A (9.2)***
8. Potomac Avenue & Swann Avenue							
Eastbound *(Swann Avenue)*	L	C (32.2)	C (32.7)	C (31.7)	C (34.2)	C (31.4)	D (35.5)
	R	C (31.3)	C (32.1)	C (30.1)	C (31.5)	C (29.6)	C (31.1)
	Overall	*C (32.1)*	*C (32.6)*	*C (31.4)*	*C (33.4)*	*C (31.0)*	*C (34.0)*
Northbound *(Potomac Avenue)*	L	A (3.6)	A (3.0)	A (3.9)	A (3.2)	A (4.0)	A (3.6)
	T	A (4.8)	A (3.0)	A (5.0)	A (3.2)	A (5.3)	A (3.6)
	Overall	*A (4.7)*	*A (3.0)*	*A (4.9)*	*A (3.2)*	*A (5.2)*	*A (3.6)*
Southbound *(Potomac Avenue)*	TR	A (5.7)	A (5.8)	A (6.8)	A (6.6)	A (7.5)	A (7.2)
	Overall	*A (5.7)*	*A (5.8)*	*A (6.8)*	*A (6.6)*	*A (7.5)*	*A (7.2)*
Overall Intersection		***A (6.0)***	***A (5.8)***	***A (6.9)***	***A (9.5)***	***A (7.3)***	***B (11.4)***
9. Potomac Avenue & East Custis Avenue							
Eastbound *(East Custis Avenue)*	L	D (46.8)	D (46.4)	D (46.9)	D (46.5)	D (47.1)	D (46.7)
	R	D (45.2)	D (46.2)	D (45.2)	D (46.2)	D (45.2)	D (46.2)
	Overall	*D (46.6)*	*D (46.3)*	*D (46.7)*	*D (46.4)*	*D (46.9)*	*D (46.6)*
Northbound *(Potomac Avenue)*	L	A (2.7)	A (2.2)	A (2.7)	A (2.2)	A (2.7)	A (2.3)
	T	A (3.5)	A (2.2)	A (3.7)	A (2.3)	A (3.9)	A (2.3)
	Overall	*A (3.5)*	*A (2.2)*	*A (3.7)*	*A (2.3)*	*A (3.9)*	*A (2.3)*
Southbound *(Potomac*	TR	A (4.4)	A (4.3)	A (4.5)	A (4.4)	A (4.5)	A (4.5)

Table 6-1: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
Avenue)	*Overall*	*A (4.4)*	*A (4.3)*	*A (4.5)*	*A (4.4)*	*A (4.5)*	*A (4.5)*
Overall Intersection		***A (5.9)***	***A (4.2)***	***A (5.9)***	***A (4.4)***	***A (6.0)***	***A (4.6)***
10. Potomac Avenue & East Howell Avenue							
Eastbound *(East Howell Avenue)*	L	C (30.1)	D (46.6)	C (30.1)	D (46.6)	C (30.1)	D (46.6)
	R	C (29.9)	C (30.5)	C (29.9)	C (30.5)	C (29.9)	C (30.5)
	Overall	*C (30.1)*	*D (43.8)*	*C (30.1)*	*D (43.8)*	*C (30.1)*	*D (43.8)*
Northbound *(Potomac Avenue)*	L	A (0.0)	A (1.1)	A (0.0)	A (1.1)	A (0.0)	A (1.1)
	T	A (2.4)	A (1.2)	A (2.5)	A (1.3)	A (2.6)	A (1.3)
	Overall	*A (2.4)*	*A (1.2)*	*A (2.5)*	*A (1.3)*	*A (2.6)*	*A (1.3)*
Southbound *(Potomac Avenue)*	TR	A (1.8)	A (1.4)	A (1.8)	A (1.5)	A (1.8)	A (1.5)
	Overall	*A (1.8)*	*A (1.4)*	*A (1.8)*	*A (1.5)*	*A (1.8)*	*A (1.5)*
Overall Intersection		***A (2.6)***	***A (2.5)***	***A (2.7)***	***A (2.4)***	***A (2.8)***	***A (2.3)***
11. Commonwealth Avenue & West Glebe Road/East Glebe Road							
Eastbound *(West Glebe Road)*	LTR	B (13.5)	B (12.8)	B (14.8)	B (13.4)	B (17.5)	B (14.1)
	Overall	*B (13.5)*	*B (12.8)*	*B (14.8)*	*B (13.4)*	*B (17.5)*	*B (14.1)*
Westbound *(East Glebe Road)*	LTR	B (12.3)	B (15.2)	B (12.7)	B (16.9)	B (13.3)	C (20.1)
	Overall	*B (12.3)*	*B (15.2)*	*B (12.7)*	*B (16.9)*	*B (13.3)*	*C (20.1)*
Northbound *(Commonwealth Avenue)*	LTR	C (24.8)	B (17.9)	C (24.8)	B (17.9)	C (24.8)	B (17.9)
	Overall	*C (24.8)*	*B (17.9)*	*C (24.8)*	*B (17.9)*	*C (24.8)*	*B (17.9)*
Southbound *(Commonwealth Avenue)*	LTR	B (17.1)	B (19.3)	B (17.1)	B (19.3)	B (17.1)	B (19.3)
	Overall	*B (17.1)*	*B (19.3)*	*B (17.1)*	*B (19.3)*	*B (17.1)*	*B (19.3)*
Overall Intersection		***B (16.9)***	***B (15.6)***	***B (17.2)***	***B (16.4)***	***B (18.2)***	***B (17.9)***
12. Mt. Vernon Avenue & East Custis Avenue (*Unsignalized*)							
Eastbound *(East Custis Avenue)*	LTR	A (9.3)	A (9.5)	A (9.9)	A (9.9)	B (10.8)	B (10.5)
	Overall	*A (9.3)*	*A (9.5)*	*A (9.9)*	*A (9.9)*	*B (10.8)*	*B (10.5)*
Westbound *(East Custis Avenue)*	LTR	A (9.1)	A (9.5)	A (9.4)	B (10.1)	A (9.9)	B (11.2)
	Overall	*A (9.1)*	*A (9.5)*	*A (9.4)*	*B (10.1)*	*A (9.9)*	*B (11.2)*
Northbound *(Mt. Vernon Avenue)*	LTR	B (11.9)	B (13.0)	B (12.5)	B (13.9)	B (13.4)	C (15.2)
	Overall	*B (11.9)*	*B (13.0)*	*B (12.5)*	*B (13.9)*	*B (13.4)*	*C (15.2)*
Southbound *(Mt. Vernon Avenue)*	LTR	B (11.0)	B (12.3)	B (11.5)	B (13.0)	B (12.2)	B (14.1)
	Overall	*B (11.0)*	*B (12.3)*	*B (11.5)*	*B (13.0)*	*B (12.2)*	*B (14.1)*
Overall Intersection		***B (11.1)***	***B (12.1)***	***B (11.6)***	***B (12.7)***	***B (12.3)***	***B (13.7)***
13. Commonwealth Avenue & Mt. Vernon Avenue & Hume Avenue							
Westbound (Hume Avenue)	LR	D (47.7)	D (44.8)	D (47.7)	D (44.8)	D (47.7)	D (44.8)
	Overall	*D (47.7)*	*D (44.8)*	*D (47.7)*	*D (44.8)*	*D (47.7)*	*D (44.8)*
Northbound (Mt. Vernon	TL	C (30.3)	C (25.8)	C (30.3)	C (25.8)	C (30.3)	C (25.8)

Table 6-1: Future With Development Traffic Analysis (Pre-Mitigation) LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Conditions**		**2021 Conditions**		**2027 Conditions**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
Avenue)	R	C (24.0)	C (21.2)	C (24.0)	C (21.2)	C (24.0)	C (21.2)
	Overall	*C (28.7)*	*C (24.6)*	*C (28.7)*	*C (24.6)*	*C (28.7)*	*C (24.6)*
Southbound (Mt. Vernon Avenue)	TL	D (39.1)	D (40.7)	D (39.1)	D (40.7)	D (39.1)	D (40.7)
	R	B (13.8)	B (16.6)	B (13.8)	B (16.6)	B (13.8)	B (16.6)
	Overall	*C (32.2)*	*C (32.8)*	*C (32.2)*	*C (32.8)*	*C (32.2)*	*C (32.8)*
Northeastbound (Commonwealth Avenue)	L	D (36.6)	D (38.9)	D (36.6)	D (38.9)	D (36.6)	D (38.9)
	TR	D (46.9)	D (41.4)	D (46.9)	D (41.4)	D (46.9)	D (41.4)
	Overall	*D (42.4)*	*D (40.4)*	*D (42.4)*	*D (40.4)*	*D (42.4)*	*D (40.4)*
Southwestbound (Commonwealth Avenue)	LTR	D (46.4)	D (43.3)	D (46.4)	D (43.3)	D (46.4)	D (43.3)
	Overall	*D (46.4)*	*D (43.3)*	*D (46.4)*	*D (43.3)*	*D (46.4)*	*D (43.3)*
Overall Intersection		***D (36.8)***	***C (34.5)***	***D (36.8)***	***C (34.5)***	***D (36.8)***	***C (34.5)***

*During the AM peak hour, the observed southbound left turn volumes at US Route 1 and Howell Avenue were minimal. As a result, due to low actuations, the synchro calculated delays for this movement were extremely high resulting in an Error for the overall intersection level of service. In order to calculate a realistic intersection level of service, the southbound left turn volumes at Howell Avenue were manually increased to a value of 30 vehicles for all AM scenarios. The magnitude of this value is within the range of similar movements.

7. Multimodal Mitigation Summary

The potential effects of multimodal mitigation strategies were analyzed for the intersections that operate at LOS of E or F under the future with development conditions. While most multimodal mitigation strategies are targeted specifically at certain intersections, there are also global strategies that affect the entire corridor (i.e. modify traffic signal timing offsets to improve north-south progression between signals and increase traffic signal cycle length to increase the total available green time). As such, while the results of mitigation analysis are only shown for certain intersections, other intersections along the Route 1 corridor may benefit from these strategies as well.

Year 2018 Mitigation

- Improvement in north-south vehicle progression between traffic signals by adjusting traffic signal offsets.
- Modification of traffic signal phasing at the intersection of US Route 1 and East Reed Avenue.
    - Eastbound and westbound signal phasing is modified from split phase to concurrent phasing with protected-permitted left turn phases.
    - Northbound right turn phase is modified to allow overlap right turns
- Modification of traffic signal phasing at the intersection of US Route 1 and East Glebe Road.
    - Eastbound right turn movement is modified to allow overlap right turns.
- Modification of lane configurations at the intersection of US Route 1 and Swann Avenue.
    - Eastbound and westbound lanes modified from shared thru-left lanes and exclusive right lanes to exclusive left turn lanes and shared thru-right lanes.

Year 2021 Mitigation

- Increase in traffic signal cycle length along Route 1 from 140 seconds to 160 seconds
- Improvement in north-south vehicle progression between traffic signals by adjusting traffic signal offsets.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Reed Avenue.
    - Eastbound and westbound signal phasing is modified from split phase to concurrent phasing with protected-permitted left turn phases.
    - Northbound right turn phase is modified to allow overlap right turns
    - Westbound lanes modified from exclusive left turn lane and shared thru-right lane to exclusive left, thru, and right lanes.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Glebe Road.
    - Eastbound right turn movement is modified to allow overlap right turns.
    - Eastbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left, thru, and right lanes. It is noted that ROW acquisition/widening may be required to accommodate the eastbound lane configuration change. This future lane configuration and associated ROW impacts were also identified in the Potomac Yard Multimodal Transportation Study as strategies to accommodate the future Potomac Yard-generated traffic.

  - Westbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left turn lane and shared thru-right lane.
  - Eastbound and westbound left turn phasing modified to be protected-permitted movements.
- Modification of lane configurations at the intersection of US Route 1 and Swann Avenue.
  - Eastbound and westbound lanes modified from shared thru-left lanes and exclusive right lanes to exclusive left turn lanes and shared thru-right lanes.

Year 2027 Mitigation

- Increase in traffic signal cycle length along Route 1 from 140 seconds to 160 seconds
- Improvement in north-south vehicle progression between traffic signals by adjusting traffic signal offsets.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Reed Avenue.
  - Eastbound and westbound signal phasing is modified from split phase to concurrent phasing with protected-permitted left turn phases.
  - Northbound right turn phase is modified to allow overlap right turns
  - Westbound lanes modified from exclusive left turn lane and shared thru-right lane to exclusive left, thru, and right lanes.
- Modification of traffic signal phasing and lane configurations at the intersection of US Route 1 and East Glebe Road.
  - Eastbound right turn movement is modified to allow overlap right turns.
  - Eastbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left, thru, and right lanes. It is noted that ROW acquisition/widening may be required to accommodate the eastbound lane configuration change. This future lane configuration and associated ROW impacts were also identified in the Potomac Yard Multimodal Transportation Study as strategies to accommodate the future Potomac Yard-generated traffic.
  - Westbound lanes modified from exclusive right turn lane and shared thru-left lane to exclusive left turn lane and shared thru-right lane.
  - Eastbound and westbound left turn phasing modified to be protected-permitted movements.
- Modification of lane configurations at the intersection of US Route 1 and Swann Avenue.
  - Eastbound and westbound lanes modified from shared thru-left lanes and exclusive right lanes to exclusive left turn lanes and shared thru-right lanes.
- Modification of lane configurations at the intersection of US Route 1 and Custis Avenue.
  - Eastbound and westbound lanes modified from shared left, thru, right lanes to exclusive left turn lanes and shared thru-right lanes. It is noted that while ROW acquisition/widening may be required to accommodate the lane configuration change, this future lane configuration and associated ROW impacts were also identified in the Potomac Yard Multimodal Transportation Study as strategies to accommodate the future Potomac Yard-generated traffic.

The proposed mitigations seek to minimize the impact of the site related traffic and, where possible, return the traffic network to pre-development levels of service. It is noted that the City of Alexandria has recognized certain east-west movements as critical to the overall operation of the Route 1 Corridor. It is noted that to reduce the delays in east-west movements, there is a necessary trade-off in the operational efficiency of north-south movements. It is also noted that because of the large volume of north-south traffic, even slight reductions in the LOS of north-south operations have a significantly larger negative impact on the overall LOS of an intersection compared to the positive impacts of improvements in east-west LOS.

The LOS results presented below are demonstrative and based on a reasonable reallocation of green time. The purpose of these results is to convey the potential positive impacts of a simple reallocation of green time for the estimated traffic volumes of this study. The signal timings and offsets used in the mitigation analysis are not definitive, but illustrative and should be revisited in the future, with actual future year traffic and transit operations, to achieve operational efficiency for both autos and buses.

The future transportation network with the proposed mitigations is shown in ***Figure 7-1: Recommended Future Intersection Laneage and Traffic Control***. The mitigated level of service results are shown graphically in ***Figure 7-2: 2018 AM Mitigated Peak Hour Turning Movement Volumes***, ***Figure 7-3: 2018 PM Mitigated Peak Hour Turning Movement Volumes***, ***Figure 7-4: 2021 AM Mitigated Peak Hour Turning Movement Volumes***, ***Figure 7-5: 2021 PM Mitigated Peak Hour Turning Movement Volumes***, ***Figure 7-6: 2027 AM Mitigated Peak Hour Turning Movement Volumes,*** and ***Figure 7-7: 2027 PM Mitigated Peak Hour Turning Movement Volumes.***

The analysis of future conditions with development and with mitigation strategies was based on the recommended future transportation network and the accompanying future turning movement volumes with development.

The existing PHF factors were increased according to the methodologies of the City of Alexandria's Transportation Planning Administrative Guidelines and to not exceed the VDOT recommended maximum of 0.95 for future scenarios. Pedestrian volumes, bicycle volumes, and heavy vehicle percentages are consistent with those used for the existing conditions analysis.

The resulting impacts to intersection Levels of Service resulting from the proposed mitigation are shown in Tables 7-1, 7-2, and 7-3. The Synchro HCM and queuing reports for conditions the with development and with mitigation strategies are included in **Appendix K.**

Figure 7-1: Recommended Future Intersection Laneage and Traffic Control

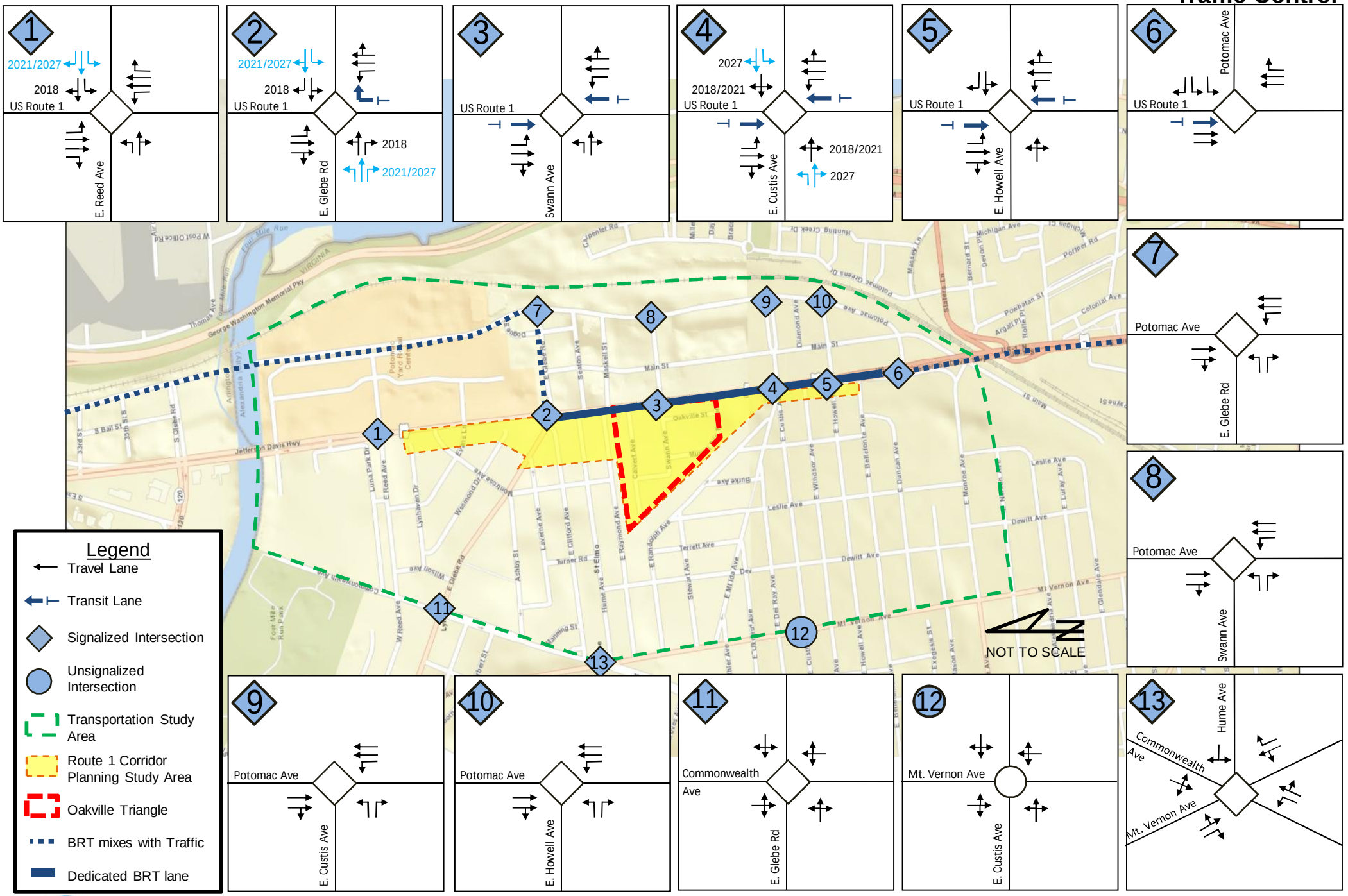


Figure 7-2: 2018 AM Mitigation Peak Hour Turning Movement Volumes and Level of Service

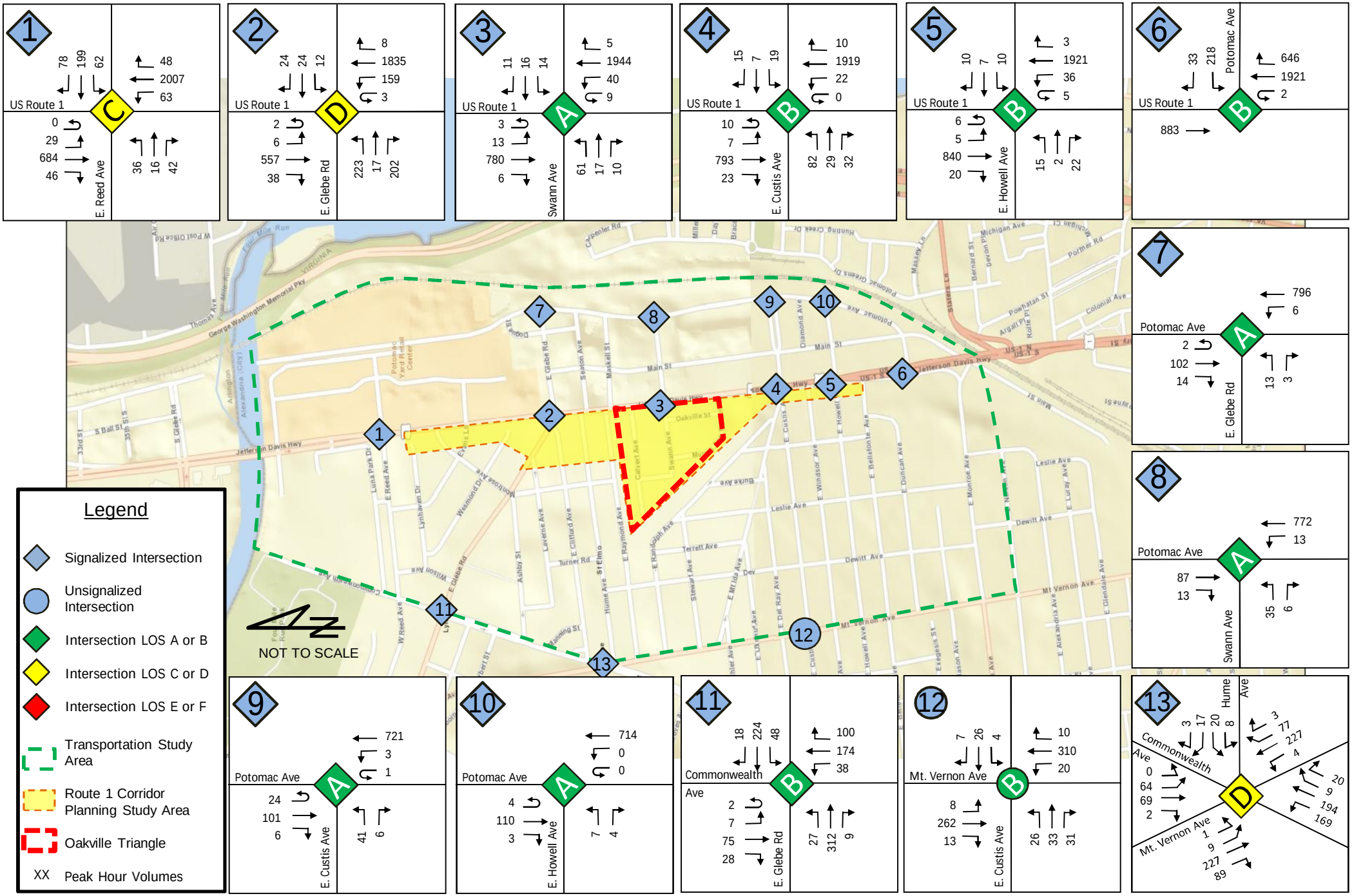


Figure 7-3: 2018 PM Mitigation Peak Hour Turning Movement Volumes and Level of Service

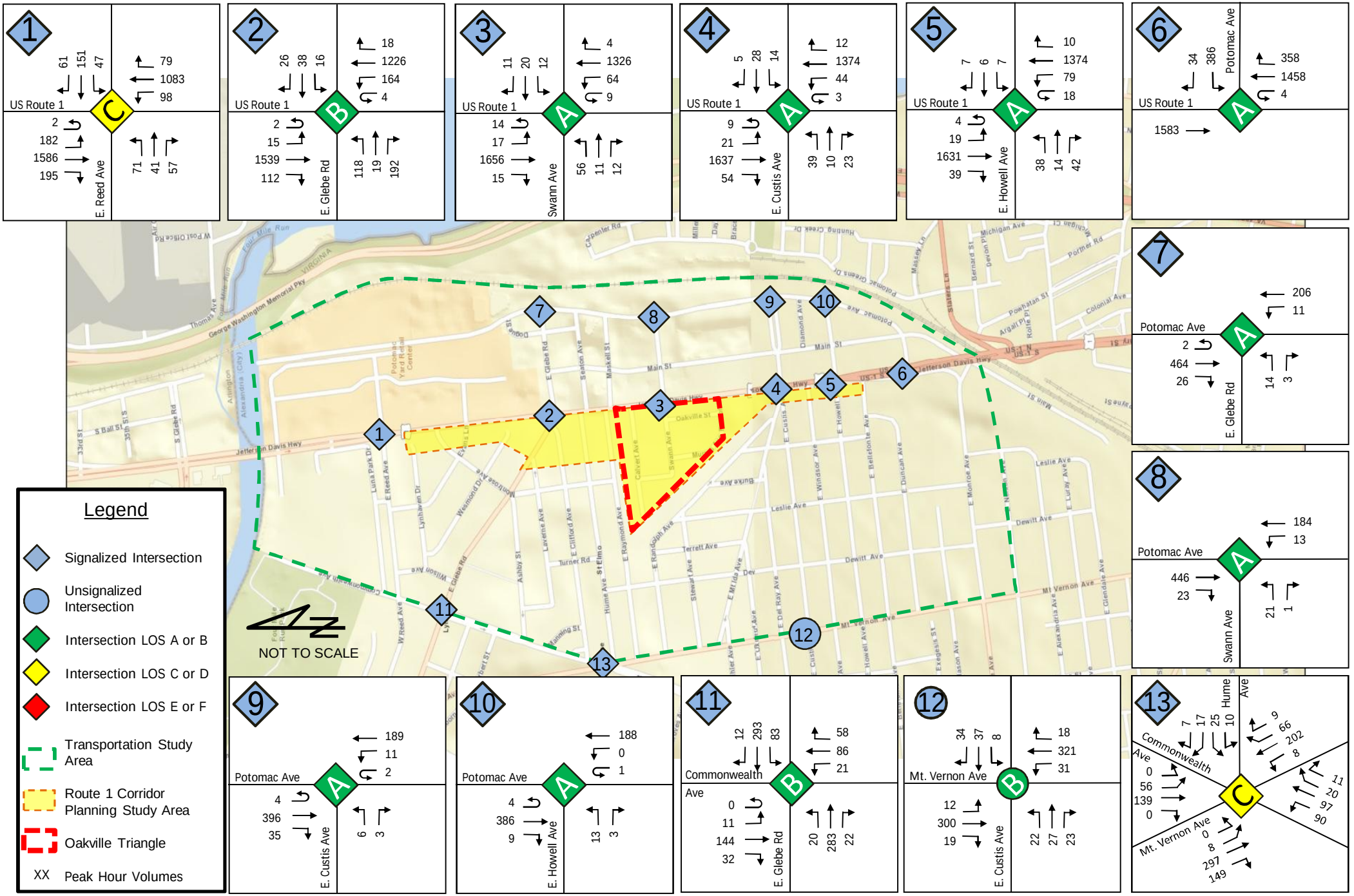


Figure 7-4: 2021 AM Mitigation Peak Hour Turning Movement Volumes and Level of Service

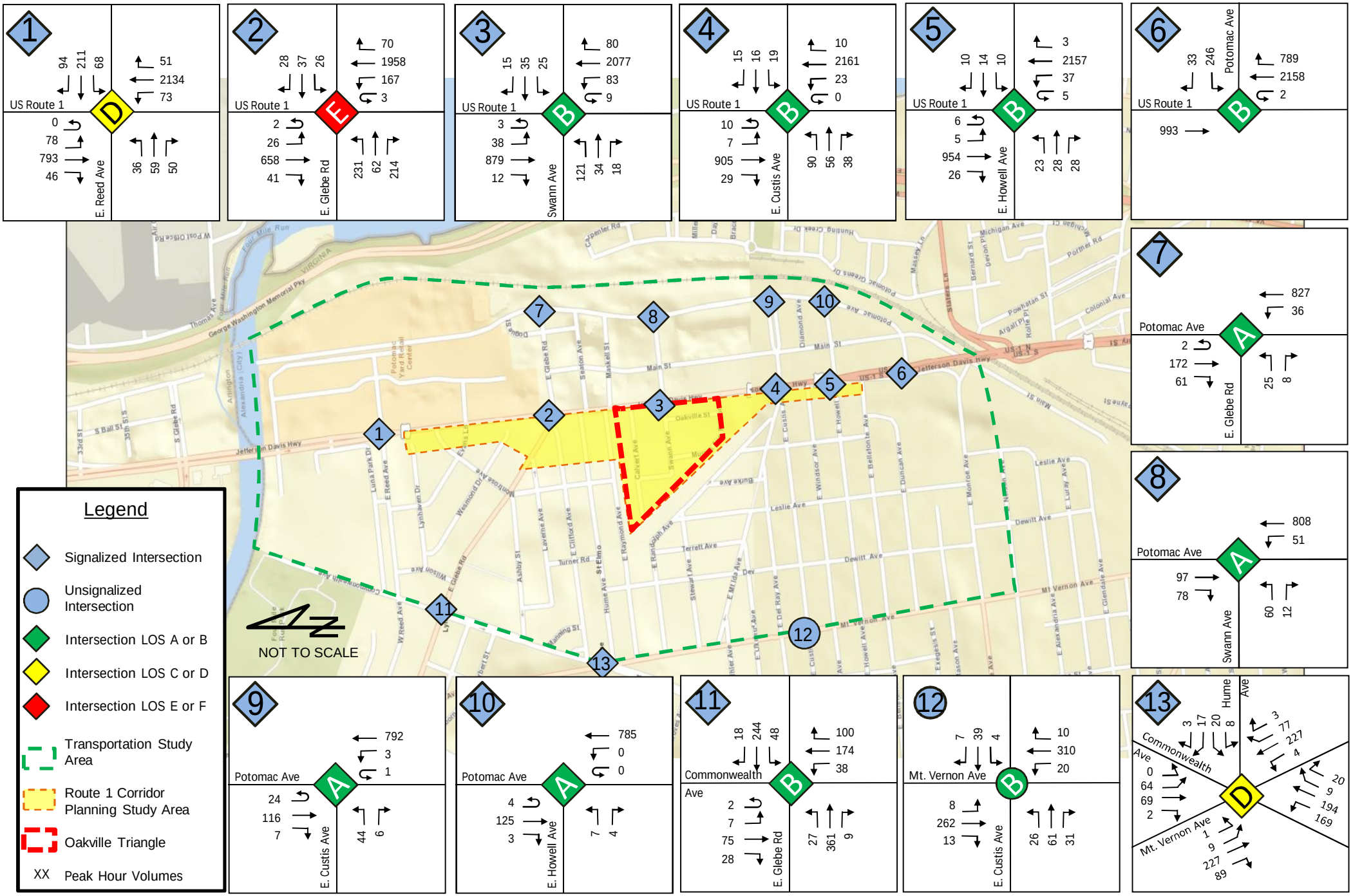


Figure 7-5: 2021 PM Mitigation Peak Hour Turning Movement Volumes and Level of Service

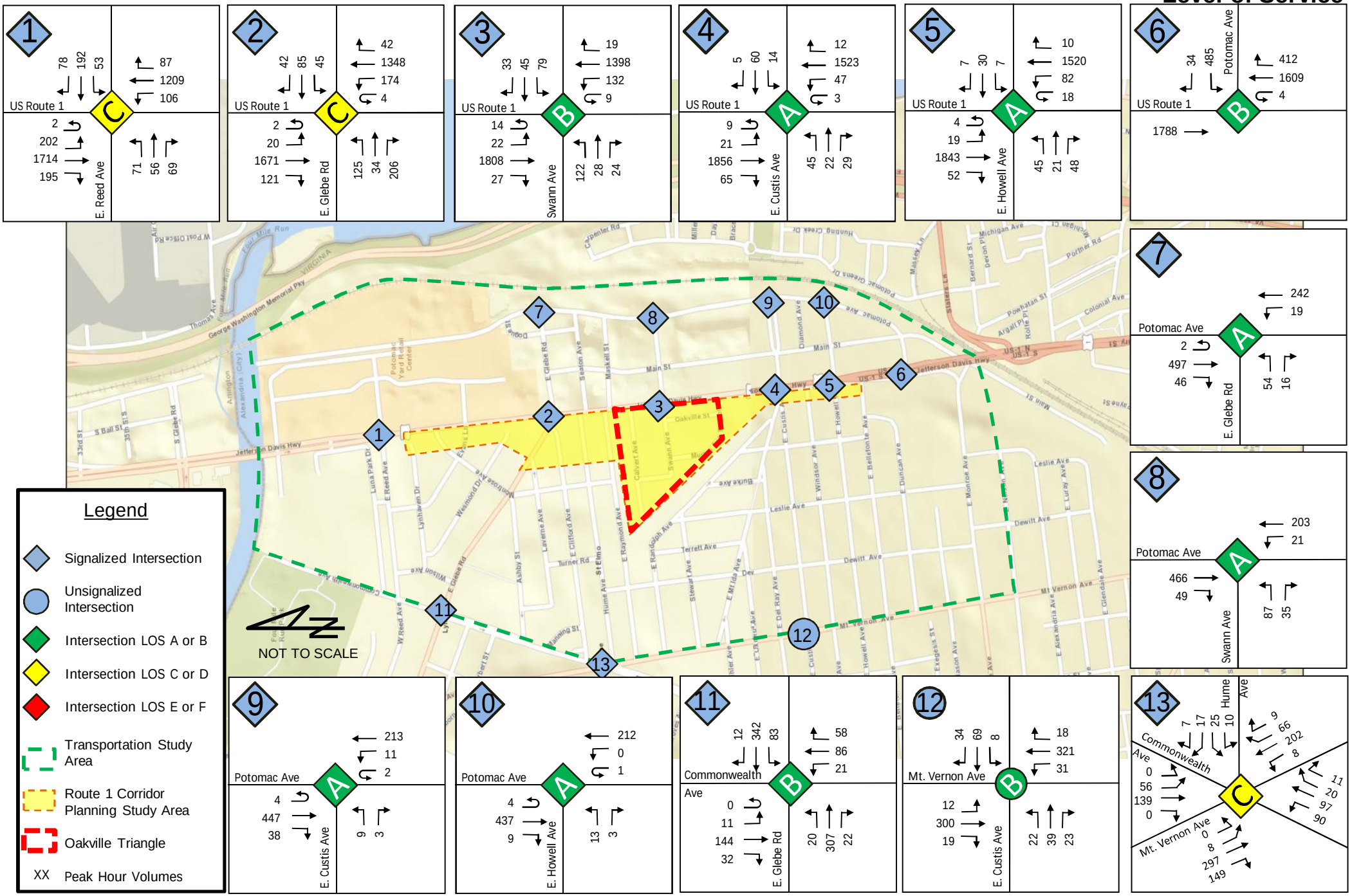


Figure 7-6: 2027 AM Mitigation Peak Hour Turning Movement Volumes and Level of Service

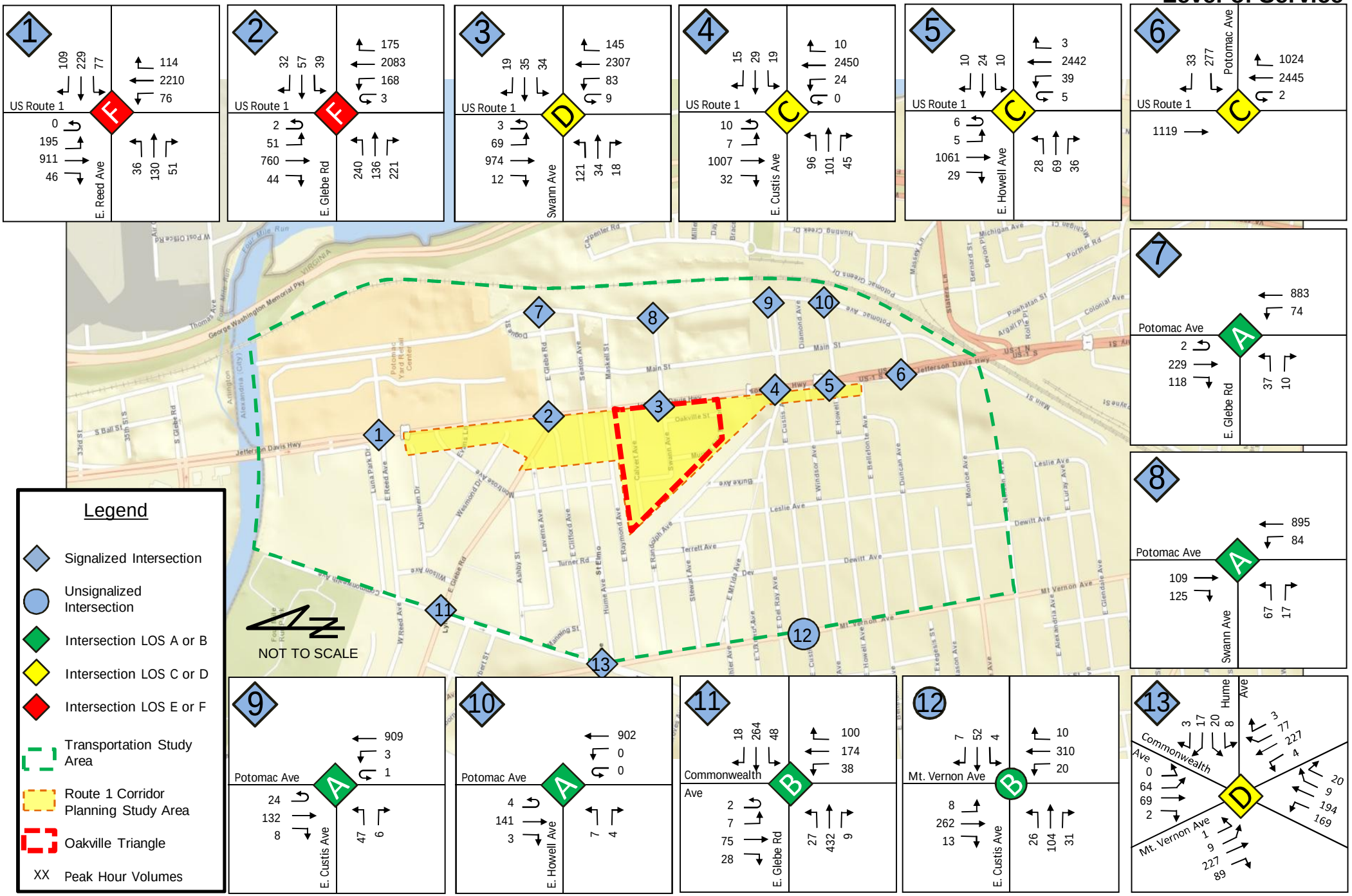


Figure 7-7: 2027 PM Mitigation Peak Hour Turning Movement Volumes and Level of Service

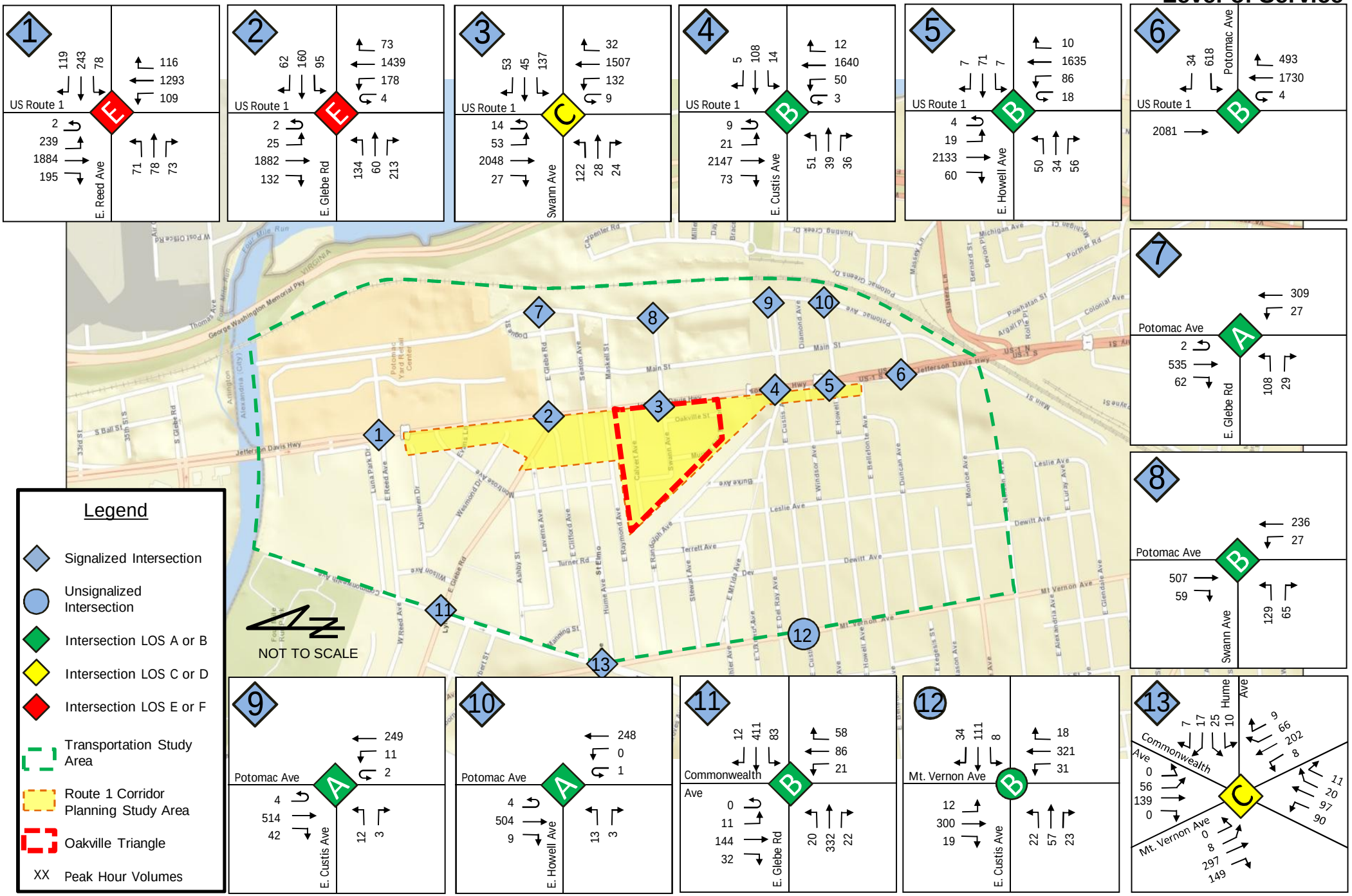


Table 7-1: Mitigation of 2018 Future With Development Traffic Analysis LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Without Development**		**2018 With Development**		**2018 With Development and Mitigation**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
1. US Route 1 & East Reed Avenue							
Eastbound *(East Reed Avenue)*	L	E (63.5)	E (63.5)	E (63.5)	E (63.5)	D (51.2)	D (43.2)
	TR	E (62.0)	E (61.2)	E (62.1)	E (61.5)	D (49.4)	D (52.2)
	Overall	*E (62.7)*	*E (62.2)*	*E (62.6)*	*E (62.3)*	*D (50.1)*	*D (48.4)*
Westbound *(East Reed Avenue)*	L	D (51.7)	D (53.5)	D (51.7)	D (53.5)	D (47.5)	D (44.3)
	TR	F (110.1)	E (80.0)	F (110.1)	E (80.0)	F (92.5)	E (76.4)
	Overall	*F (99.4)*	*E (75.2)*	*F (99.4)*	*E (75.2)*	*F (84.3)*	*E (70.6)*
Northbound *(US Route 1)*	L	B (12.1)	C (29.2)	B (12.5)	C (31.0)	A (4.0)	C (33.7)
	T	E (57.8)	B (17.5)	E (63.5)	B (18.2)	C (32.2)	B (17.4)
	R	B (14.1)	B (15.0)	B (14.1)	B (15.0)	A (0.1)	D (37.6)
	Overall	*E (55.6)*	*B (18.2)*	*E (60.8)*	*B (19.0)*	*C (30.6)*	*B (20.0)*
Southbound *(US Route 1)*	L	C (29.8)	B (19.6)	C (29.8)	B (19.8)	C (31.2)	B (20.0)
	T	B (15.0)	D (37.1)	B (14.8)	D (36.9)	B (12.6)	D (37.1)
	R	B (11.4)	B (15.7)	B (11.4)	B (15.9)	A (9.8)	B (15.9)
	Overall	*B (15.4)*	*C (33.4)*	*B (15.2)*	*C (33.2)*	*B (13.2)*	*C (33.4)*
Overall Intersection		***D (50.5)***	***C (32.4)***	***D (54.4)***	***C (32.6)***	***C (32.7)***	***C (32.1)***
2. US Route 1 & East Glebe Road							
Eastbound (East Glebe Road)	TL	F (87.1)	E (59.2)	F (87.1)	E (59.9)	E (78.5)	E (59.7)
	R	D (45.4)	D (49.3)	D (45.5)	D (49.5)	C (27.5)	C (31.9)
	Overall	*E (68.3)*	*D (53.5)*	*E (68.1)*	*D (53.8)*	*E (55.2)*	*D (43.5)*
Westbound *(East Glebe Road)*	TL	D (44.3)	D (49.1)	D (44.5)	D (49.3)	D (43.6)	D (49.2)
	R	D (43.2)	D (52.0)	D (43.1)	D (51.9)	D (42.3)	D (51.8)
	Overall	*D (43.9)*	*D (50.1)*	*D (44.0)*	*D (50.1)*	*D (43.1)*	*D (50.1)*
Northbound *(US Route 1)*	L	E (72.4)	E (55.7)	E (68.0)	D (55.5)	E (62.7)	D (48.1)
	TR	C (27.2)	B (14.4)	C (31.4)	B (16.8)	C (32.9)	B (10.3)
	Overall	*C (30.8)*	*B (19.2)*	*C (34.4)*	*C (21.4)*	*D (35.3)*	*B (14.8)*
Southbound *(US Route 1)*	L	D (48.9)	D (37.4)	D (49.8)	D (37.9)	D (53.4)	D (38.1)
	TR	B (18.4)	A (5.8)	B (18.9)	A (6.2)	C (24.5)	B (11.3)
	Overall	*B (18.7)*	*A (6.1)*	*B (19.3)*	*A (6.5)*	*C (24.9)*	*B (11.5)*
Overall Intersection		***C (33.8)***	***B (16.8)***	***D (36.4)***	***B (18.0)***	***D (36.3)***	***B (16.8)***
3. US Route 1 & Swann Avenue							
Eastbound *(Swann Avenue)*	TL	E (62.3)	E (64.9)	E (61.6)	E (78.5)	-	-
	R	E (60.6)	E (62.0)	E (55.4)	E (59.9)	-	-
	L	-	-	-	-	E (63.6)	E (72.5)

Table 7-1: Mitigation of 2018 Future With Development Traffic Analysis LOS (sec/veh)							
Intersection	**Mvmt**	**2018 Without Development**		**2018 With Development**		**2018 With Development and Mitigation**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
	TR	-	-	-	-	E (58.6)	E (61.2)
	Overall	*E (61.7)*	*E (63.9)*	*E (60.9)*	*E (75.7)*	*E (62.0)*	*E (69.1)*
Westbound *(Swann Avenue)*	TL	E (61.8)	E (63.2)	E (56.8)	E (61.8)	-	-
	R	E (60.6)	E (62.0)	E (55.4)	E (59.9)	-	-
	L	-	-	-	-	E (58.7)	E (61.6)
	TR	-	-	-	-	E (58.5)	E (61.6)
	Overall	*E (61.4)*	*E (62.6)*	*E (56.4)*	*E (61.3)*	*E (58.6)*	*E (61.6)*
Northbound *(US Route 1)*	L	F (83.1)	D (54.1)	F (88.8)	E (51.5)	F (86.9)	E (51.7)
	TR	A (2.4)	A (9.9)	A (3.3)	B (10.4)	A (2.8)	A (6.1)
	Overall	*A (4.1)*	*B (11.0)*	*A (5.4)*	*B (12.5)*	*A (4.9)*	*A (8.4)*
Southbound *(US Route 1)*	L	D (52.7)	F (90.0)	D (51.3)	F (93.2)	E (65.2)	F (89.6)
	TR	A (8.3)	A (2.6)	B (11.4)	A (5.1)	A (5.5)	A (2.7)
	Overall	*A (9.2)*	*A (4.2)*	*B (12.2)*	*A (6.7)*	*A (6.7)*	*A (4.3)*
Overall Intersection		***A (6.9)***	***A (8.6)***	***A (9.7)***	***B (11.7)***	***A (7.9)***	***A (8.5)***

In 2018, with the proposed mitigations, LOS of D or better can be maintained at the three study intersections. Vehicle delays for individual movements are improved or have a negligible increase (as a trade-off for reduced delay in certain approaches).

The overall intersection delays at East Reed Avenue reduce by 21.7 and 0.5 seconds in the AM and PM peak hours, respectively and the LOS of the AM peak hour is improved from D to C.

The eastbound intersection delays at Glebe Road reduce by 12.9 and 10.3 seconds in the AM and PM peak hours, respectively. The eastbound approach at Glebe Road was identified as a critical movement by City staff.

It is noted that the 2018 mitigations were selected to maintain an overall intersection LOS to D or better and to demonstrate the positive impacts of traffic signal progression that is tailored to the future traffic volumes. These mitigation are less aggressive than 2021 or 2027 mitigations (i.e. the 2018 mitigations do not require any ROW or major changes to traffic signal cycle length). While the results suggest that the 2018 mitigations are an acceptable interim improvement to address LOS impacts, the mitigations proposed for 2021 and 2027 could be accelerated to 2018. This would likely result in enhanced intersection operations for the 2018 analysis year.

Table 7-2: Mitigation of 2021 Future With Development Traffic Analysis LOS (sec/veh)							
Intersection	**Mvmt**	**2021 Without Development**		**2021 With Development**		**2021 With Development and Mitigation**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
1. US Route 1 & East Reed Avenue							
Eastbound *(East Reed Avenue)*	L	E (60.3)	E (62.5)	E (59.8)	E (61.1)	E (56.5)	D (52.3)
	TR	E (63.3)	E (64.4)	E (64.7)	E (66.6)	E (64.1)	E (63.8)
	Overall	*E (62.5)*	*E (63.6)*	*E (63.5)*	*E (64.6)*	*E (62.2)*	*E (59.6)*
Westbound *(East Reed Avenue)*	L	D (52.0)	D (51.5)	D (52.0)	D (51.5)	D (52.4)	D (53.6)
	TR	F (140.9)	F (101.8)	F (140.9)	F (101.8)	-	-
	T	-	-	-	-	E (76.9)	F (87.3)
	R	-	-	-	-	E (58.5)	E (61.3)
	Overall	*F (124.6)*	*F (93.5)*	*F (124.6)*	*F (93.5)*	*E (67.8)*	*E (75.5)*
Northbound *(US Route 1)*	L	B (14.4)	C (30.5)	B (13.8)	D (38.4)	A (2.8)	D (52.1)
	T	F (110.8)	C (21.0)	F (139.4)	C (25.2)	D (51.8)	B (18.0)
	R	B (16.8)	B (17.5)	B (17.1)	B (17.9)	A (0.0)	A (0.8)
	Overall	*F (106.1)*	*C (21.4)*	*F (132.6)*	*C (25.8)*	*D (49.1)*	*B (19.5)*
Southbound *(US Route 1)*	L	C (29.8)	C (32.2)	C (29.5)	D (43.1)	D (40.6)	C (26.7)
	T	B (17.3)	D (50.8)	B (18.4)	E (66.2)	B (14.4)	D (38.9)
	R	B (12.6)	B (17.2)	B (13.5)	B (17.9)	B (10.6)	B (15.4)
	Overall	*B (18.1)*	*D (45.8)*	*B (19.1)*	*E (59.5)*	*B (16.4)*	*D (35.6)*
Overall Intersection		***F (83.8)***	***D (42.2)***	***F (100.9)***	***D (50.8)***	***D (43.4)***	***C (34.4)***
2. US Route 1 & East Glebe Road							
Eastbound (East Glebe Road)	TL	F (107.6)	E (68.9)	F (120.1)	E (76.5)	-	-
	R	D (43.2)	D (46.8)	D (43.8)	D (46.5)	C (34.4)	D (42.8)
	L	-	-	-	-	E (71.7)	E (66.9)
	T	-	-	-	-	E (58.5)	E (60.0)
	Overall	*F (81.0)*	*E (56.7)*	*F (87.9)*	*E (59.6)*	*D (54.4)*	*D (52.7)*
Westbound *(East Glebe Road)*	TL	D (43.8)	D (49.4)	D (44.9)	D (49.2)	-	-
	R	D (41.1)	D (49.5)	D (41.1)	D (48.2)	-	-
	L	-	-	-	-	E (66.1)	E (62.2)
	TR	-	-	-	-	E (72.6)	E (65.0)
	Overall	*D (42.9)*	*D (49.4)*	*D (43.8)*	*D (49.0)*	*E (70.7)*	*E (64.3)*
Northbound *(US Route 1)*	L	E (71.3)	D (48.8)	E (67.5)	D (48.4)	E (63.4)	E (64.7)
	TR	F (84.9)	C (25.5)	F (107.4)	C (32.9)	F (89.4)	B (17.1)
	Overall	*F (83.9)*	*C (28.1)*	*F (104.3)*	*C (34.7)*	*F (87.4)*	*C (22.5)*
Southbound *(US Route 1)*	L	D (45.6)	D (36.2)	D (45.6)	D (35.4)	E (59.7)	D (54.4)
	TR	B (19.6)	A (9.2)	C (20.9)	C (29.3)	C (28.2)	C (29.4)

Table 7-2: Mitigation of 2021 Future With Development Traffic Analysis LOS (sec/veh)							
Intersection	**Mvmt**	**2021 Without Development**		**2021 With Development**		**2021 With Development and Mitigation**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
	Overall	*C (20.6)*	*A (9.5)*	*C (21.8)*	*C (29.4)*	*C (29.4)*	*C (29.7)*
Overall Intersection		***E (69.1)***	***C (22.9)***	***F (83.4)***	***D (35.2)***	***E (70.3)***	***C (30.5)***
3. US Route 1 & Swann Avenue (Modified Eastbound/Westbound Lane Configuration)							
Eastbound *(Swann Avenue)*	TL	E (60.3)	E (57.9)	E (75.9)	F (90.2)	-	-
	R	E (58.8)	E (56.1)	D (49.8)	D (48.9)	-	-
	L	-	-	-	-	F (88.2)	F (91.5)
	TR	-	-	-	-	E (62.5)	E (62.2)
	Overall	*E (59.7)*	*E (57.3)*	*E (73.2)*	*F (84.5)*	*F (80.5)*	*F (82.8)*
Westbound *(Swann Avenue)*	TL	E (60.6)	E (69.8)	D (52.5)	E (79.2)	-	-
	R	E (58.8)	E (56.1)	D (49.8)	D (49.0)	-	-
	L	-	-	-	-	E (62.3)	E (67.1)
	TR	-	-	-	-	E (62.4)	E (63.4)
	Overall	*E (60.0)*	*E (65.8)*	*D (51.9)*	*E (72.8)*	*E (62.4)*	*E (65.3)*
Northbound *(US Route 1)*	L	F (83.6)	D (53.1)	F (81.8)	D (50.4)	F (97.1)	E (65.6)
	TR	A (5.4)	B (15.0)	C (20.3)	B (18.5)	A (6.0)	B (11.9)
	Overall	*A (6.9)*	*B (15.9)*	*C (22.8)*	*C (21.4)*	*A (9.7)*	*B (16.7)*
Southbound *(US Route 1)*	L	D (50.1)	F (93.1)	D (47.1)	F (92.5)	D (54.8)	F (86.6)
	TR	A (9.4)	A (4.8)	C (20.2)	C (26.1)	B (16.4)	B (6.5)
	Overall	*B (11.3)*	*A (6.6)*	*C (21.4)*	*C (27.4)*	*B (18.0)*	*B (8.0)*
Overall Intersection		***A (9.4)***	***B (13.3)***	***C (25.6)***	***C (29.4)***	***B (16.7)***	***B (17.5)***

In 2021, with the proposed mitigations, a LOS of D or better can be maintained at Reed Avenue and at Swann Avenue in both the AM and PM peak hours.

The overall intersection delays at East Reed Avenue reduce by 57.5 and 16.4 seconds in the AM and PM peak hours, respectively, and the LOS of the AM peak hour is improved from F to D, while the LOS of the PM peak hour is improved from D to C.

The overall intersection delays at Swann Avenue reduce by 8.9 and 11.9 seconds in the AM and PM peak hours, respectively, and the LOS of both the AM and PM peak hours are improved from C to B.

For the intersection of US Route 1 with Glebe Road, an overall intersection LOS of D or better can be achieved during the PM peak hour (LOS of C with a reduction in delay of 4.7 seconds compared to the condition without mitigation). The calculated LOS of E for the AM peak hour is still an improvement compared to the condition without mitigation, reducing vehicle delays by 13.1 seconds and improving LOS from F to E.

It is noted that the LOS E during the AM peak hour is a return to the condition without development. It is also noted that the mitigation results demonstrate reductions in eastbound delays, with delay savings of 33.5 and 6.9 seconds in the AM and PM peak hours, respectively. This results in improvements to the eastbound LOS from F and E in the AM and PM peak hours, respectively, to LOS D in both peak hours. Based on level of service and delay, the eastbound approach with mitigations in place will be significantly improved compared to traffic conditions without the development. The eastbound approach of the Glebe Road intersection was identified as a critical movement by City staff.

Vehicle delays for individual movements at all intersections are generally improved or have a negligible increase (as a trade-off for reduced delay in certain approaches).

Table 7-3: Mitigation of 2027 Future With Development Traffic Analysis LOS (sec/veh)

Intersection	Mvmt	2027 Without Development		2027 With Development		2027 With Development and Mitigation	
		AM	PM	AM	PM	AM	PM
1. US Route 1 & East Reed Avenue							
Eastbound *(East Reed Avenue)*	L	E (55.7)	E (60.0)	D (54.9)	E (58.8)	D (53.4)	D (50.1)
	TR	E (73.0)	E (67.8)	E (75.9)	E (71.5)	E (74.5)	E (62.2)
	Overall	*E (69.9)*	*E (65.0)*	*E (72.4)*	*E (67.4)*	*E (71.0)*	*E (58.3)*
Westbound *(East Reed Avenue)*	L	D (52.3)	D (52.3)	D (52.3)	D (52.3)	D (50.1)	D (49.6)
	TR	F (186.5)	F (218.1)	F (186.5)	F (218.1)	-	-
	T	-	-	-	-	E (77.7)	F (84.1)
	R	-	-	-	-	E (57.8)	E (58.1)
	Overall	*F (161.6)*	*F (188.8)*	*F (161.6)*	*F (188.8)*	*E (67.4)*	*E (71.0)*
Northbound *(US Route 1)*	L	B (18.8)	D (35.8)	B (17.0)	D (37.2)	A (4.9)	D (50.1)
	T	F (217.1)	C (28.0)	F (248.7)	C (32.2)	F (170.6)	C (31.7)
	R	B (13.1)	F (97.2)	B (12.9)	F (107.4)	A (1.9)	B (10.9)
	Overall	*F (202.0)*	*C (34.2)*	*F (230.2)*	*D (38.3)*	*F (157.4)*	*C (31.5)*
Southbound *(US Route 1)*	L	E (57.0)	E (59.0)	E (61.7)	E (62.5)	D (53.9)	E (64.2)
	T	C (21.5)	F (88.6)	C (23.0)	F (120.8)	B (17.4)	E (74.6)
	R	B (14.8)	B (18.2)	B (15.7)	B (19.0)	B (12.1)	B (17.3)
	Overall	*C (27.2)*	*E (79.3)*	*C (29.2)*	*F (106.2)*	*C (23.3)*	*E (68.7)*
Overall Intersection		***F (141.7)***	***E (74.9)***	***F (159.9)***	***F (89.4)***	***F (107.1)***	***E (55.9)***
2. US Route 1 & East Glebe Road							
Eastbound (East Glebe Road)	TL	F (201.2)	F (162.2)	F (249.0)	F (328.3)	-	-
	R	D (43.2)	D (43.4)	D (44.2)	D (44.5)	D (38.6)	D (41.1)
	L	-	-	-	-	F (97.7)	E (77.3)
	TR	-	-	-	-	-	-
	T	-	-	-	-	E (69.7)	E (59.1)

Table 7-3: Mitigation of 2027 Future With Development Traffic Analysis LOS (sec/veh)							
Intersection	**Mvmt**	**2027 Without Development**		**2027 With Development**		**2027 With Development and Mitigation**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
	Overall	*F (144.3)*	*F (100.4)*	*F (173.1)*	*F (179.7)*	*E (69.4)*	*E (55.7)*
Westbound *(East Glebe Road)*	TL	E (60.1)	F (80.4)	F (146.2)	F (145.3)	-	-
	R	D (41.1)	D (46.0)	D (41.1)	D (46.0)	-	-
	L	-	-	-	-	E (58.7)	D (53.1)
	TR	-	-	-	-	E (67.7)	E (65.8)
	Overall	*D (54.9)*	*E (73.1)*	*F (119.8)*	*F (126.0)*	*E (65.0)*	*E (62.0)*
Northbound *(US Route 1)*	L	E (68.2)	D (42.6)	E (68.1)	D (42.0)	E (71.5)	E (72.2)
	TR	F (169.0)	F (39.4)	F (197.1)	D (41.4)	F (170.2)	C (21.1)
	Overall	*F (162.2)*	*F (39.7)*	*F (188.1)*	*D (41.5)*	*F (163.3)*	*C (26.6)*
Southbound *(US Route 1)*	L	D (44.6)	D (36.1)	D (44.3)	D (35.8)	E (64.5)	D (45.2)
	TR	C (21.0)	E (67.4)	C (22.5)	F (110.8)	C (30.0)	F (129.2)
	Overall	*C (22.5)*	*E (67.0)*	*C (23.8)*	*F (109.8)*	*C (32.1)*	*F (*128.1)
Overall Intersection		***F (125.7)***	***E (59.9)***	***F (148.6)***	***F (91.4)***	***F (118.1)***	***E (78.2)***
3. US Route 1 & Swann Avenue							
Eastbound *(Swann Avenue)*	TL	E (60.2)	D (52.1)	E (75.9)	F (87.1)	-	-
	R	E (58.7)	D (50.4)	D (49.8)	D (44.5)	-	-
	L	-	-	-	-	F (88.2)	F (84.5)
	TR	-	-	-	-	E (62.4)	E (59.8)
	Overall	*E (59.6)*	*D (51.5)*	*E (73.2)*	*F (81.3)*	*F (80.4)*	*F (77.1)*
Westbound *(Swann Avenue)*	TL	E (61.3)	E (77.0)	E (53.5)	F (101.0)	-	-
	R	E (58.7)	D (50.6)	D (49.8)	D (44.7)	-	-
	L	-	-	-	-	E (62.8)	F (88.2)
	TR	-	-	-	-	E (62.4)	E (61.4)
	Overall	*E (60.4)*	*E (69.7)*	*D (52.7)*	*F (88.2)*	*E (62.6)*	*F (77.0)*
Northbound *(US Route 1)*	L	F (80.4)	D (52.7)	F (80.9)	E (67.5)	F (93.6)	F (59.7)
	TR	C (32.0)	B (17.5)	F (92.0)	C (21.8)	E (61.1)	B (18.0)
	Overall	*C (32.8)*	*B (18.3)*	*F (91.6)*	*C (25.6)*	*E (62.2)*	*C (21.5)*
Southbound *(US Route 1)*	L	E (56.7)	F (92.4)	D (49.8)	F (89.9)	D (52.9)	F (80.2)
	TR	A (9.0)	B (12.1)	B (19.5)	E (70.6)	B (18.4)	B (14.3)
	Overall	*B (12.4)*	*B (14.8)*	*C (21.6)*	*E (71.2)*	*C (20.7)*	*B (16.4)*
Overall Intersection		***C (27.8)***	***B (19.4)***	***E (70.7)***	***D (54.4)***	***D (51.7)***	***C (24.3)***
***4.* US Route 1 & East Custis Avenue**							
Eastbound (Custis Avenue)	*LTR*	E (72.1)	E (66.8)	E (75.4)	F (102.8)	-	-
	L	-	-	-	-	*F (90.5)*	*E (71.2)*

Table 7-3: Mitigation of 2027 Future With Development Traffic Analysis LOS (sec/veh)							
Intersection	**Mvmt**	**2027 Without Development**		**2027 With Development**		**2027 With Development and Mitigation**	
		AM	**PM**	**AM**	**PM**	**AM**	**PM**
	TR	-	-	-	-	*E (78.5)*	*E (67.4)*
	Overall	E (72.1)	E (66.8)	*E (75.4)*	*F (102.8)*	*F (83.3)*	*E (68.9)*
Westbound (Custis Avenue)	*LTR*	D (50.7)	E (62.2)	D (48.5)	E (62.1)	-	-
	L	-	-	-	-	*E (65.7)*	*E (65.7)*
	TR	-	-	-	-	*E (64.7)*	*E (73.8)*
	Overall	D (50.7)	E (62.2)	D (48.5)	E (61.2)	*E (65.0)*	*E (72.9)*
Northbound (US Route 1)	*L*	F (90.4)	E (78.9)	F (92.1)	F (81.7)	F (95.8)	E (69.9)
	TR	E (57.3)	A (2.4)	F (85.9)	A (2.9)	C (22.7)	A (5.8)
	Overall	*E (57.6)*	*A (4.6)*	*F (85.9)*	*A (5.4)*	*C (23.4)*	*A (7.8)*
Southbound (US Route 1)	*L*	E (64.7)	F (81.2)	E (58.7)	E (76.8)	F (75.4)	F (82.3)
	TR	A (4.6)	A (8.2)	A (5.3)	A (9.3)	A (4.4)	A (8.4)
	Overall	*A (5.7)*	*A (9.2)*	*A (6.2)*	*B (10.2)*	*A (5.5)*	*A (9.4)*
Overall Intersection		***D (44.5)***	***B (10.2)***	***E (62.7)***	***B (12.6)***	***C (22.9)***	***B (12.4)***

In 2027, with the proposed mitigations, LOS of D or better can be maintained at Swann Avenue and at Custis Avenue in both the AM and PM peak hours. Vehicle delays for individual movements are improved or have a negligible increase (as a trade-off for reduced delay in certain approaches).

For the intersection of US Route 1 with East Reed Avenue, the calculated overall LOS of F for the AM peak hour and E for the PM peak hour are still an improvement compared to the pre-mitigated future with development condition. Vehicle delays are reduced by 52.8 and 33.5 seconds, respectively. It is noted that the overall intersection delays in the mitigated scenario are less than those in the future without development condition. It is also noted that there are reductions in eastbound and westbound delays, with the westbound delay reductions being significant.

The overall intersection delays at Swann Avenue reduce by 19.0 and 30.1 seconds in the AM and PM peak hours, respectively, and the LOS of the AM and PM peak hour are improved from E and D to D and C, respectively.

For the intersection of US Route 1 with Glebe Road, the calculated LOS of F for the AM peak hour and E for the PM peak hour are still an improvement compared to the pre-mitigation scenario, reducing vehicle delays by 30.5 seconds in the AM and 13.2 seconds in the PM (the PM LOS improves from F to E). It is noted that a LOS of E in the PM peak hour is a return to the without development condition. The eastbound and westbound delays are significantly improved. It also is noted that the overall intersection delays for the AM peak hour in the mitigated scenario are less than those in the future without development condition. The eastbound approach is one of the movements of the Glebe Road intersection emphasized by City staff as critical.

The overall intersection delays at Custis Avenue reduce by 39.8 and 0.2 seconds in the AM and PM peak hours, respectively, and the LOS of the AM peak hour is improved from E to C.

8. Conclusion

The existing conditions traffic analysis shows that all study intersections operate at an overall LOS of D or better during both the AM and PM peak hours. The local street network to the west and south of Route 1, the developing grid network of streets in the Potomac Yard, and the opening of Potomac Avenue as a viable north south alternative provide convenient opportunities for vehicle, pedestrian, bicycle, and transit travel due to the interconnected nature of the network. The interconnected network of streets allows for the efficient dispersion of traffic, reducing the automobile pressure along the Route 1 corridor and allowing the signalized and unsignalized intersections in the area to operate efficiently.

In the future, without the traffic generated by Oakville Triangle and Route 1 Corridor Study Planning Area developments, but considering the combined effects of the addition of approved and unbuilt developments, regional growth, and programmed transportation improvements, the analysis shows that along US Route 1 the intersections of Glebe Road, Reed Avenue, and Custis Avenue will operate at LOS worse than D during one or both peak hours.

Of the 13 study intersections, only four were identified for mitigation with the Oakville Triangle and Route 1 Corridor Planning Study Area development-related traffic added. The mitigation was identified to address LOS of E or F in either the AM or PM peak hour of commuter travel. The traffic impacts of these intersections can be mitigated with signal timing and phasing improvements and lane configuration changes. The analysis results indicate that in 2018 and 2021, the intersections can be improved to LOS of E or better using these mitigations, with LOS E representing an acceptable operation in most urban areas. The analysis results indicate that in 2027, significant delay reductions can be realized at these intersections. The total volume of traffic results LOS ranging from B to E with two exceptions where LOS F will occur. Even with these LOS F conditions, significant reductions in delay can be achieved. These results assume that the vehicle trip assignments occur as rigidly as assumed in this traffic study and that the forecasted level of development is realized, including significant assemblage of the remaining parcels of the Route 1 Corridor Planning Study area.

As no further widening of US 1 Route 1 is planned, in order for it to have continued success as a viable north-south alternative to the I-95 corridor, traffic patterns in the Route 1 Corridor will have to change. This may be achieved organically, as local and regional travelers make better use of the interconnected network of streets and as traffic adjusts to other north-south roads (Potomac Avenue and Main Line Boulevard). This may also be achieved by progressive emphasis on transit and other alternate modes of travel that further reduces the auto dependency of the Route 1 Corridor.

Minor traffic impacts are anticipated at other study area intersections, but these intersections will continue to operate at LOS D or better. Recognizing the interconnected nature of the study area streets, operations at the intersection are likely to be better than the calculated figures because the traffic will balance among the many intersections along US 1. Further, the global mitigation strategies suggested in this report (improving traffic signal progression and increasing traffic signal cycle length) will serve to improve the north-south throughput of all Route 1 intersections.