

WELLS + ASSOCIATES
MEMORANDUM



To: Michael J. Gallagher, PE
Deputy Director of Public Works
Town of Vienna

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

Re: Flagship Carwash Redevelopment

Subject: Traffic Impact Analysis

Date: May 4, 2015
Updated April 6, 2016

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INTRODUCTION

This document summarizes an updated traffic impact analysis for the Flagship Carwash redevelopment located in the Town of Vienna, Virginia. It is based on the previously submitted document dated May 4, 2015, and addresses comments provided by the Town of Vienna staff and Planning Commission. A copy of the comment response memorandum is included as Appendix F for reference. Specific changes which have been incorporated into the revised report are summarized below.

- Existing signal timings were used for the existing conditions operational analysis and the planned signal timings based on the Maple Avenue Corridor Study, provided by the Town of Vienna, were used for future conditions.
- Updated study includes the intersections of Nutley Street/Windover Avenue (Intersection #5) and James Madison Drive/Windover Avenue (Intersection #6).
- Site trip distributions were adjusted, to remove site trips utilizing the local street grid to return south on Maple Avenue. This update assumes all southbound traffic to use the James Madison Drive/Maple Avenue intersection to turn left making the analysis more conservative at the intersection.
- Future traffic forecasts were adjusted to account for the installation of a new HAWK signal at the James Madison Drive/Maple Avenue intersection. Based on a meeting between the Applicant, VDOT and Town staff, due to safety

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concerns VDOT recommended that with the HAWK signal southbound left-turns from James Madison Drive onto Maple Avenue should be restricted.

- Future conditions with redevelopment reflect the Applicant's proposal to include a one-way southbound service drive along the site's frontage. In addition to being used for loading, the service drive will allow exiting drive-thru traffic the ability to travel southbound along the service drive towards the James Madison Drive/Maple Avenue intersection, where they could then turn left onto southbound Maple Avenue. The drive aisle is vital to the overall operations of the drive-thru facility and creates an alternative option if queuing along Maple Avenue blocks the exit.

This memorandum presents a traffic impact analysis for a rezoning and special exception application for the proposed redevelopment of the existing Flagship Carwash located at 540 Maple Avenue in the Town of Vienna, Virginia.

The applicant, Vienna Car Wash LLC, is seeking to rezone a subject site to the new Maple Avenue Corridor (MAC) zone from the existing C-1 and C-2 commercial zoning to replace the existing car wash with a new car wash and fast food restaurant with drive thru in a two-story structure. The proposal would also require a special exception to permit the uses. The proposed development would include a 5,001 S.F. fast-food restaurant with a drive-thru window and a new carwash facility on the second level. The site is generally located on the east side of Maple Avenue (VA 123) just to the south of the Maple Avenue (VA 123)/Nutley Street (VA 243) intersection, as shown on Figure 1.

Direct access to the property is provided via two (2) existing right-in/right-out driveways on Maple Avenue. Additional access is provided via a frontage road which allows for full-movement access to/from Maple Avenue at James Madison Drive. With the redevelopment both curb cuts on Maple Avenue would remain. As proposed, the southern driveway will serve the sit-down portion of the restaurant and the carwash while the northern driveway will provide egress from the restaurant's drive-thru. The frontage road onsite would be maintained as a one-way southbound travel way that would allow for a layby area for drive-thru traffic only. The frontage road will also be used as a loading zone during non-peak hours to facilitate deliveries. A copy of the site plan is shown on Figure 2.

This traffic study is based on a traffic scoping agreement with the Town Vienna Public Works staff which is included in Appendix A for reference. A build out year of 2017 was assumed for purposes of this analysis and assumes the full buildout and occupancy of the property.

Tasks undertaken in this study included the following:

1. Confirmation of the traffic study scope with Town Vienna (see Appendix A).
2. Collection of existing traffic counts during the AM, PM, and Saturday peak hours at the site driveways and the James Madison Drive/Maple Avenue intersection. The intersection of Nutley Street/Maple Avenue was also analyzed using peak hour traffic counts provided by the Town Vienna. Additionally, existing traffic counts were collected at the Nutley Street/Windover Avenue and James Madison Drive/Windover Avenue intersections on March 31, 2016, at the direction of Planning Commission to evaluate the proposed turning restriction on James Madison Drive at Maple Avenue during the AM and PM peak hours.
3. Capacity analyses for existing AM, PM, and Saturday peak hour conditions at each of the site driveways and study intersections utilizing the Synchro version 9.1 analysis software and the HCM 2000 methodology. Peak hour queuing results at the intersection of Nutley Street/Windover Avenue was reported using HCM 2010 methodology, due to HCM 2000 methodology being unable to report queues at all-way stop controlled intersections.
4. Preparation of background traffic forecasts for 2017 conditions that include existing traffic and an ambient growth of 1% compounded annually for three (3) years.
5. Capacity analyses for background 2017 conditions based on the background traffic forecasts and the HCM 2000 and 2010 (all-way stop controlled queuing) methodology computed by Synchro version 9.1. Background 2017 conditions were analyzed using the planned signal timings provided by the Town of Vienna.
6. Calculation of the number of peak hour trips that would be generated by the proposed development based on standard Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition rates and equations and the observed peak hour traffic counts for the existing carwash.
7. Preparation of traffic forecasts of future conditions with the proposed development for year 2017 including traffic adjustments for the proposed turning restriction on James Madison Drive at Maple Avenue with the installation of a HAWK signal.



8. Determination of total future levels of service at the study intersections based on the future traffic forecasts with the proposed development and HAWK signal using the planned signal timings provided by the Town of Vienna.

Sources of data for this analysis included previous traffic study information, the Institute of Transportation Engineers (ITE), the Virginia Department of Transportation (VDOT), The Town of Vienna, Flagship Carwash, Bohler Engineering, and Wells + Associates Inc.

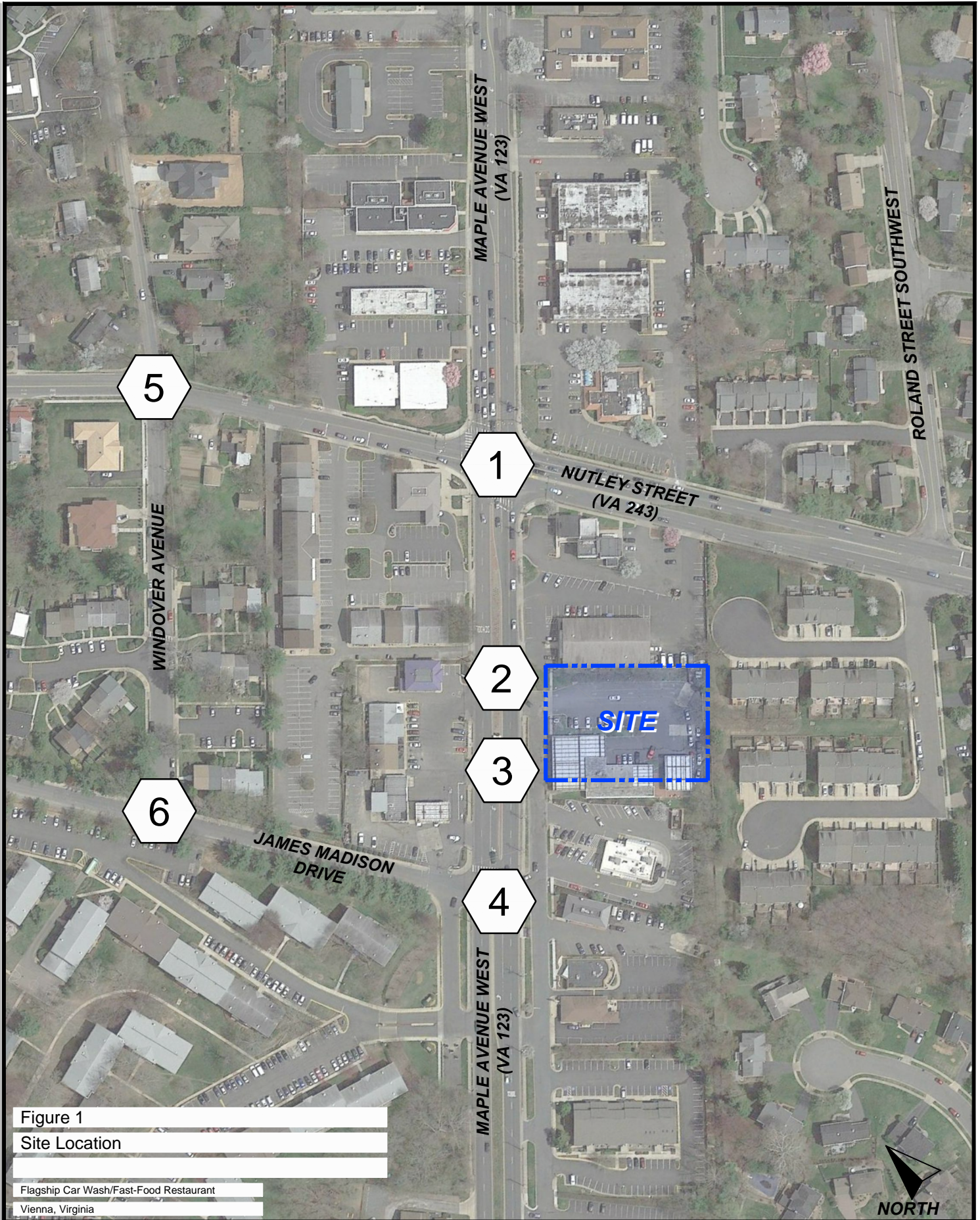


Figure 1

Site Location

Flagship Car Wash/Fast-Food Restaurant

Vienna, Virginia



BACKGROUND INFORMATION

Compliance with VDOT Chapter 870 Guidelines

As identified later in this document, the proposed site is estimated to result in 2,482 additional daily (24-hour) trips on a weekday and 3,611 additional site trips on a Saturday. This is less than the 5,000 daily (24-hour) trip threshold and is therefore exempt from the Chapter 870 Guidelines.

Study Area and Road Network

Based on the traffic scoping agreement, the following intersections were included as part of this traffic study:

1. Maple Avenue (VA 123)/Nutley Street (VA 243).
2. Maple Avenue (VA 123)/North Site Driveway.
3. Maple Avenue (VA 123)/South Site Driveway.
4. Maple Avenue (VA 123)/James Madison Drive.
5. Windover Avenue NW/Nutley Street (VA 243).
6. Windover Avenue NW/James Madison Drive.

Existing Road Network

Maple Avenue (VA Route 123) is a four-lane, undivided, Urban Principal Arterial with a posted speed limit of 30 mph adjacent to the site. Maple Avenue in the area of the site carries 26,000 average daily trips. A traffic signal and turn lanes exist at the Nutley Street (VA 243) intersection. Separate left-turn lanes are provided at the James Madison Drive intersection.

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

James Madison Drive is a two-lane, undivided, Rural Minor Collector with a posted speed limit of 25.

Windover Avenue is a two-lane, undivided, Local Collector with a speed limit of 25 mph between James Madison Drive and Commons Drive NW and Major Collector with a speed limit of 25 mph between Commons Drive NW and Nutley Street NW.

Existing lane use and traffic control at key intersections in the site vicinity are shown on Figure 3.

Existing Traffic Counts

Wells + Associates conducted peak hour traffic counts at the previously mentioned intersections on Tuesday, January 27, 2015, Saturday, January 31, 2015, and Thursday March 31, 2016. Traffic data provided by the Town of Vienna for the intersection of Maple Avenue and Nutley Street was counted on Thursday, May 8, 2014 and Saturday, May 10, 2014. The existing thru traffic counts along Maple Avenue (at James Madison Drive and the site driveways) were balanced up to within 10 percent of the traffic volumes at the intersection of Maple Avenue and Nutley Street to account for the different count dates. The AM, PM, and Saturday peak hour traffic volumes are summarized on Figure 4 and detailed count data is provided in Appendix B.

Pedestrian and Bicycle Facilities

The subject site is located in an area with connected sidewalks along both sides on Maple Avenue. At the signalized intersection of Maple Avenue/Nutley Street crosswalks with pedestrian countdown signal heads are provided on all legs of the intersection. In the vicinity of the site BikeFairfax identifies Courthouse Road as the preferred bicycle route. Courthouse Road generally parallels Maple Avenue south of Nutley Street and then bends to intersect with Maple Avenue approximately a one-half mile north of Nutley Street.

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

Site Access

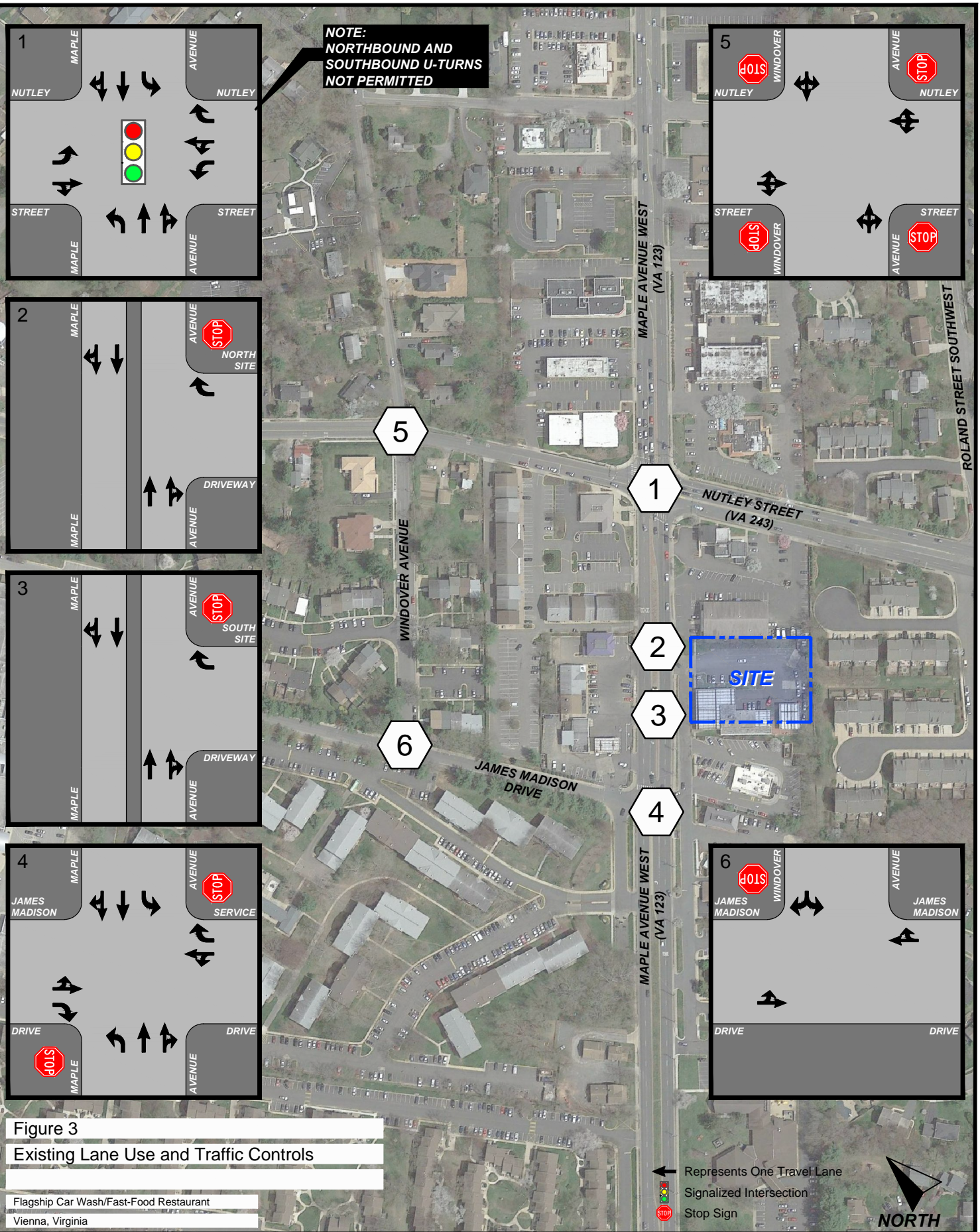
As shown on Figure 1, two (2) right-in/right-out driveways currently exist on Maple Avenue serving the site. The northern site driveway is located approximately 300 feet south of the signalized Maple Avenue/Nutley Street intersection. The existing south site driveway is located approximately 400 feet south of the signalized Maple Avenue/Nutley Street intersection. Currently both site driveways have access to a service driveway which runs parallel to Maple Avenue. This service driveway provides full movement access onto Maple Avenue via the James Madison Drive/Maple Avenue intersection. Both right-in movements at the site driveways share a through-right lane along Maple Avenue. A separate left-turn lane is provided

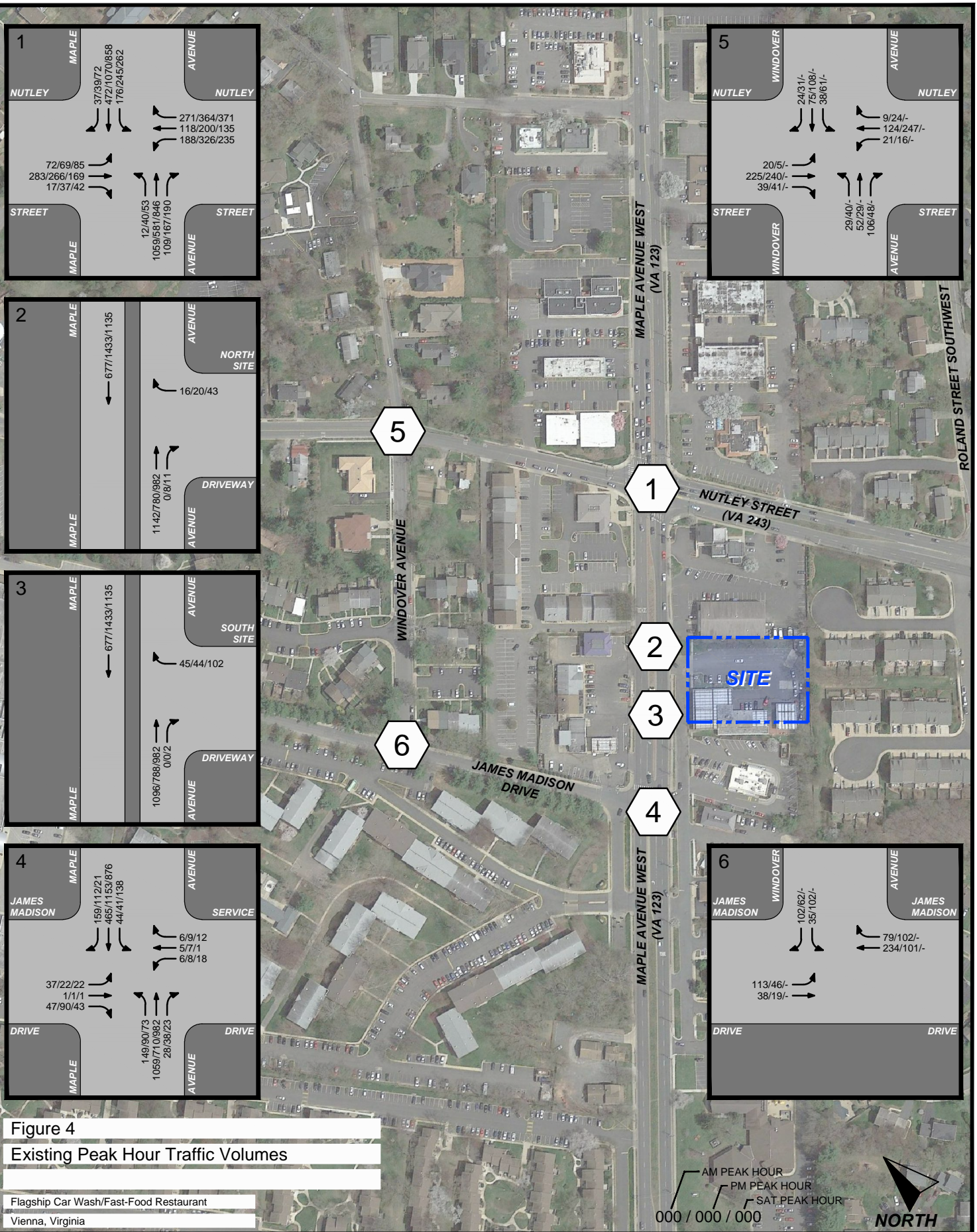


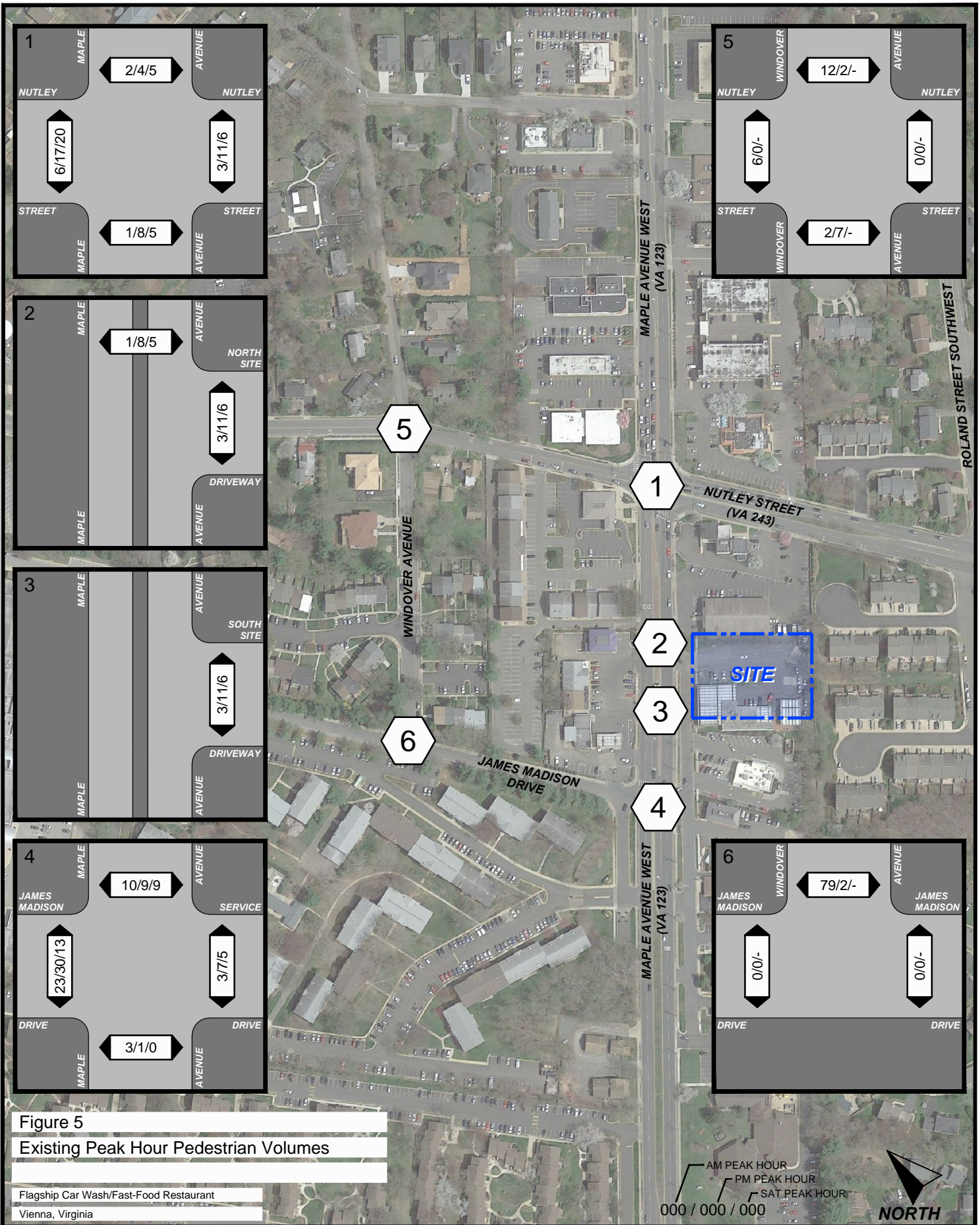
for inbound traffic traveling southbound on Maple Avenue where they would turn at the James Madison Drive/Maple Avenue intersection to gain access into the site via the service drive.

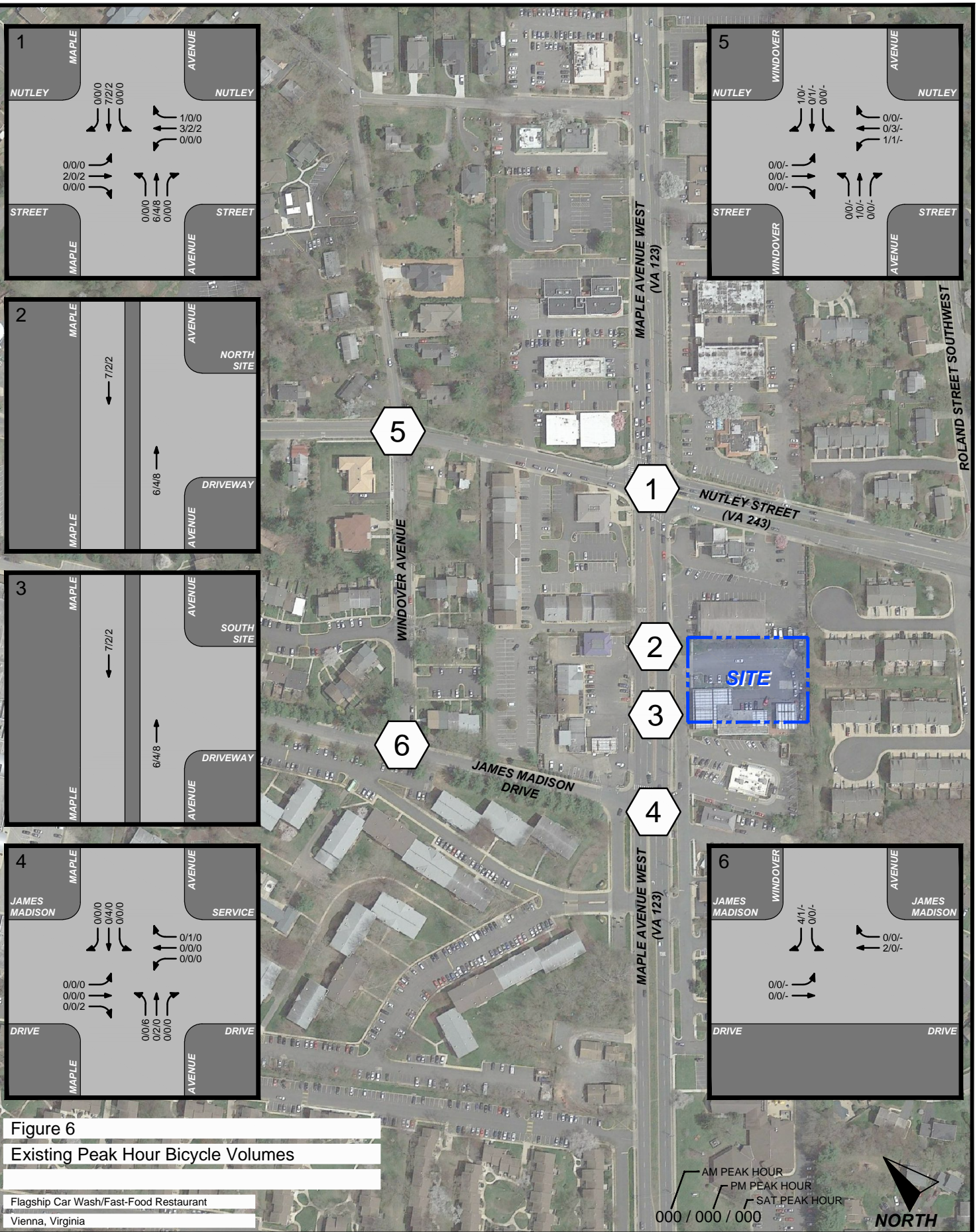
As proposed, the southern driveway will serve as the main entrance/exit for both the restaurant and car wash while the northern driveway will provide egress from the restaurant's drive-thru traffic. It should be noted that McDonald's access to/from the service drive and Maple Avenue would continue to operate the same as prior to redevelopment. The frontage road would be maintained and restricted to one-way southbound. The proposed private one-way drive aisle in front of the site would provide patrons the option to travel south towards the intersection of James Madison Drive to proceed south and also serve as an outlet for drive-thru patrons that may be impeded from exiting the site by peak hour queueing along Maple Avenue during peak periods.

Once on site, patrons would proceed up the ramp to access the car wash or circulate within the lower level to access the 43 parking spaces and drive thru for the restaurant. While the town of Vienna has no drive-thru restrictions, Fairfax County Zoning requires a minimum of eleven (11) stacking spaces and minimum of five (5) spaces designated for the ordering station. The current site plan has capacity for twenty-five (25) vehicles in the drive-thru queue, which is well within the county's requirement. The frontage road will also be used as a loading zone during non-peak hours to facilitate deliveries. Access to/from the frontage road would be maintained in the future allowing for full movement access to Maple Avenue.









ANALYSIS OF EXISTING CONDITIONS

Existing Conditions Operational Analysis

Existing peak hour levels of service were estimated at the study intersections based on the existing lane usage and traffic control and existing traffic volumes shown on Figure 3, existing traffic volumes shown on Figures 4 through 6, and the 2000 Highway Capacity Manual (HCM) methodology using Synchro, Version 9.1. Existing traffic signal timings at the intersections of Maple Avenue and Nutley Street were provided by the Town of Vienna. The results are presented in Appendix C and summarized in Table 1.

Capacity Analyses

Nutley Street/Maple Avenue (VA 123)

The intersection currently operates at overall level of service (LOS) “E” during the both the AM and PM peak hours, and operates at an overall LOS “D” during the Saturday peak hour. Both the southbound and northbound thru movements along Maple Avenue currently operate at acceptable LOS “D” or better during the AM, PM, and Saturday peak periods. During each of the peak periods the westbound and eastbound lane groups on Nutley Street currently operate at LOS “E” or “F”. The overall delay of the intersection and delays on Nutley Street during peak periods are in part due to the split phasing of the signal (east/west) and allotment of green time to Maple Avenue to facilitate thru traffic.

Site Driveways/Maple Avenue (VA 123)

All turning movements at each of the site driveways currently operate at acceptable levels of service during the AM, PM, and Saturday peak hours with LOS “B” or better.

James Madison Drive/Maple Avenue (VA 123)

The eastbound and westbound approaches of James Madison Drive and Maple Avenue currently operate at acceptable levels of service, LOS “D” or better, during the AM, PM peak hour periods. During the Saturday peak the westbound approach currently operates at LOS “E.”

Nutley Street (VA 243)/Windover Avenue

All approaches of the all-way stop controlled intersection operate at acceptable levels of service, LOS “B” or better, during the AM and PM peak periods.

James Madison Drive/Windover Avenue

All approaches of the intersection operate at acceptable levels of service, LOS “C” or better, during the AM and PM peak periods.

Queuing Analyses

The 50th and 95th percentile queues of existing conditions are used to establish a datum against which to compare future conditions. The 50th percentile (or average) queue is defined as the maximum back of queue associated with a typical signal cycle. The 95th percentile queue is defined as the maximum back of queue with 95th percentile traffic volumes. The 95th percentile queue is not necessarily ever observed, it is simply based on statistical calculations. The results are summarized in Table 1 and included in Appendix C.

As shown in Table 1, the left/right turn storage at study intersections is currently adequate to accommodate the 95th percentile queue with the exception of the following locations:

- Westbound left turn from Nutley Street
- Southbound left turn from Maple Avenue

It should be noted that additional southbound left turn storage on Maple Avenue is available within the two way left turn lane north of the existing striped taper. In some instances the queuing of thru traffic may extend beyond available turn lane storage.

Based on field observations the northbound queue along Maple Avenue at Nutley Street generally extended back to or beyond the northern site driveway during a typical cycle during peak periods. This queue clears each cycle and allowed egress from the site. Queues along the frontage road were generally two to three (3) vehicles at the James Madison Drive/Maple Avenue intersection. Vehicles exiting from the minor approaches currently use gaps in traffic created by the signal at Maple Avenue and Nutley Street.

ANALYSIS OF FUTURE 2017 CONDITIONS WITHOUT DEVELOPMENT

Regional Growth, Pipeline Developments & Future Forecasts without Development

As identified during the scoping process and detailed in the traffic scoping agreement contained in Appendix A, regional growth on thru traffic was included in the future traffic forecasts. A growth rate of one (1.0) percent was applied to traffic along Maple Ave W. and Nutley Street to account for ambient growth and for future development not assumed herein and is summarized on Figure 7.

Per the scoping document, no pipeline developments were identified for inclusion in this traffic study. It is acknowledged that concurrent traffic studies have been submitted to the Town for review. Consistent with other traffic studies conducted in the neighboring jurisdiction, and those reviewed by VDOT, only approved, but unbuilt developments are typically included in TIAs. In order to account for the other proposed developments, a regional growth rate has assumed.

A review of published VDOT data, as noted in the scope of work document, between 2010 and 2013 the average daily traffic volumes, on both Maple Avenue and Nutley Street have declined (from 30,000 to 26,000 vehicles per day and 26,000 to 19,000 vehicles per day, respectively). Thus, the 1.0 percent growth rate assumed herein should be considered conservative and would account for adjacent developments not specifically assumed in the TIA.

Future peak hour traffic forecasts without the proposed redevelopment are shown on Figure 8 and include the existing peak hour traffic and regional growth.

2017 Operational Analysis without Development

Peak hour levels of service and queuing analyses for future conditions without development were estimated at the study intersections based on the lane usage and traffic control shown on Figure 3, the future peak hour traffic forecasts without redevelopment (Figure 8), and the 2000 HCM methodology using Synchro version 9.1. The future signal timings were provided by the Town of Vienna. These planned timings were used to complete the future conditions analyses. The results are presented in Appendix D and summarized in Table 1.

Capacity Analyses

Nutley Street/Maple Avenue (VA 123)

In the future with the additional of three (3) years of regional growth and integration of new signal timings, the intersection would continue to operate at an overall LOS “E” during the both the AM and PM peak hours, and operate at an overall LOS “D” during the Saturday peak hour. Consistent with existing conditions, the westbound and eastbound lane groups on Nutley Street would continue to operate at LOS “E” or “F” during the peak periods. As mentioned previously, the overall delay of the intersection and delays on Nutley Street during peak periods are in part due to the split phasing of the signal (east/west) and allotment of green time to Maple Avenue to facilitate thru traffic.

Site Driveways/Maple Avenue (VA 123)

All turning movements at each of the site driveways would continue to operate at acceptable levels of service during the AM, PM, and Saturday peak hours with LOS “B” or better.

James Madison Drive/Maple Avenue (VA 123)

The eastbound and westbound approaches of James Madison Drive and Maple Avenue would continue to operate at acceptable levels of service, LOS “D” or better, during the PM peak hour period. During the AM and Saturday peak periods the westbound approach would operate at LOS “E.”

Nutley Street (VA 243)/Windover Avenue

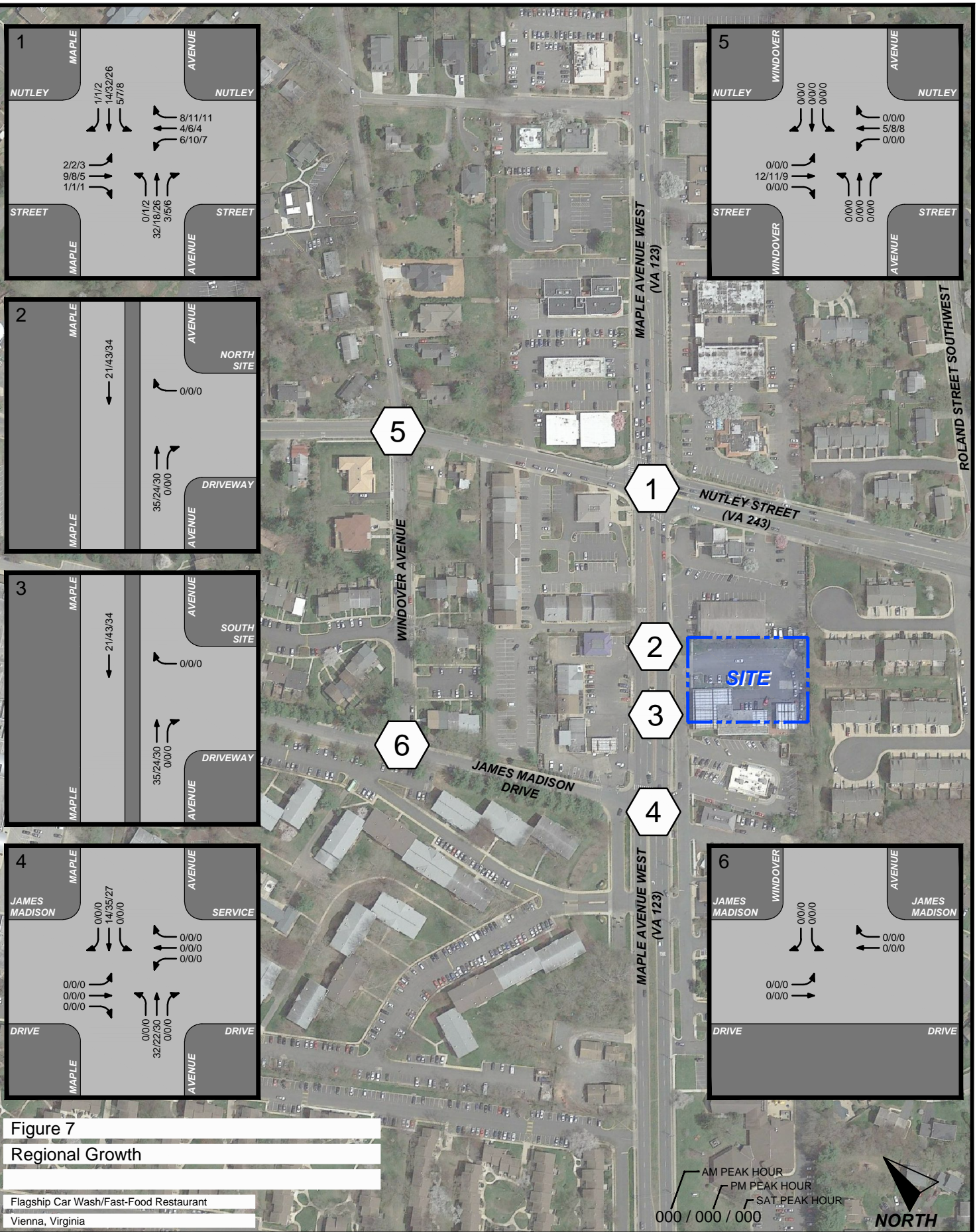
All approaches of the all-way stop controlled intersection would continue to operate at acceptable levels of service, LOS “B” or better, during the AM and PM peak periods.

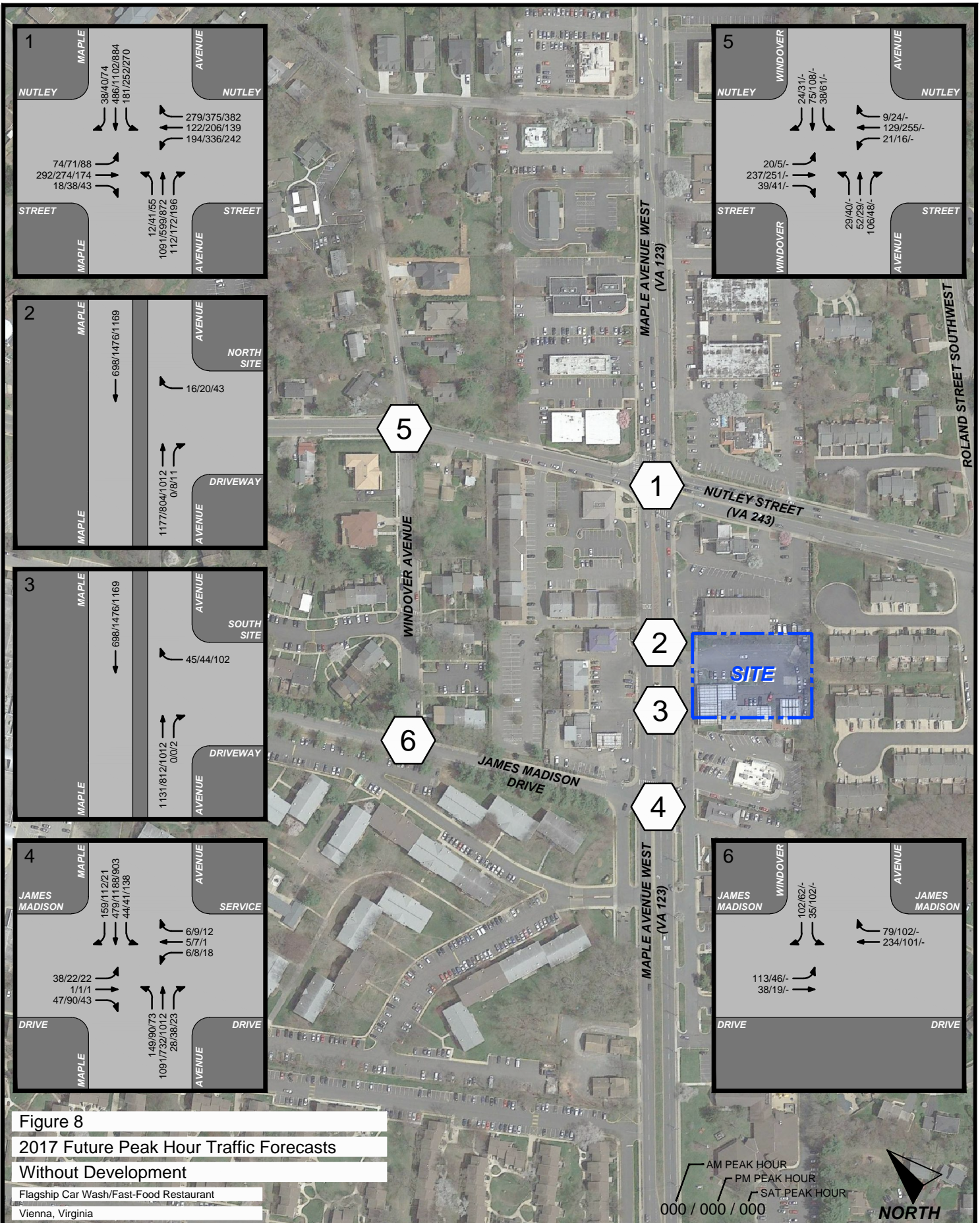
James Madison Drive/Windover Avenue

All approaches of the intersection would continue to operate at acceptable levels of service, LOS “B” or better, during the AM and PM peak periods.

Queuing Analyses

As shown in Table 1, the 50th and 95th percentile queues at study intersections would increase marginally when compared to existing conditions due to the increase in traffic relating to regional growth and signal timing modifications.





ANALYSIS OF FUTURE 2017 CONDITIONS WITH DEVELOPMENT

Site Trip Generation

The number of peak hour vehicle trips that would be generated by the new fast-food restaurant with drive-thru was calculated using the ITE Trip Generation Manual, 9th Edition rates and equations. These trips were combined with the observed traffic counts of the existing car wash that result in the new site total trips consistent with the methodology included in the scoping document.

Based on the observed peak hour traffic count data, the existing car wash generates 1 AM peak hour trips (1 in and 0 out), 63 PM peak hour trips (31 in and 32 out), and 174 Saturday peak hour trips (84 in and 90 out). A review of sales data provided by the applicant indicates that the total sales for the days (and month) in which the traffic counts were conducted are higher than the typical day (Tuesday through Thursday) or monthly variation. Figure 9 shows a comparison of available sales data for the typical weekday, Saturday and monthly variation. Based on the available data the count dates fall within the 85th percentile or higher. Thus no adjustments to the trips rates were made.

As shown in Table 2, the proposed development is estimated to generate 229 AM peak hour trips (117 in and 112 out), 227 PM peak hour trips (116 in and 111 out), and 470 Saturday peak hour trips (235 in and 235 out). The trip generation estimates represent the total number of combined inbound and outbound vehicles movements at the site and is comprised of primary trips, restaurant pass-by trips, and restaurant diverted link trips. Each trip type is defined below:

Primary Trips

- The primary reason for the vehicle being on the road network is to visit the site.
- These are the net new vehicles that the site adds to the road network.

Pass-by Trips

- Vehicles already driving past the site driveways that pull into the site.
- When departing the site, these vehicles proceed on to their original destination.

Diverted Link Trips

- Vehicles already on the road network that divert their route to access the site.
- These vehicles would not have otherwise driven past the site.
- When departing, they return to their original route.

As shown in Table 2, the trip generation estimates indicate that the fast-food restaurant would generate 48 new AM peak hour, 49 new PM peak hour, and 89 new Saturday peak hour primary trips.

The percentages of the peak hour trips that would represent the pass-by and diverted-link trips of the fast food restaurant were estimated using the ITE Trip Generation Handbook, 9th Edition. It is estimated that pass-by trips would account for approximately 51, 47 and 47 percent of the total traffic generated by the fast-food restaurant during the AM, PM and Saturday peak hours respectively. It is estimated that diverted link trips would account for approximately 28, 23 and 23 percent of the total traffic generated by the fast-food restaurant during the AM, PM and Saturday peak hours respectively.

Non-Auto Assumption/Pedestrian Safety

The proposed uses (fast-food restaurant with drive-thru and car wash) are auto orientated uses, thus the non-auto mode split for the proposed uses would be minimal. For purpose of this analysis no non-auto reduction was taken. However, it is recognized that the proximity to the local High School would likely result in an increase in pedestrian traffic. Therefore, in order to mitigate existing and future pedestrian safety concerns, pedestrian improvements are proposed at the intersection of James Madison Drive and Maple Avenue as well as the existing service drive.

It should be noted that while no statistical data is available to predict the likelihood of accidents occurring between pedestrians and vehicles, the proposed drive aisle has been designed with multiple visual and physical queues to drivers indicating that the drive aisle area is a pedestrian first environment. Low speeds combined with traffic calming measures allow for additional reaction time for both drivers and pedestrians resulting in the reduced likelihood of conflicts and/or incidents.

Restaurant Site Generated Traffic Assignments

Trip distributions for the proposed fast-food restaurant with drive-thru uses were developed based on recent traffic counts and the surrounding road network. As identified in the scoping agreement, the following general trip distributions were used in this study for the car wash and fast-food restaurant's primary trips and are



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MEMORANDUM

shown on Figure 10.

To/From the North on Maple Avenue:	35%
To/From the East on Nutley Street:	25%
To/From the South Maple Avenue:	30%
<u>To/From the West on Nutley Street:</u>	<u>10%</u>
Total:	100%

Separate distributions were developed for the fast-food restaurant's pass-by and diverted-link trips based on the individual characteristics for each trip type and the observed traffic patterns. Pass-by trips to and from the site were assumed along Maple Avenue (VA 123) using existing traffic directional splits and diverted link trips to and from the site were assumed along Nutley Street (VA 243). The site trip assignments for the restaurant's pass-by and diverted-link trips are summarized on Figures 11 and 12, respectively.

Existing Carwash Traffic Reassignment

Vehicular traffic currently using the northern site driveway for access to the existing carwash was reassigned to the southern curb-cut with redevelopment. The northern site driveway will be egress only, serving exiting drive thru traffic. Figure 13 shows the redirected traffic to the southern site driveway.

Installation of the HAWK Signal and James Madison Drive Reassignments

As part of the site redevelopment, the Applicant proposes to install a HAWK (High-Intensity Activated Crosswalk) signal at the James Madison Drive/Maple Avenue intersection. This signal will improve pedestrian safety along Maple Avenue and create a signalized crossing point for pedestrians and handle any increase in pedestrian traffic related to this proposal. When activated, the HAWK signal would be timed in order to provide adequate crossing time for pedestrians. In addition to the HAWK signal, a marked crosswalk would be installed on the service drive adjacent to McDonald's.

Based on a meeting between the Applicant, VDOT and Town staff, VDOT has recommended that left-turns from James Madison Drive onto Maple Avenue be restricted to eliminate the possibility of left-turning vehicles using the HAWK signal to exit James Madison Drive and jump the Maple Avenue queue and create conflicts with crossing pedestrians. This was reaffirmed in an email correspondence from VDOT dated April 6, 2016 (see Appendix G).

In order to evaluate the impact of restricting left turns on James Madison Drive the left turns were reassigned to the surrounding road network. Refer to Figure 14 for the reassignment of the left-turning traffic.

2017 Future Traffic Forecasts with Development

Future peak hour traffic forecasts for 2017 with the proposed development were prepared by combining the future peak hour traffic forecasts without redevelopment (Figure 8), the site's combined peak hour traffic forecasts (Figures 10 through 13), and traffic reassigned with the installation of the HAWK signal (Figure 14). The resulting total future traffic forecasts are shown on Figure 15.

2017 Operational Analysis with Development

Capacity and queuing analyses were prepared for future conditions with development based on the lane use shown on Figure 16, the future traffic forecasts with development shown on Figure 15 and the Synchro (version 9.1) capacity analysis procedures. Consistent with the future conditions without development, the planned signal timings provided by the Town of Vienna were used. The results are presented in Appendix E and summarized in Table 1.

Capacity Analyses

Nutley Street/Maple Avenue (VA 123)

In the future with the proposed development the intersection would operate at an overall LOS "E" during the AM and PM peak hours and LOS "D" during the Saturday peak hour. The overall delay per vehicle would increase by less than three (3) seconds per vehicle when compared to future conditions without redevelopment. The westbound and eastbound lane groups on Nutley Street would continue to operate at LOS "E" or "F" during the peak periods, in part due to the split phasing of the signal (east/west) and allotment of green time to Maple Avenue to facilitate thru traffic. Overall, only marginal delay increases are expected when results are compared to those of future without development conditions.

Site Driveways/Maple Avenue (VA 123)

All turning movements at each of the site driveways would continue to operate at acceptable levels of service during the AM, PM, and Saturday peak hours with LOS "C" or better.



James Madison Drive/Maple Avenue (VA 123)

The left turns at the intersection would continue to operate acceptable level of service (LOS “D” or better) during peak periods. The minor street westbound approach from the service drive onto Maple Avenue would operate at LOS “E” or “F” during the peak periods.

Nutley Street (VA 243)/Windover Avenue

All approaches of the all-way stop controlled intersection would continue to operate at acceptable levels of service, LOS “B” or better, during the AM and PM peak periods with redevelopment and the turning restriction in place on James Madison Drive at Maple Avenue.

James Madison Drive/Windover Avenue

All approaches of the intersection would continue to operate at acceptable levels of service, LOS “C” or better, during the AM and PM peak periods with redevelopment and the turning restriction in place on James Madison Drive at Maple Avenue.

Queuing Analyses

As shown in Table 1, the 50th and 95th percentile queues at study intersections would increase marginally when compared to future conditions without development. Maximum forecasted peak hour queues from the site driveways are approximately one (1) to two (2) vehicles (55 feet or less) while the estimated queue along the frontage road is approximately five (5) to six (6) vehicles (144 feet or less).

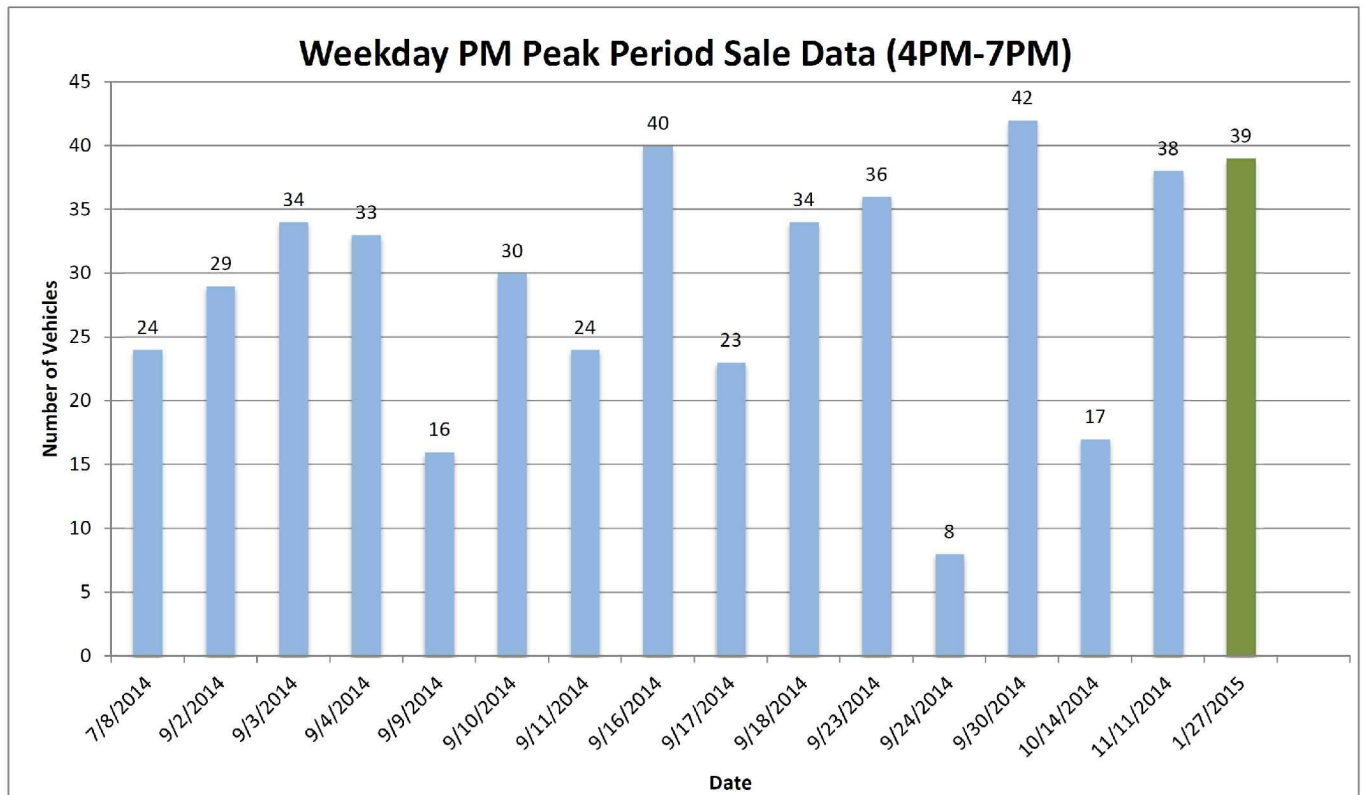
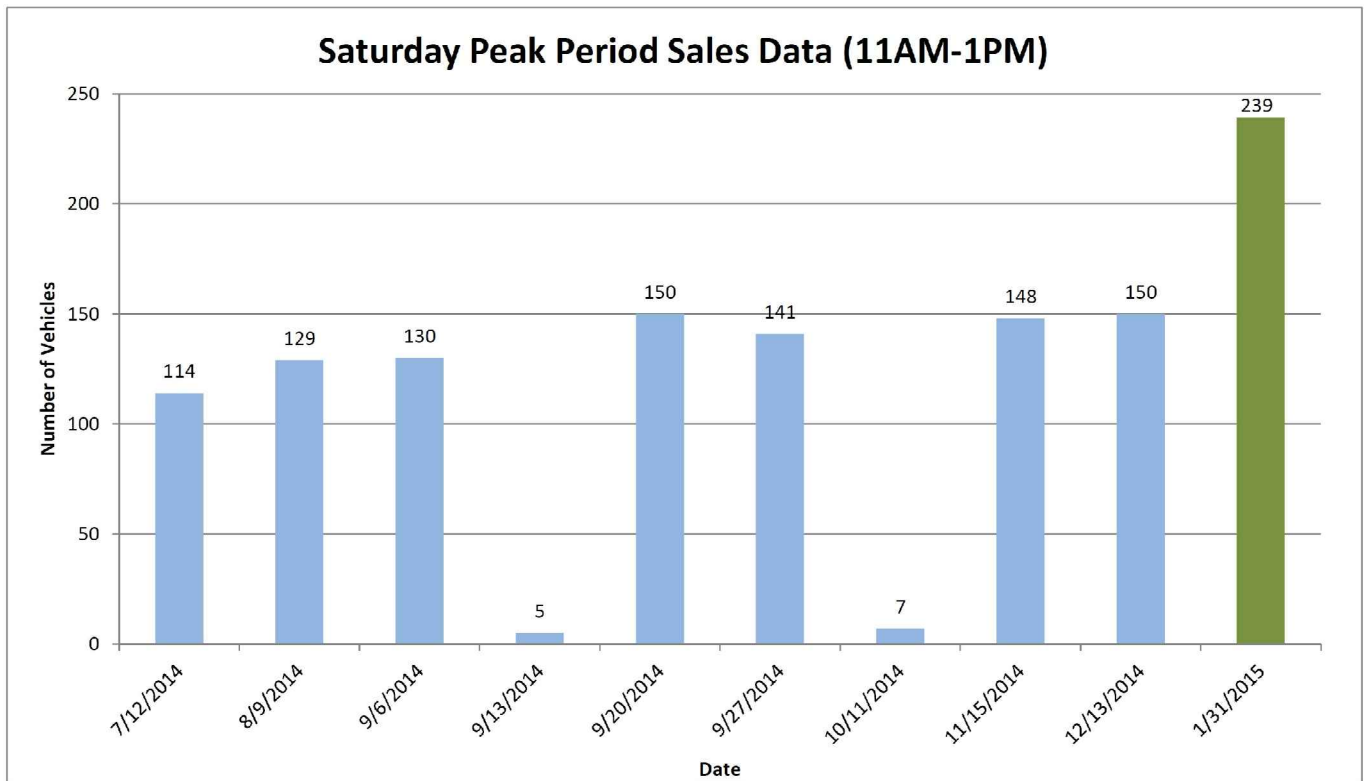


Figure 9
Sales Data

Flagship Car Wash/Fast-Food Restaurant
Vienna, Virginia

*GREEN COLUMNS REPRESENT STUDY PERIOD

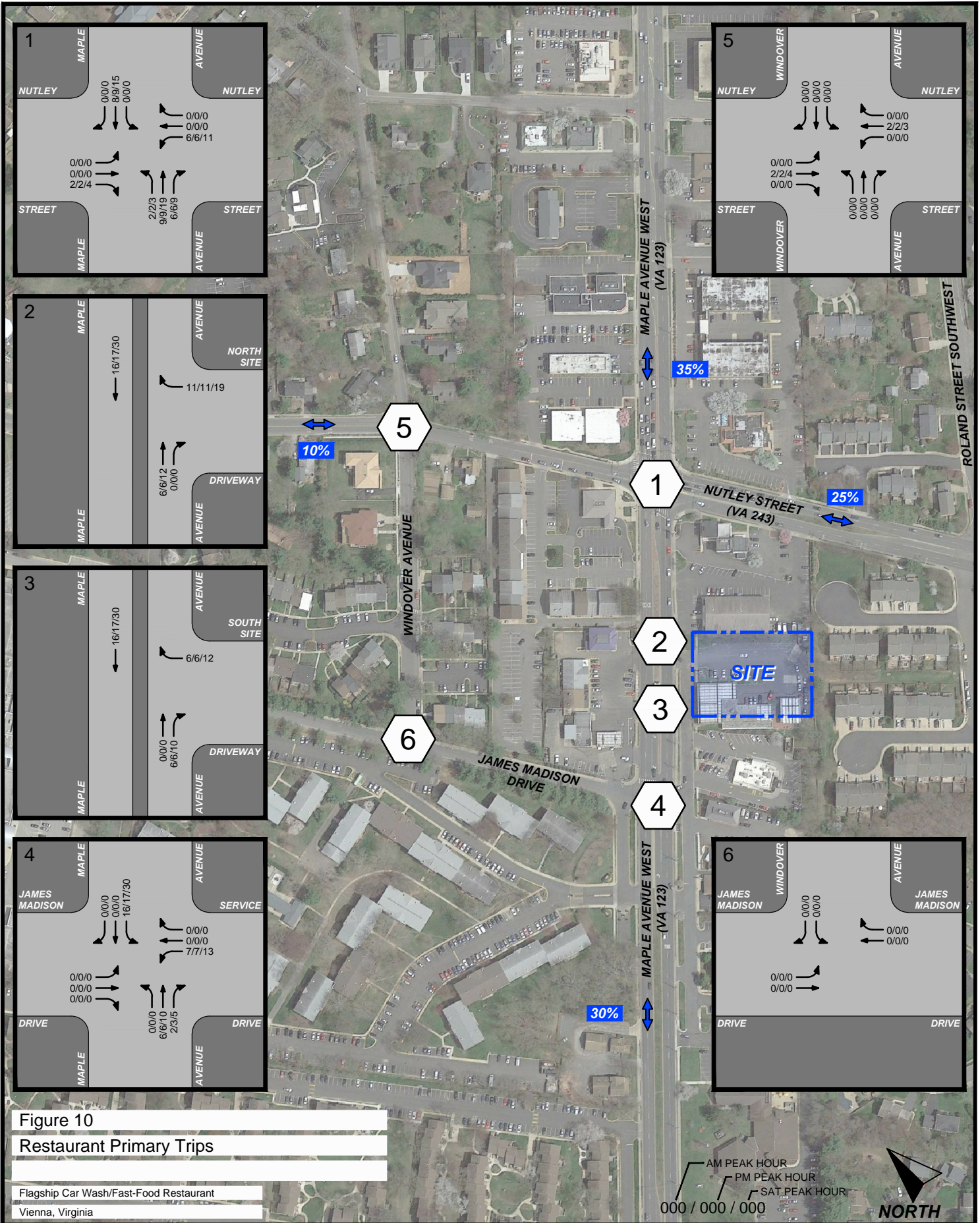


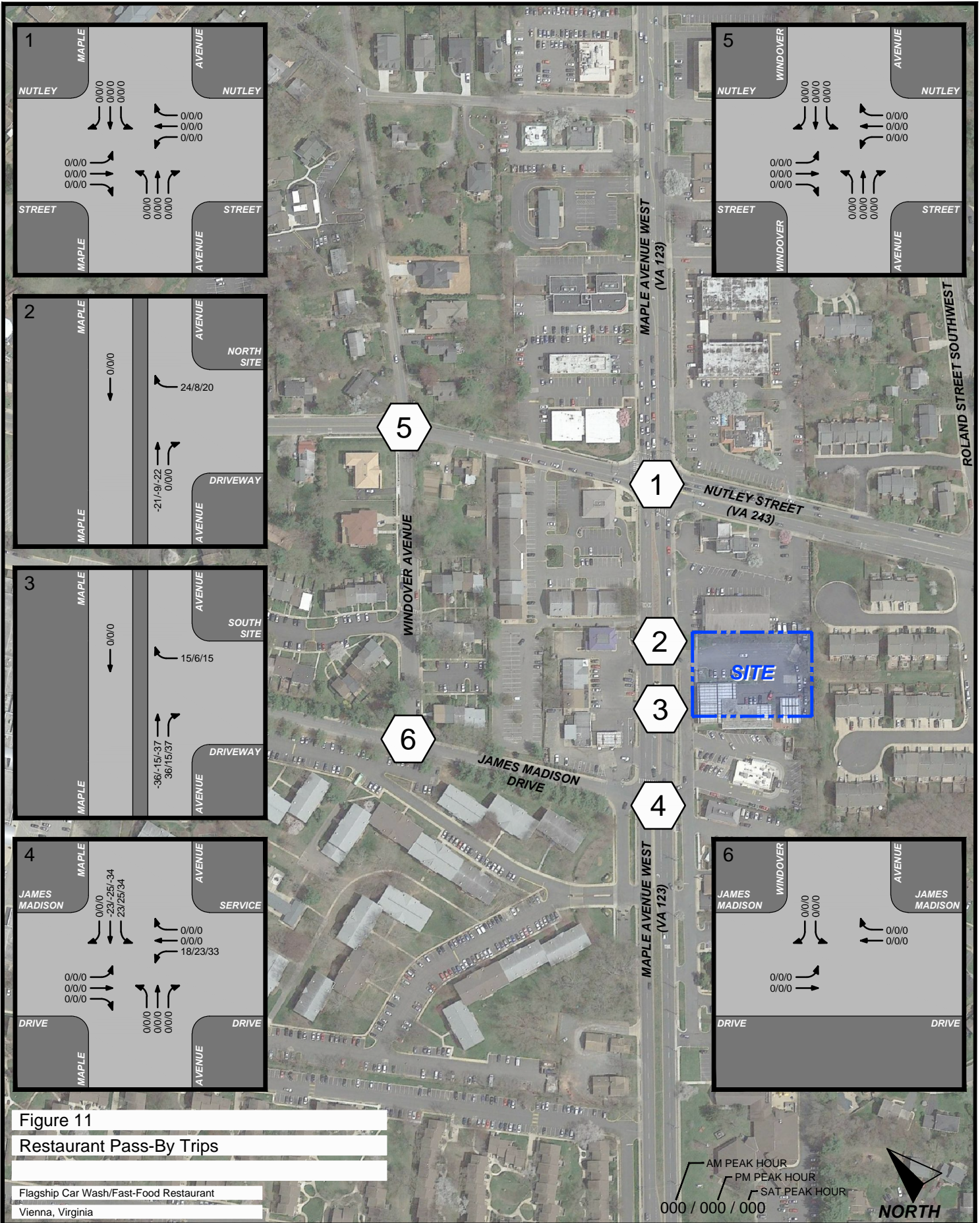
Table 2
Flagship Car Wash & Restaurant
Site Trip Generation Analysis - Peak Hour of Adjacent Street ⁽¹⁾

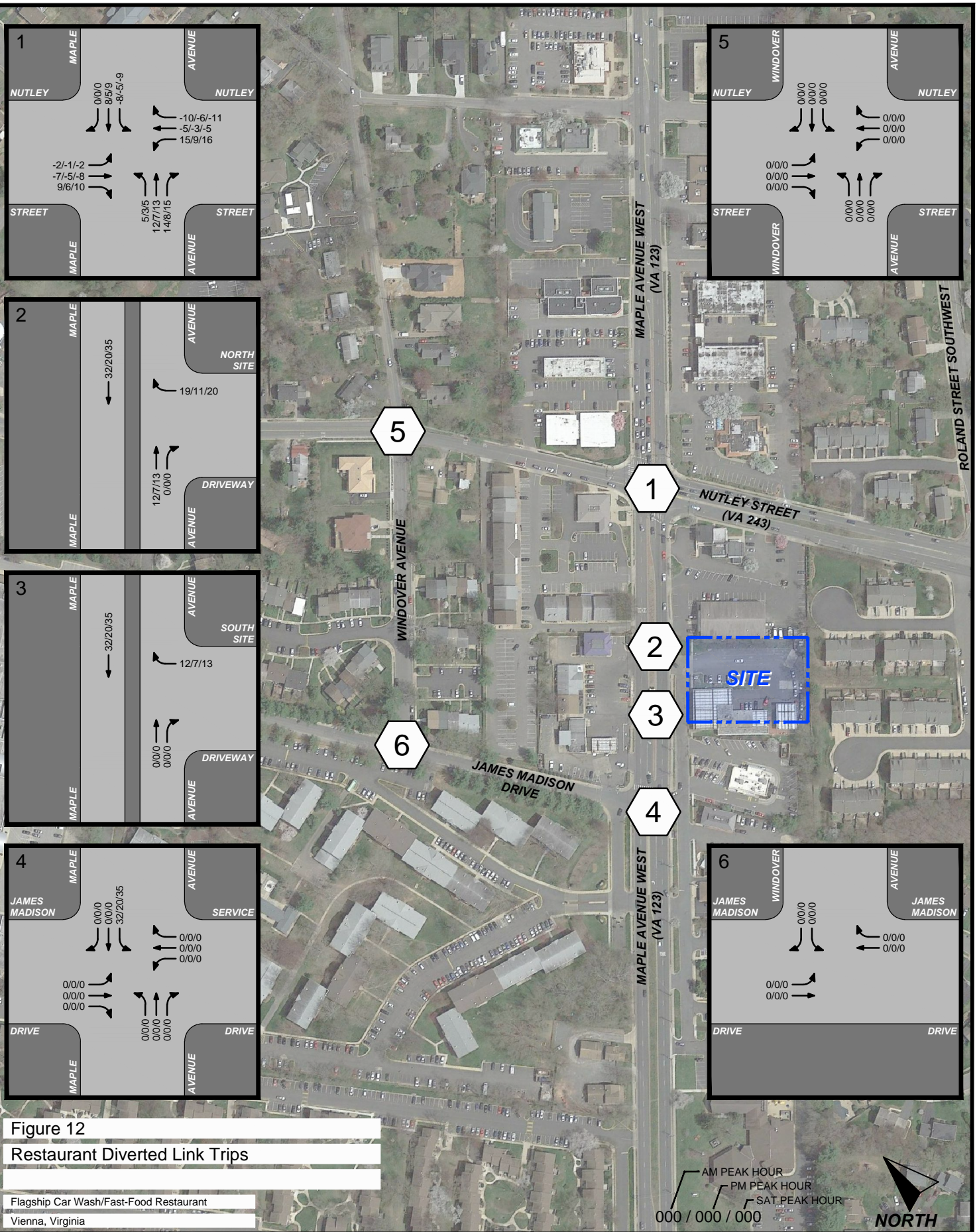
Scenario	Land Use Code	Amount	Units	AM Peak Hour			PM Peak Hour			Average Daily Trips	SAT Peak Hour			Average Daily Trips
				In	Out	Total	In	Out	Total		In	Out	Total	
Car Wash ⁽²⁾				1	0	1	31	32	63	630	84	90	174	1,740
Fast-food Restaurant with Drive-thru ⁽³⁾	934	5,001	SF	116	112	228	85	79	164	2,482	151	145	296	3,611
Pass-By Trip Reduction				59	57	116	40	37	77		71	68	139	
Diverted Link Trip Reduction ⁽³⁾				32	31	63	20	18	38		35	33	68	
Restaurant New Primary				24	24	48	26	24	50		45	44	89	
Total Site Trips				117	112	229	116	111	227	3,112	235	235	470	5,351

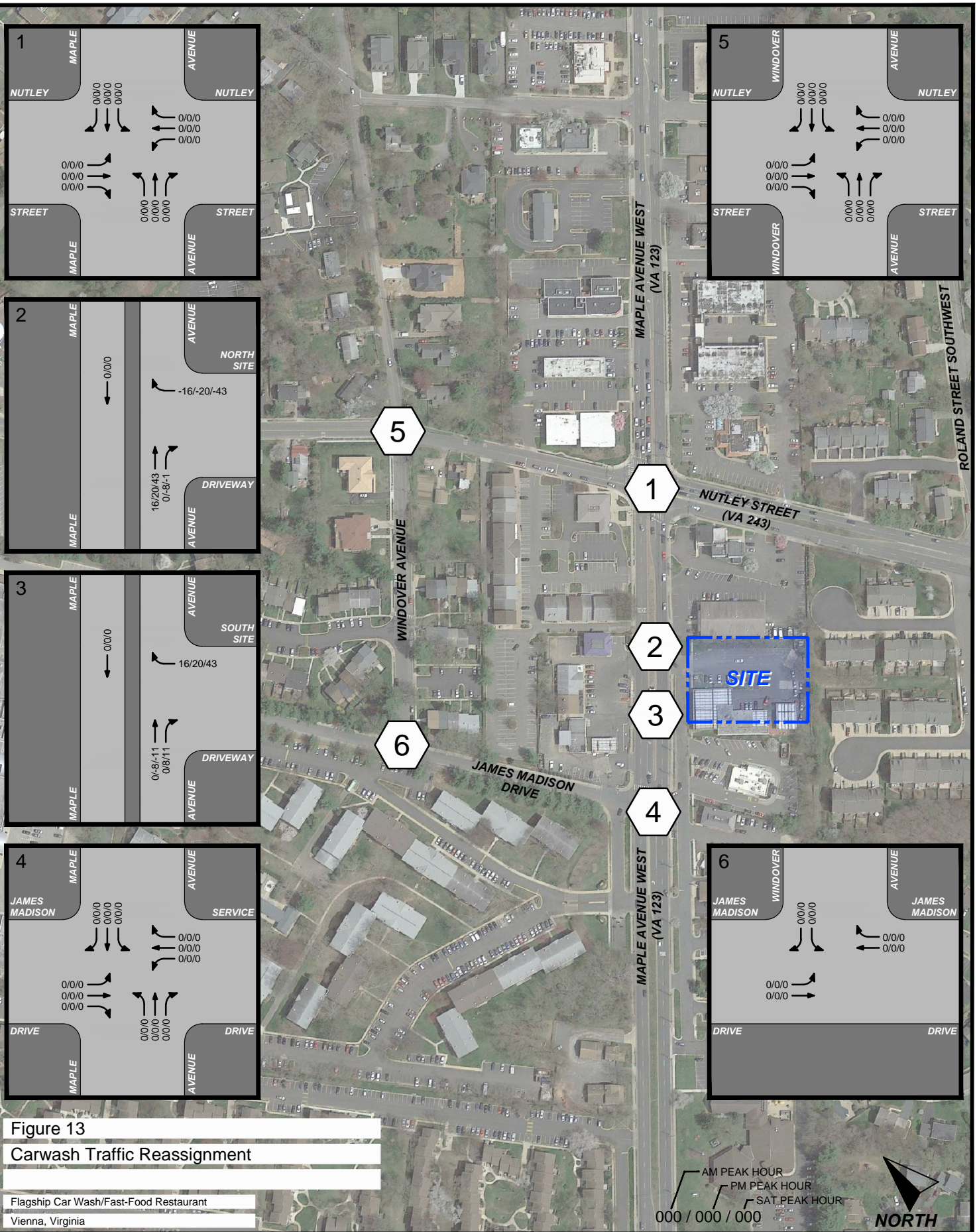
Note(s):

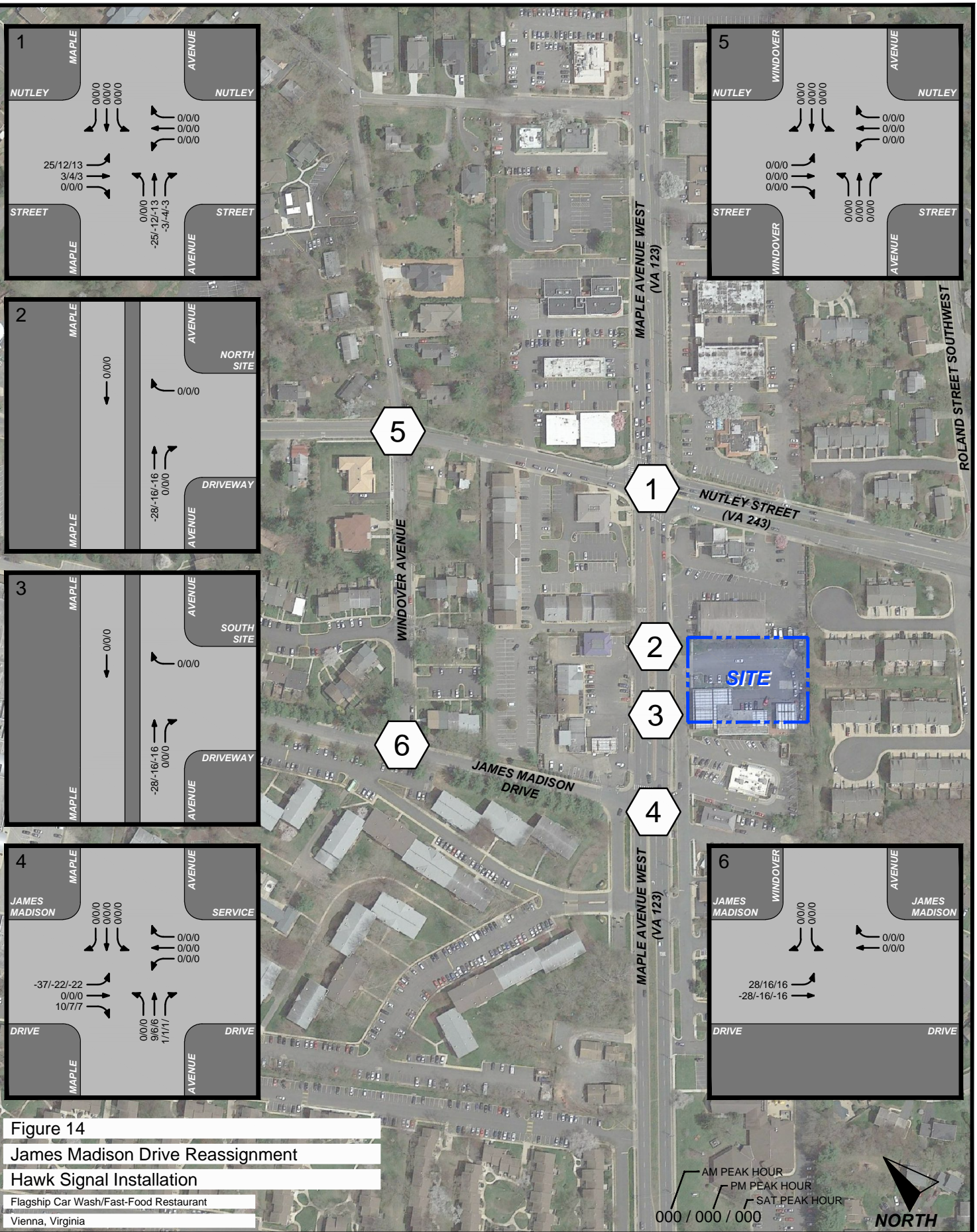
1. Trip generation based on the Institute of Transportation Engineers' Trip Generation, 9th Edition rates/equations as appropriate.
2. Based on observed driveway counts from January 27, 2015 and January 31, 2015. Daily traffic based peak hour multiplied by a factor of 10.
3. Reduction based on ITE Trip Generation Handbook Pass-By (AM:51%, PM:47%, SAT:47%) Diverted Link (AM:28%, PM: 23%, SAT: 23%)

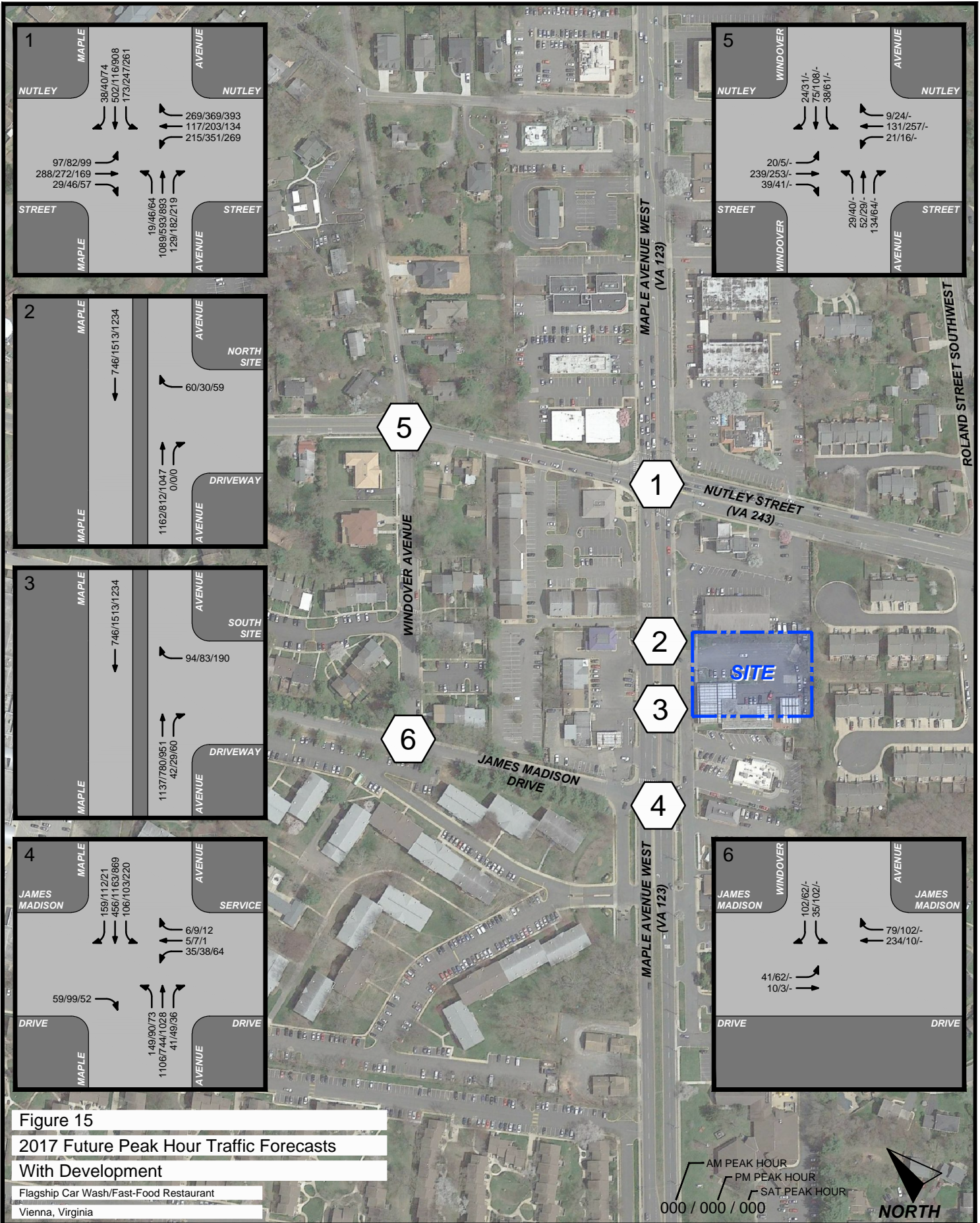


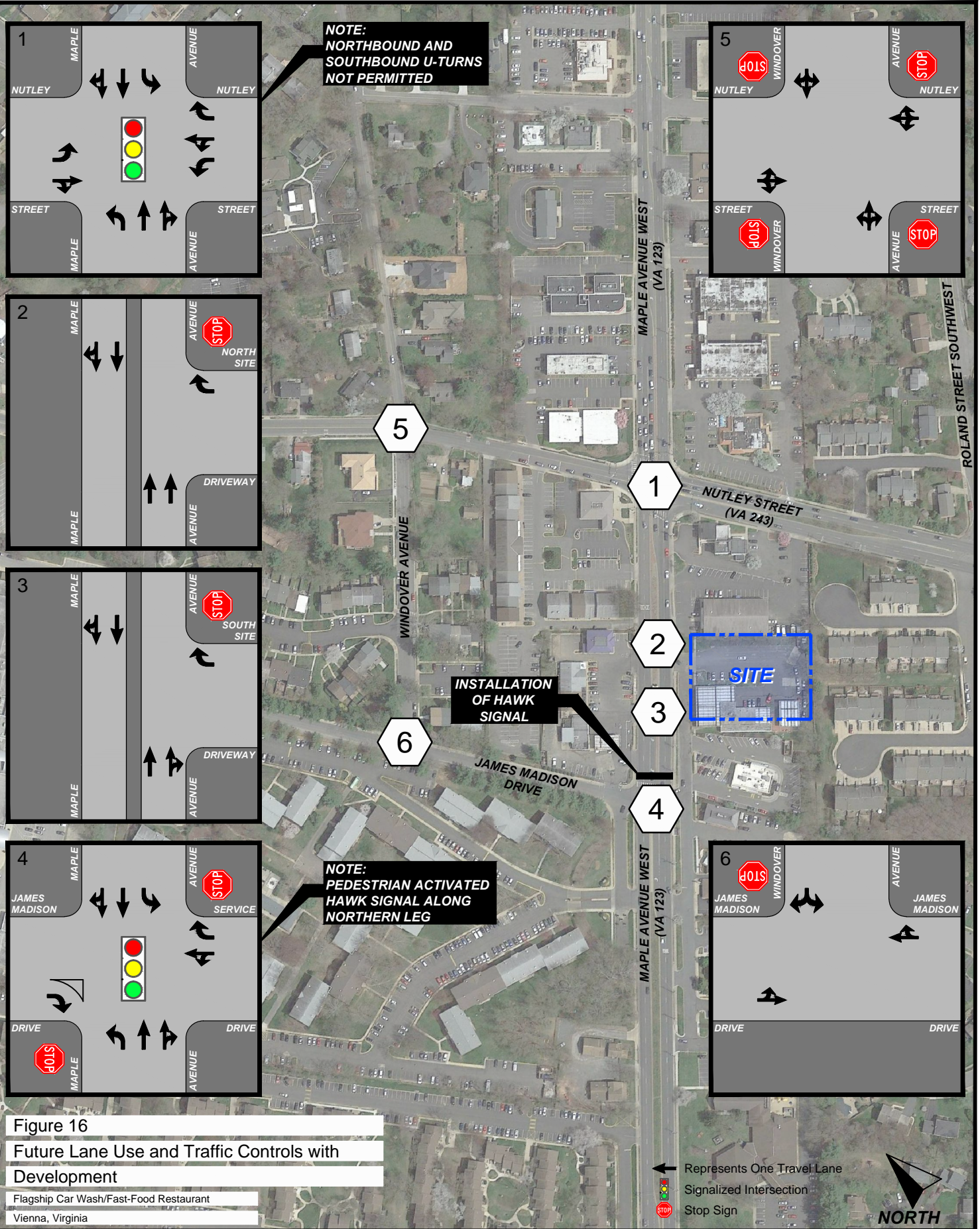












CONCLUSIONS

The proposed carwash and fast-food restaurant with drive-thru is estimated to generate 229 AM peak hour trips, 227 PM peak hour trips, and 470 Saturday peak hour trips. Accounting for pass-by and diverted link trips the proposed redevelopment would add 48 new primary trips during the AM peak hour, 49 new primary trips during the PM peak hour, and 89 new primary trips during the Saturday peak hour.

Based on the analysis contained herein the proposed redevelopment would have a negligible impact on the operations of mainline of Maple Avenue and adjacent signalized intersection of Maple Avenue and Nutley Street. The overall delay per vehicle at the Maple Avenue and Nutley Street intersection would increase by less than three (3) seconds per vehicle during peak periods.

The proposed private one-way drive aisle in front of the site would provide patrons the option to travel south along the service drive towards the intersection of James Madison Drive to proceed south. It will also serve as an outlet for drive-thru patrons that may be impeded from exiting the site by peak hour queueing along Maple Avenue during peak periods. The proposed private drive aisle has been designed as a pedestrian friendly environment, with speeds intended to be five (5) to 10 miles per hour. The drive aisle will include special paving and raised pedestrian crossings which would further slow vehicle traffic giving the pedestrian the right of way.

In order to address an existing safety concern and to address any potential increase in pedestrian traffic with the proposed redevelopment the Applicant proposes to install a new HAWK signal at the James Madison Drive/Maple Avenue intersection, subject to VDOT and Town approval, along with a new marked pedestrian crossing on the service in the vicinity of the site. The pedestrian improvements as proposed would significantly improve pedestrian safety surrounding the site. The signalized pedestrian crossing on Maple Avenue and marked crosswalk on the service in front of the McDonald's as well as new ADA ramps would provide an improved crossing from the north side on Maple Avenue to the south side of the parallel service drive. This crossing would improve pedestrian safety not only of pedestrians walking to and from the proposed development, but also for uses along Maple Avenue in the vicinity of the intersection.

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