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TECHNICAL MEMORANDUM

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From:	Maris E. Fry Robert B. Schiesel, P.E. Dan VanPelt, P.E., PTOE	
Date:	October 20, 2014	
Subject:	Curtis Properties PUD – Building 1 (2255 Martin Luther King, Jr. Ave) Transportation Evaluation Stage 2 PUD Application – Zoning Case Number 08-07a	

INTRODUCTION

This memorandum reviews the transportation elements and impacts of Building 1 of the Curtis Properties development, in support of its Stage 2 Planned Unit Development (PUD) application. It presents a site-specific transportation evaluation of Building 1, located at 2255 Martin Luther King, Jr Avenue in the southeast quadrant of Washington, DC. The project site consists of Lot 839 and a portion of Lot 906 in Square 5785. The building consists of 71 residential units, served by 26 parking spaces. This is a slight change from the approved Stage 1 PUD that proposed 65 residential units and 33 parking spaces. As was proposed in the Stage 1 plans, the site plan includes the construction of the extended alley (in private space) northwest to connect with Shannon Place. An overall summary of the development program with Building 1 is shown in Figure 1. A site plan for Building 1 is shown in Figure 2.

Building 1 is one of 9 buildings of The Curtis Properties PUD, a vibrant, urban mixed use development along Martin Luther King, Jr. Avenue in the Anacostia neighborhood of the District of Columbia. Currently, the entire project has Stage 1 PUD approval. The Stage 1 PUD application was supported by significant transportation analyses and documentation, including a Traffic Impact Study performed in March of 2008 by Gorove/Slade Associates and a Supplemental Transportation Evaluation performed in June of 2013 by Gorove/Slade Associates. This memo builds from those analyses and documents in order to reach conclusions on the potential impact of Building 1. The Applicant and the District Department of Transportation (DDOT) discussed this approach and developed a formal scope for this memo, submitted to DDOT on September 28, 2012, and approved on November 29, 2012.

Because this is a Stage 2 PUD application, this memo focuses on the specific transportation elements of the Building 1 site plan. Topics discussed within this memorandum include the following:

- Site access elements including parking access, loading, curbside management, and pedestrian and bicycle accommodations
- An updated Transportation Demand Management (TDM) plan
- Intersection capacity analysis, queuing analysis, and safety analysis of the study area

The evaluation contained within this memorandum concludes that the development of Building 1 will not have a detrimental impact to the surrounding neighborhood or transportation system, for the following reasons:

- There is abundant access to public transit near the site; a Metrorail station is located within a half mile and several Metrobus lines are located within a quarter mile of the site.
- Residents of Building 1 will have ample access to bicycle and pedestrian facilities and improvements to the overall pedestrian and bicycle environment around the site will be implemented as part of the development.
- An appropriate amount of loading facilities and parking spaces will be provided to serve the site.
- A robust Transportation Demand Management plan will be implemented to promote non-auto modes of transportation to and from the site.
- The Building 1 development will generate a very small amount of new vehicular traffic. A capacity analysis of nearby intersections showed that these new trips will have a small impact on operations and traffic, in some cases lengthening delays on side street approaches to Martin Luther King Jr. Avenue. This evaluation reviews how this and other existing traffic concerns can be alleviated through signal timing and/or lane marking adjustments.

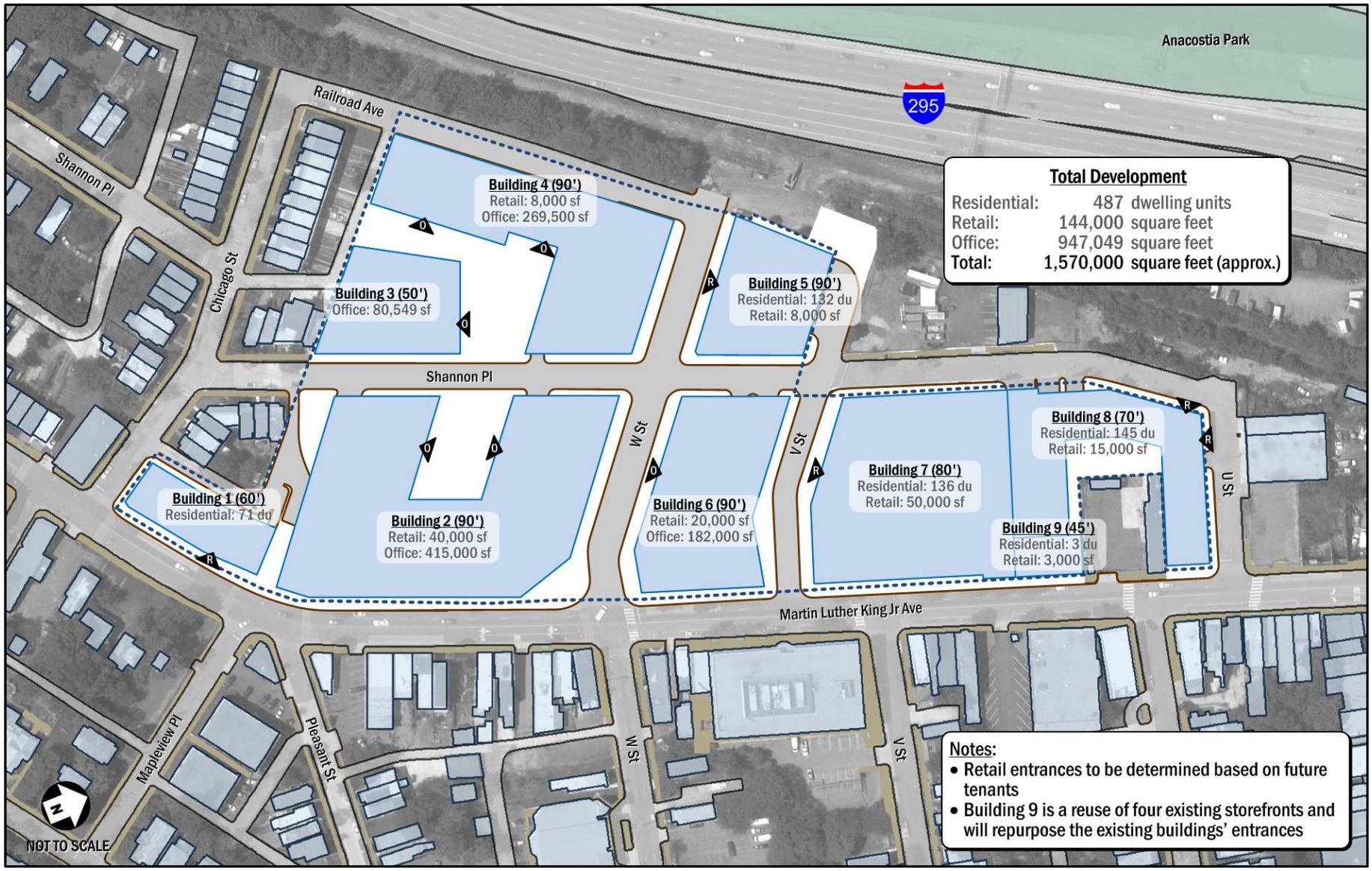


Figure 1: Overall Stage 1 PUD Plan

Figure 2: Building 1 Site Plan

EXISTING TRANSPORTATION FEATURES

Transit

Multiple transit services provide the study with local, city wide, and regional transit connections, linking the site with major cultural, residential, employment, and commercial destinations throughout the region. Figure 3 identifies existing transit service.

WMATA's Metrobus and Metrorail systems provide public transportation access to the Building 1 site. Anacostia station, which serves the Green Line, is the nearest Metrorail station, located approximately 1,700 feet from the development at the intersection of Howard Road and Firth Sterling Avenue SE. The Green line runs approximately every 6 minutes during the morning and afternoon peak periods and every 15 to 20 minutes during the weekday off-peak periods and on weekends.

Metrobus service also serves the site with nearby stops primarily along Martin Luther King, Jr. Avenue SE and Morris Road SE. The majority of these Metrobus lines converge at the Anacostia Metrorail station. These routes connect the site with several destinations throughout downtown DC and the surrounding areas. Table 1 shows a summary of the bus route information for the lines that serve the site, including service hours, headways, and distance to the nearest stop.

Table 1: Bus Route Information

Route Number	Route Name	Service Hours[1]	Headway[1]	Distance to nearest bus stop
90, 93	U Street-Garfield Line	4:30 am – 3:00 am	20-30 min	90 - <0.05 miles 93 - 0.10 miles
A42, 46, 48	Anacostia-Congress Heights Line	Late night extension of A2, 6, 8 line Weekdays: 12:00 am – 6:00 am Weekends: 12:00 am – 8:00 am	30 min	0.10 miles
B2	Bladensburg Road-Anacostia Line	Weekdays: 4:30 am – 3:00 am Saturday: 4:30 am – 2:15 am Sunday: 5:00 am – 1:30 am	10-25 min	<0.05 miles
P6	Anacostia-Eckington Line	Weekdays: 5:00 am – 2:00 am Saturday: 5:30 am – 2:00 am Sunday: 6:30 am – 12:30 am	15-30 min	<0.05 miles
U2	Minnesota Avenue-Anacostia Line	Weekdays: 6:00 am – 10:15 pm Saturday: 6:30 am – 10:00 pm	25-30 min	<0.05 miles
W2, W3	United Medical Center-Anacostia Line	Weekdays: 5:30 am – 2:30 am Saturday: 6:00 am – 2:30 am Sunday: 6:30 am – 1:00 am	10-30 min	0.10 miles
W8	Garfield-Anacostia Loop Line (counterclockwise service)	Monday – Saturday: 6:00 am – 2:30 am Sundays: 6:00 am – 12:30 am	30-50 min	0.10 miles
Circulator	Potomac Ave Metro-Skyland Via Barracks Row	Winter Hours (October 1 – March 31) Weekdays: 6:00 am – 7:00 pm Summer Hours (April 1 – September 30) Weekdays: 6:00 am – 9:00 pm Saturdays: 7:00 am – 9:00 pm	10 min	0.10 miles

[1] WMATA route schedules, http://wmata.com/bus/timetables/

Recently, DDOT developed a plan to identify transit challenges and opportunities and to recommend investments to help support growth and strengthen neighborhoods. As outlined in the DC's *Transit Future System Plan* report published by DDOT in April 2010, this plan includes the reestablishment of streetcar service in the District including near the development. The District's streetcar plan includes one planned line that is expected to terminate near the development. The planned route for this line will connect the site with Buzzard Point. This line is part of the 22 mile priority system that also includes the Georgetown Waterfront to Benning Road Line and the North-South Streetcar Line.

Bicycle Facilities

Within the study area, bicyclists have access to multi-use trails, signed bike routes, and local and residential streets that facilitate cycling. The bicycle network generally provides good conditions for local trips, with some routes available for regional trips.

For cyclists, the most attractive routes are those that have good cycling conditions and provide direct routing between origins and destinations. Conditions in the study area that contribute to good cycling conditions includes minimal changes in topography, multi-use trails that separate bicycle traffic from vehicle traffic, on-street bicycle lanes that designate bicycle rights-of-way, multiple Capital Bikeshare stations, local and collector streets with low traffic volumes and speeds, sidewalks that permit bicycle traffic and provide routing through barriers, and bicycle parking.

Within the existing study area, cycling conditions are good and provide attractive conditions for commuters and recreational riders alike. The existing conditions provide a good environment for cycling including low traffic volumes and speeds, wide travel lanes, the Anacostia Riverwalk Trail, and three Capital Bikeshare stations. There are two direct connections to the Anacostia Riverwalk Trail via Martin Luther King, Jr. Avenue (a signed bike route) in addition to nearby access to the Suitland Parkway Trail and the Fort Circle Trail. The site is also connected to the 11th Street Bridge via Martin Luther King, Jr. Avenue. The 11th Street Bridge connects the site to areas of the District north of the Anacostia River and provides access to many on-street bike lanes, such as the ones along 11th Street. Figure 4 illustrates bicycle facilities in the study area.

Much of the surrounding area has limited access to bicycle parking. Some bicycle parking was observed in the study area though most cyclists typically use street signs, parking meters, or similar objects to secure their bicycles. This indicates that there is demand for additional bicycle parking facilities in the study area.

In addition to personal bike use, the Capital Bikeshare program has placed 300 bicycle share stations across Washington, DC, Arlington and Alexandria, VA, and most recently Montgomery County, MD with over 2,500 bicycles provided. In the vicinity of the proposed development, Capital Bikeshare stations have been placed in four locations. The locations and number of docks at each station are provided in Table 2.

Table 2: Capital Bikeshare Locations

Capital Bikeshare Location	Number of Docks
Pleasant Street & Martin Luther King, Jr. Avenue SE	11 docks
Anacostia Metro	11 docks
Good Hope Road & Martin Luther King Jr. Avenue SE	11 docks
Total	**33 docks**

Pedestrian Facilities

Overall, the pedestrian facilities within the study area provide a good walking environment. Pedestrian access to the site is provided along Martin Luther King, Jr. Avenue SE. Sidewalks, crosswalks, and curb ramps with detectable warnings are provided at most intersections in the study area. Pedestrian activity within the study area occurs along transit access routes, in the vicinity of transit stops, at commercial nodes along Martin Luther King, Jr. Avenue and, to a lesser extent, between residential neighborhoods and transit and commercial nodes. Nearly all streets in the study area have adequate sidewalks, planted buffers between sidewalks and the curb, and on-street parking that provides an additional buffer between pedestrians and vehicular traffic.

The bus stops located along Martin Luther King, Jr. Avenue serve bus routes that provide local and commuter service between the study area and destinations downtown and in the surrounding area. Pedestrians access these bus stops along the local pedestrian network at the site and within the residential and commercial neighborhoods located adjacent to the site. There is some pedestrian activity between transit stops and residential areas throughout the day.

There are some barriers and areas of concern within the study area that negatively impact the quality and attractiveness of walking, including walking distances between the site and some major destinations, manmade and natural barriers that increase walking distances, and roadway conditions that reduce the quality of walking conditions, including narrow sidewalks along several streets, lengthy freeway underpasses, and lengthy crossings at some intersections. Walking distances between the site and major transit and commercial destinations in the area will not have a significant impact on the pedestrian activity because access routes generally provide good walking conditions and walking is a convenient and quick option as compared to other modes.

A review of pedestrian facilities near the site shows that some facilities meet DDOT standards and provide a quality walking environment; however, there are locations surrounding the site that do not provide adequate sidewalks or crossings. Figure 5 shows a detailed inventory of the existing pedestrian infrastructure within the study area.

Sidewalks, crosswalks, and curb ramps are evaluated based on the guidelines set forth by DDOT's *Public Realm Design Manual,* in addition to ADA standards. Sidewalk width and buffer requirements for the District are shown below in Table 3. Within the area shown, most roads are considered residential with a moderate density; thus, a six-foot sidewalk with a four-foot buffer is required. The exception to this is Martin Luther King, Jr. Avenue which would be considered a Commercial roadway and therefore require a sidewalk with of 10 feet with a 4 foot buffer.

As can be seen in Figure 5, the majority of sidewalks in the study area do not meet the width standards. There are some sidewalks within the overall Curtis Properties footprint that meet the standards; however, there is a distinct sense of disconnect between pedestrian facilities because many roadways have substandard sidewalks or no sidewalks at all. In addition, Martin Luther King, Jr. Avenue does not meet the width requirements of a Commercial roadway. Under existing conditions, there are constraints in regards to the right-of-way width that do not allow for sidewalks to meet the requirements without extending across the property line. To help alleviate this issue, all new Curtis Properties buildings, including Building 1, will be set back from the property line in order to provide more space for pedestrians. Where possible, sidewalk improvements as part of the development will provide at least 10 feet of clear sidewalk along Martin Luther King, Jr. Avenue. Although the right-of-way constraints on Martin Luther King, Jr. Avenue prevent reaching the ideal 10 feet of clear width standard, the development improves substantially over existing conditions. In addition, sidewalk widths along Shannon Place, W Street, and V Street will be improved to better serve residents, employees, and patrons of the Curtis Properties development.

ADA standards require that all curb ramps be provided wherever an accessible route crosses a curb and must have a detectable warning. Curb ramps shared between two crosswalks are not desired. As shown in Figure 5 under existing conditions, there are some issues with crosswalks and curb ramps near the site. For the most part, crosswalks and curb ramps meet the standards along Martin Luther King, Jr. Avenue; more issues tend to arise at intersections within the surrounding neighborhoods where less vehicular and pedestrian traffic is observed. Within the perimeter of the Curtis Properties development, crosswalks and curb ramps will be updated to meet these standards.

Despite the deficiencies in the pedestrian network, most routes that connect the site to transit meet the sidewalk and intersection requirements. Particularly, the route between the site and the Anacostia Metrorail station along Shannon Place has sidewalks that meet the standards with very few insufficiencies at the intersection crossings.

Table 3: Sidewalk Requirements

Street Type	Minimum Sidewalk Width	Minimum Buffer Width
Residential (Low to Moderate Density)	6 ft	4 ft (6 ft preferred for tree space)
Residential (High Density)	8 ft	4 ft (6 ft preferred for tree space)
Commercial (Non-downtown)	10 ft	4 ft
Downtown	16 ft	6 ft

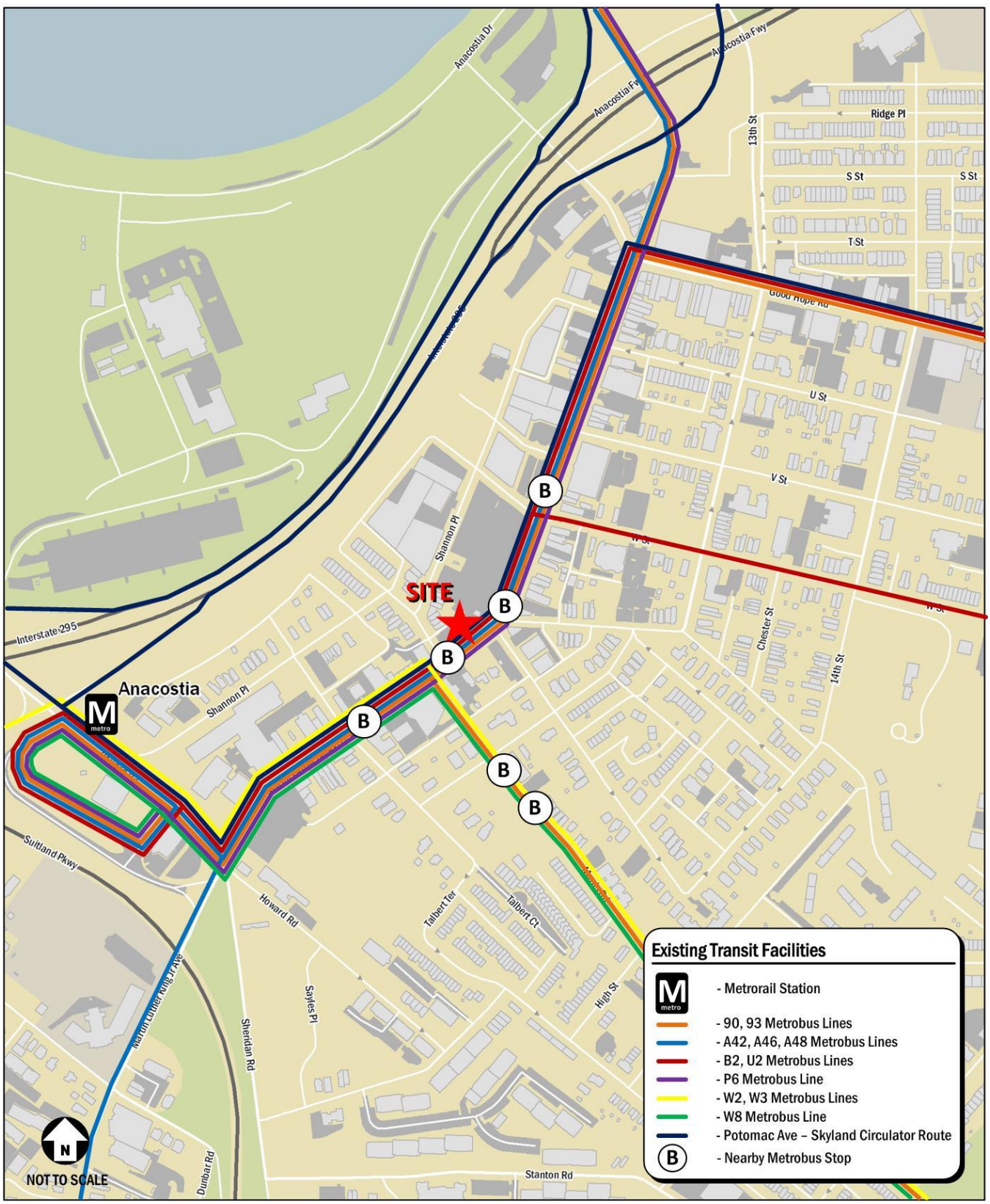


Figure 3: Existing Transit Facilities

Figure 4: Existing Bicycle Facilities

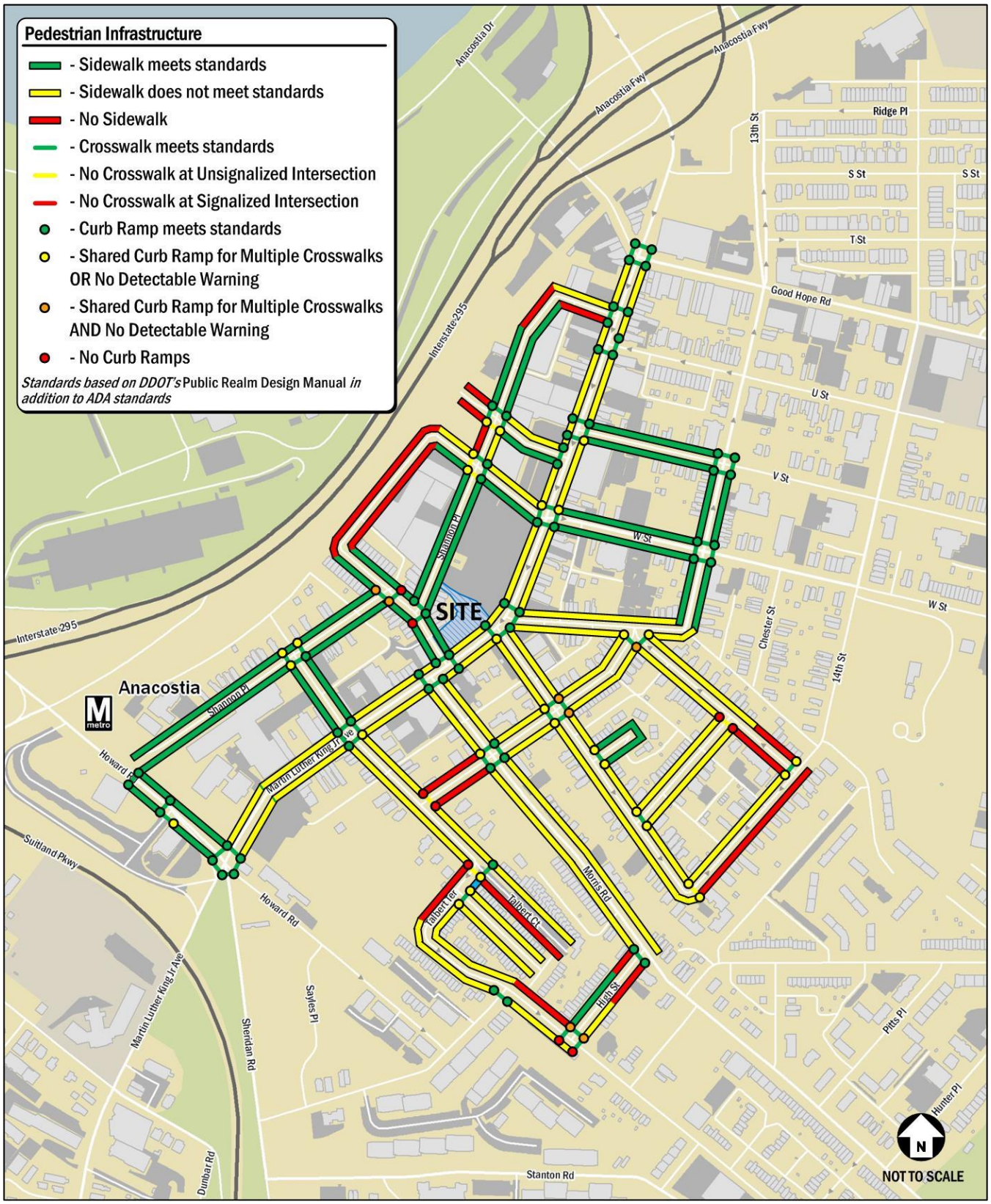


Figure 5: Pedestrian Infrastructure

DESIGN REVIEW

Parking

Off-Street Parking

Parking for residents at Building 1 will be accommodated by a 26-space below grade parking garage. Inbound and outbound vehicular traffic is expected to utilize Shannon Place and the extended alley. The location of the vehicular access is consistent with the Stage 1 PUD plans. The parking provided, however, has been modified from the Stage 1 PUD. The Stage 1 plans showed 33 parking spaces, while the Stage 1 plans show 26 spaces. Even with this small reduction, the amount of parking provided will accommodate the parking demand generated by the building.

On-Street Parking

Building 1 and the remainder of the Curtis Properties development are expected to provide an adequate amount of off-street parking to accommodate all demand. Although it is unlikely that Building 1 will create a significant amount of on-street parking impacts, there is a chance that the overall development will generate some on-street parking impacts. As part of the "Curtis Properties Stage 1 PUD – Supplemental Transportation Information Memorandum" compiled by Gorove/Slade in June of 2013, an on-street parking study was performed that analyzed the area within a 0.25 mile walk from the overall project boundaries, as shown in Figure 6. An inventory and occupancy count of these block faces was performed on June 6, 2013. Table 4 summarizes the counts.

Table 4: Summary of On-Street Parking

	Afternoon (2pm)			Evening (8pm)		
Space Type	Inventory	Occupancy	**Utilization**	Inventory	Occupancy	**Utilization**
Residential Permit Parking (RPP)	415	186	**45%**	415	184	**44%**
Unrestricted	1223	444	**36%**	1280	418	**33%**
Other	8	4	**50%**	8	1	**13%**
All On-Street Spaces	**1646**	**634**	**39%**	**1703**	**603**	**35%**

Based on the counts, the demand for on-street parking throughout the entire study area is fairly low. Specifically, within the overall development area, over one quarter of the all parking spaces remain available during the afternoon park hour. This indicates that at present an average block within the area to be redeveloped currently has 1-3 available parking spaces even during the afternoon period when office employee parking demand is at its peak. With the addition of dedicated off-street spaces for the office, residential, grocery, and retail components of the proposed Curtis site, most of the vehicles currently parking on-street that are generated by the existing office buildings should be relocated to the increased off-street parking supply in future conditions. Therefore, the future on-street spaces will see less long-term demand and will be able to more effectively serve short term parking demand from office visitors and the site's street-level retail shops.

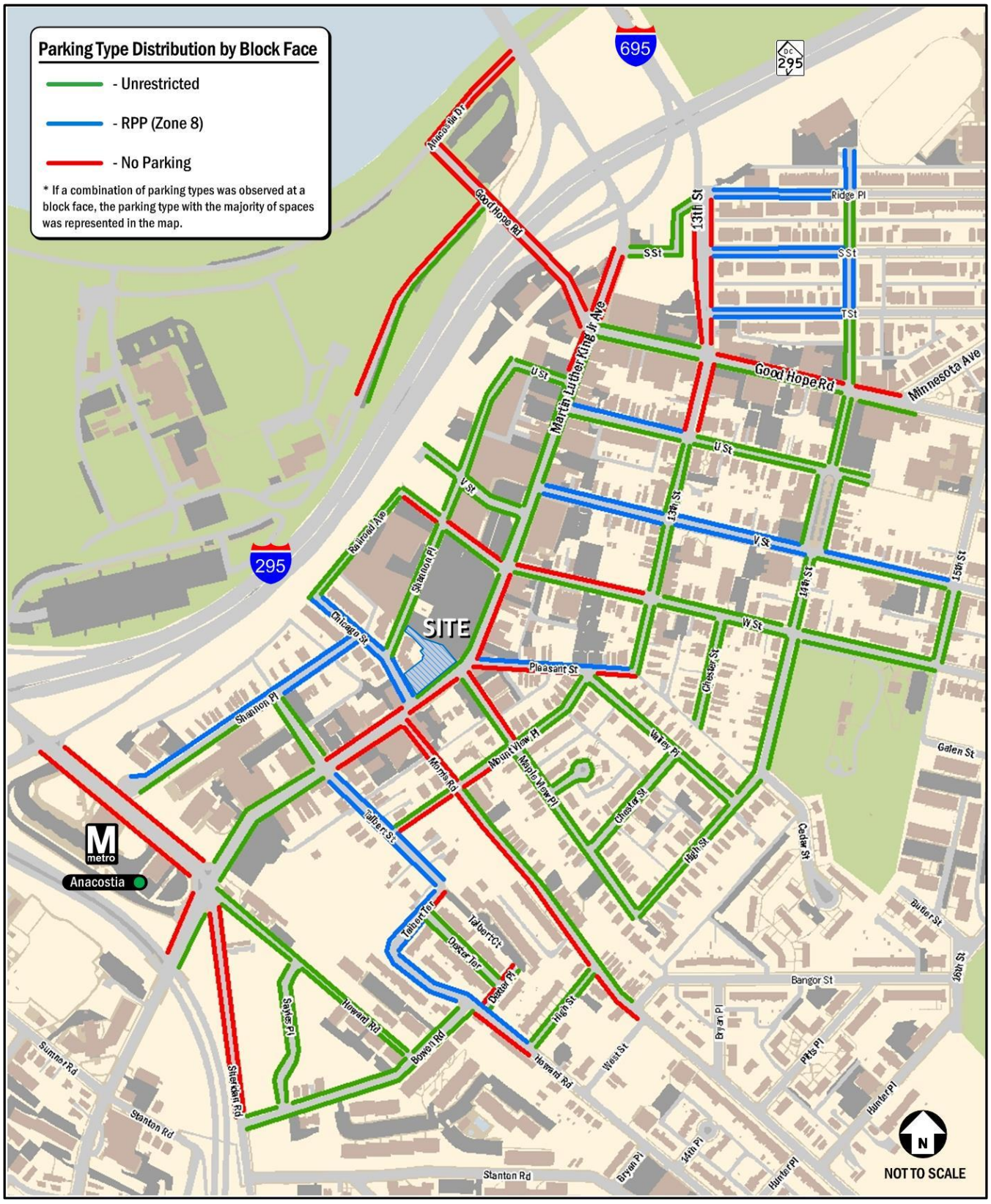


Figure 6: Existing On-Street Parking Inventory

Loading

Loading for Building 1 will be provided by a single loading dock accommodating trucks up to 30 feet. This loading plan follows the scheme shown in the Stage 1 PUD plans. The loading dock is designed such that inbound trucks enter at the alley along Chicago Street and exit from the extended alley segment to Shannon Place. Truck maneuvering diagrams detailing these maneuvers will be submitted prior to the hearing.

Curbside Management

Operational changes will be made to the curbside management of streets surrounding Building 1 as discussed below and shown in Figure 7:

- Two curb cuts will be abandoned: one along Martin Luther King, Jr. Avenue and one along Chicago Street.
- Due to the abandonment of the curb cut along Chicago Street, the parking spaces between Martin Luther King, Jr. Avenue and the existing alley can be shifted to the south. This allows for easier truck movements into the alley without eliminating any parking.
- The extension of the alley through to Shannon Place will result in the removal of one Residential Parking Permit (RPP) space. One unrestricted space across the street can be converted to an RPP space to maintain the amount of RPP spaces surrounding the site.

Bicycle & Pedestrian Accommodations

Building 1 includes 37 secure bicycle spaces located within the parking garage. This exceeds the current bicycle parking regulations, which requires one secure bicycle parking space per three residential units. In addition, bicycle racks located along the perimeter of the site will serve short-term bicycle parking needs, such as residential building visitors.

The development of Building 1 will improve the pedestrian and sidewalk accommodations on site. In addition to eliminating a curb cut along Martin Luther King, Jr. Avenue, the proposed PUD also widens the sidewalk in some locations. Surrounding Building 1, the sidewalk along Martin Luther King, Jr. Avenue will be widened. In addition a pedestrian path will be added along the existing alley and the extended alley section to allow the safe pedestrian accommodations along the entire perimeter of the site.

Transportation Demand Management

The following is the proposed TDM plan for Building 1, based on the Curtis Properties Stage 1 TDM plan with adjustments based on the specific land uses, layout of the site, and changes in TDM strategies in the intervening years. The goal of the TDM strategies is to minimize the impact of site traffic on the transportation network and promote the efficient use of transportation resources. TDM strategies are specifically tailored to promote travel modes that have the least impact on the transportation network and other resources, such as the environment, and discourage those that have the greatest impact.

- A member of the property management group will be a point of contact and will be responsible for coordinating, implementing, and monitoring the TDM strategies. This would include the development and distribution of informational and promotional brochures to visitors, patrons, and employees regarding transit facilities and services, walk and bicycle facilities and linkages, and car sharing.

- The project website will provide links to existing resources such as www.goDCgo.com, which provides transportation information and options for getting around the District. In addition, an electronic message board will be placed in the lobby that displays information such as real-time transit information for the closest bus or rail stops and bikes available at nearby Capital Bikeshare stations.
- Residents will be offered a SmarTrip card pre-paid with $20 to encourage the use of transit to be distributed when moving in. This program will be limited to one card per unit, and will only be employed on the initial move-in.
- The Applicant will provide a secure room inside the garage for long-term resident bicycle parking, and some racks outside for visitor or short-term bicycle parking. The development will provide a total of 37 secure bicycle parking spaces for use by residents in the parking garage.

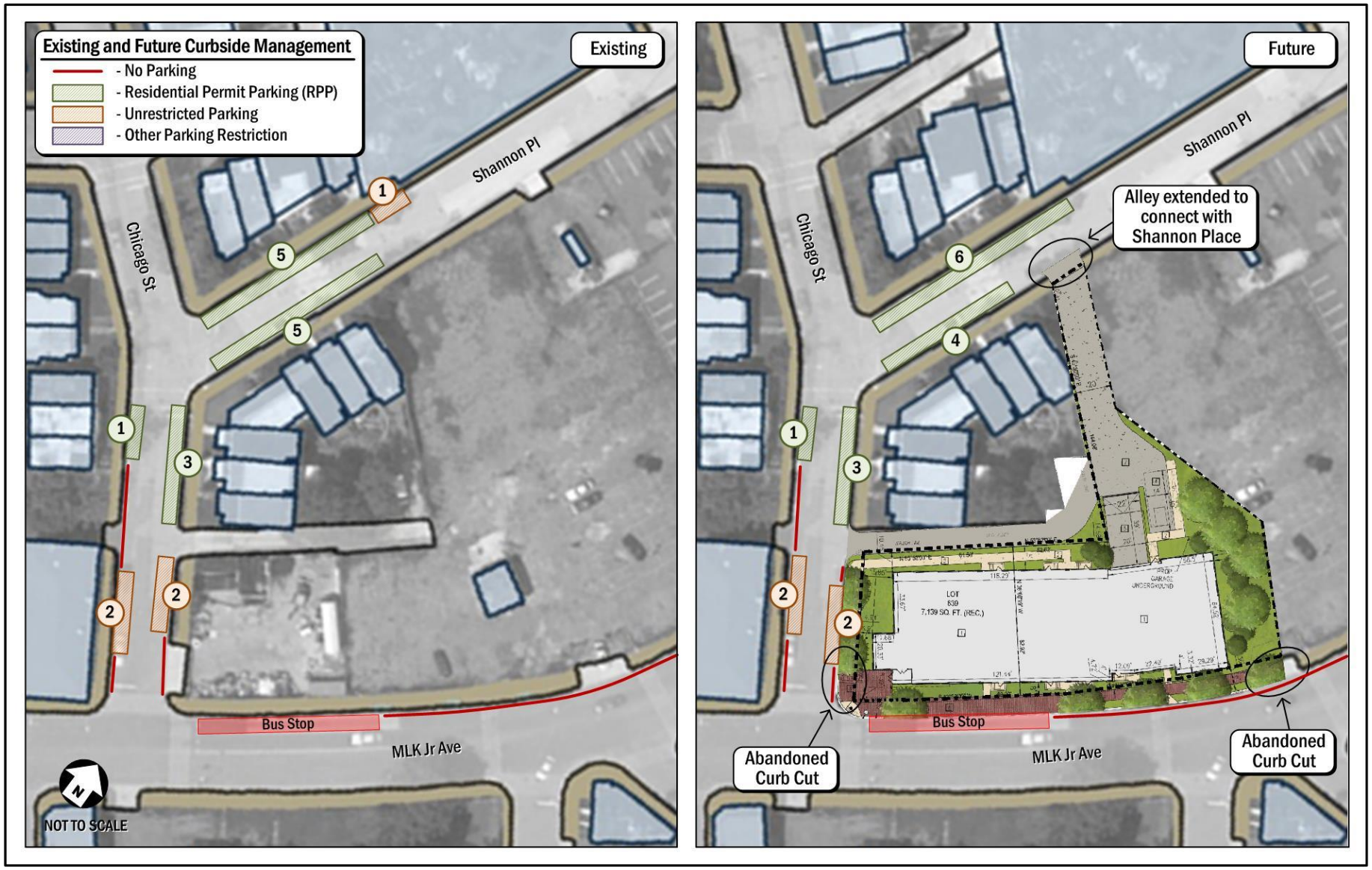


Figure 7: Existing and Future Curbside Management

IMPACTS REVIEW

This section of the report focuses on the influence and impact site generated traffic will have on the local transportation network, with the following purpose:

- To provide information to the District Department of Transportation (DDOT) and other agencies on how the development of the site will influence the local transportation network. This report accomplishes this by identifying the potential trips generated by the site on all major modes of travel and where these trips are expected to travel to and from.
- To determine if development of the site will lead to adverse impacts on the local transportation network. This report accomplishes this by projecting future conditions with and without development of the site and performing analysis of intersection delays. These delays are compared to the acceptable levels of delay set by DDOT standards to determine if the site will negatively impact the study area. The report describes what improvements to the transportation network are needed to mitigate adverse impacts.

Trip Generation

Trip Generation for Building 1 was calculated using the same methodology in the Curtis Properties Stage 1 study, in which the Institute of Transportation Engineers' (ITE) *Trip Generation,* 9th Ed was supplemented to account for the urban nature of the site. Trips were split into four modes: transit (consisting of both Metrorail and Metrobus/DC Circulator), walking, biking, and vehicle.

The mode split assumptions are based on data from the WMATA Ridership Survey for residential sites. However, as none of the sites surveyed resemble the proposed PUD, the mode split assumptions are based on the residential mode share data categorized by location typology. The mode share for all residential sites related as "Suburban-Inside the Beltway" had an average mode split of approximately 39% auto, 49% transit, and 14% walk & other. Additionally, census data from the 2008-2012 American Community Survey shows that Census Tract 75.03, which contains the site, had the following mode split: 57.7% auto, 40.2% transit, and 2.1% walk & other. However, as the site is located along the border of three Census Tracts, the average of these three Census Tracts near the site (74.01, 74.07, and 75.03) was also investigated. The census data showed that these three Census Tracts had the following average mode split: 55.1% auto, 39.1% transit, and 5.8% walk & other. Based on the Census information and the proposed parking ratio, a mode split of 45% auto, 45% transit, 7% walk, and 3% bike was assumed.

Table 5 summarizes the trip generation for Building 1 as well as the mode splits assumed. Building 1 will generate approximately:

- 18 vehicular trips, 20 transit trips, 3 walking trips, and 1 bicycle trips during the morning peak hour; and
- 26 vehicular trips, 28 transit trips, 5 walking trips, and 2 bicycle trips during afternoon peak hour

Table 5: Trip Generation for Building 1 by Mode

Trip Generation by Land Use & Mode		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Transit Person-Trips	45%	4	16	20	19	9	28
Walking Person-Trips	7%	1	2	3	3	2	5
Bicycling Person-Trips	3%	0	1	1	1	1	2
Vehicular Person-Trips	45%	4	15	19	18	10	28
Vehicle-Trips		***4***	***14***	***18***	***17***	***9***	***25***

This section details the vehicular trips generated in the study area along the vehicular access routes, defines the analysis assumptions, analyzes the vehicular impacts of the proposed development, and makes recommendations for improvements where needed.

Vehicular Impacts

Scope of Analysis

The purpose of the vehicular capacity analysis is to determine the existing conditions of the intersections located in the immediate vicinity of the proposed development. The following intersections were selected, as shown in Figure 8:

1. Martin Luther King, Jr. Avenue & W Street SE
2. Martin Luther King, Jr. Avenue & Maple View Place SE
3. Martin Luther King, Jr. Avenue & Pleasant Street SE
4. Martin Luther King, Jr. Avenue & Chicago Street SE
5. Martin Luther King, Jr. Avenue & Morris Road SE
6. Chicago Street & Shannon Place SE

Intersection capacity analyses were performed for the existing conditions at each intersection within the study area during the morning and afternoon peak hours, as well as for future conditions with and without the proposed development. The study scenarios are as follows:

- Existing Conditions (2014 Existing)
- Future Conditions without Development (2017 Background)
- Future Conditions with Development (2017 Future)

The *Synchro, Version 7.0* software package was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. The *Synchro* model was compiled using signal timings provided by DDOT and with lane configurations and traffic volumes collected by Gorove/Slade.

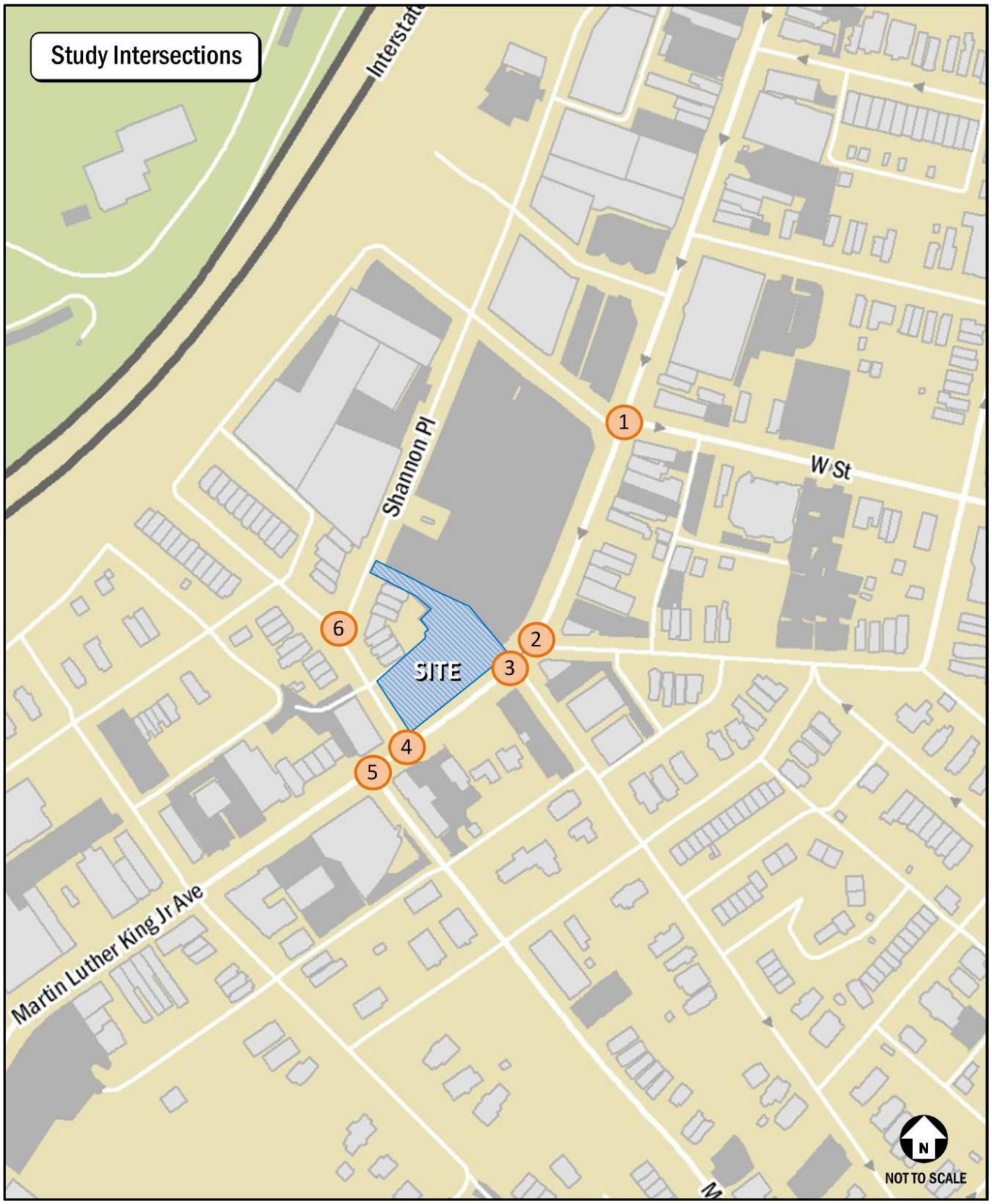


Figure 8: Study Intersections

Traffic Volume Assumptions

2014 Existing Conditions

The overall purpose of this study is to show what effect the proposed development will have on the transportation system in the study area. The existing conditions in and around the site are characterized in order to provide a foundation for assessing the transportation implications of the proposed development. This is determined by examining the peak traffic hours, which are directly associated with the characteristics of the site and the adjacent transportation system. These peak characteristics are found through analysis of existing count data.

DDOT and National standards require that traffic counts be conducted on a weekday, not including Monday or Friday, when traffic conditions can be described as "typical". This includes the consideration for adjacent uses, such as retail, special events, and recreation facilities and for major traffic generators, such as the area public school system or any large public or private institutions. Weekend and other off-peak periods are also often reviewed if the study area includes other uses that may be relatively inactive during the "typical" weekday.

The traffic counts conducted on a "typical" day are used to determine the morning and afternoon "peak hour" of traffic within the study area. According to the Highway Capacity Manual (HCM) methodologies, a one-hour analysis period is preferred. Analysis periods that exceed one hour are not usually used because traffic conditions are typically not steady for long time periods and because the adverse impact of short peaks in traffic demand may not be detected in a long time period. The "peak hour" represents the worst-case scenario, when the system traffic volumes are the highest. The use of a "typical" weekday morning and afternoon peak hours are used to ensure that conclusions regarding adverse impacts and their respective mitigation measures would apply to the vast majority of time roadways are used in the study area. Although there may be times when volume flows exceed these conditions, such as during special events, holiday weekends, or other times depending on the study area and site location, it is the industry standard to design transportation infrastructure for the peak times during "typical" weekdays.

In order to ensure that the data collected contains the peak hour, traffic counts are taken for a period of several hours during the morning and afternoon peak periods. From these peak periods, a peak hour is derived for both the morning and the afternoon time periods. According to the Transportation Impact Analyses for Site Development Manual published by the Institute of Transportation Engineers (ITE), data is generally collected during the weekday morning (7:00 to 9:00 AM) and afternoon (4:00 to 6:00 PM) peak hours. Although this is the standard, Gorove/Slade usually collects data for a three-hour (or longer) period to ensure that the peak hour is contained within the data collection timeframe.

The peak period counts are analyzed to determine the one hour during the morning and afternoon periods that contains the highest cumulative directional traffic demands. From each peak period count, the morning and afternoon "peak hours" are determined by summing up the four fifteen-minute consecutive time periods in the study area that experience the highest cumulative traffic volumes. These morning and afternoon "peak hours" are analyzed for the system of intersections investigated, choosing the "peak hour" of the entire system instead of each individual intersection.

Following the above guidelines, traffic counts, including vehicular and pedestrian volumes, were conducted by Gorove/Slade at the key study intersections between the hours of 6:30 and 9:30 AM and between 4:00 and 7:00 PM on Tuesday, June 10, 2014. This count date represents a "typical" weekday when the DC public school systems were in session, as well as the surrounding counties in Maryland and Virginia. This "typical" weekday represents times with normal operation for other major traffic generators in the study area (schools, Universities, US Congress, etc..). The results of the traffic counts are included in the Technical Appendix. The morning and afternoon peak hours for the system of

intersections being studied occurred between 7:30 – 8:30 AM and 5:00 – 6:00 PM, respectively. Peak hour traffic volumes for the existing conditions are included in the Technical Appendix the morning and afternoon peak hours.

2017 Future Conditions without Development (2017 Background)

The development is anticipated to be complete in 2017. The traffic projections for the future condition without the development consist of the traffic generated by background developments with planned completion by 2017 added to the existing traffic volumes. Only developments that meet the criteria of being approved and having an origin/destination within the study area are including in the 2017 Background scenario. One development fits these criteria: 2235 Shannon Place SE. This development is currently under construction and has a development plan of 80,549 square feet of office space. Utilizing the same trip generation assumptions as Building 1, it was determined that the 2235 Shannon Place development would generate 72 trips during the morning peak hour (64 inbound, 9 outbound) and 76 trips during the afternoon peak hour (13 inbound, 63 outbound).

In addition to the background developments, inherent growth on the study area roadways due to ambient growth in the vicinity of the site was accounted for based on data from the Metropolitan Washington Council of Governments (MWCOG) transportation planning models. Traffic projects along Martin Luther King, Jr. Avenue were analyzed to determine an annual growth based on direction and time period as shown in Table 6.

Table 6: MWCOG Generated Growth Rates along Martin Luther King, Jr. Avenue

Direction	Time Period	Growth rate between 2015 and 2017
Northeastbound	AM	0.0%
Northeastbound	PM	3.7%
Southwestbound	AM	3.3%
Southwestbound	PM	2.5%

The traffic volumes generated by the background developments were added to the 2014 existing traffic volumes in order to establish the 2017 background traffic volumes. The traffic volumes for the 2017 background conditions are included in the Technical Appendix for the morning and afternoon peak hours.

2017 Future Conditions with Development (2017 Total Future)

The future conditions with development scenario adds trips generated by the proposed development to the 2017 future conditions without development scenario. Regional traffic patterns were analyzed in order to determine the trip distribution for vehicles accessing the site, as shown in Figure 9.

The traffic volumes for the 2017 Total Future conditions were calculated by adding the site-generated traffic volumes to the 2017 background traffic volumes. Thus the future conditions with the proposed development include traffic generated by the existing volumes, background development through the year 2017, and the proposed Randall School development. The 2017 Total Future traffic volumes are included in the Technical Appendix for the morning and afternoon peak hours.

Vehicular Analysis Results

Intersection capacity analyses were performed for the three scenarios at the intersections contained within the study area during the morning and afternoon peak hours. *Synchro, Version 7.0* was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. The results of the capacity analyses are expressed in level of service

(LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS E is typically used as the acceptable LOS threshold in the District; however, LOS F is sometimes accepted in urbanized areas.

The LOS capacity analyses were based on: (1) the peak hour traffic volumes; (2) the lane use and traffic controls; and (3) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). The average delay of each approach and LOS is shown for the signalized intersections, in addition to the overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Appendix.

Table 7 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds) for the 2014 Existing and 2017 Background and Total Future scenarios.

In addition to the capacity analyses presented above, a queuing analysis was performed at the study intersections. The queuing analysis was performed using the *Synchro* software. The 50th percentile and 95th percentile maximum queue lengths are shown for each lane group at the study area signalized intersections. The 50th percentile maximum queue is the maximum back of queue on a typical cycle. The 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes. For unsignalized intersection, the 95th percentile queue is reported for each lane group (including free-flowing left turns and stop-controlled movements) based on the HCM calculations. The HCM does not give guidelines for calculating queues for an all-way stop-controlled intersection, so this information is not reported. Table 8 shows the queuing results for the study area intersections.

The majority of study intersections operate at acceptable conditions during the morning and afternoon peak hours for the 2014 Existing, 2017 Background, and 2017 Total Future scenarios. The exceptions to this are the following:

- The eastbound approach at the intersection of Martin Luther King, Jr. Avenue & W Street SE operates at an LOS F during the afternoon peak hour under existing, background, and total future conditions.
- The westbound approach at the intersection of Martin Luther King, Jr. Avenue & Pleasant Street SE operates at an LOS E during the afternoon peak hour under existing, background, and total future conditions.
- The eastbound approach at the intersection of Martin Luther King, Jr. Avenue & Chicago Street SE operates at an LOS E during the afternoon peak hour under existing conditions and at an LOS F under background and total future conditions; this approach also operates at an LOS E during the morning peak hour under total future conditions.
- The westbound approach of Martin Luther King, Jr. Avenue & Morris Road SE operates at an LOS E during the morning and afternoon peak hours under existing, background, and total future conditions.

Typically, a proposed development is considered to have an impact at an intersection if the capacity analyses yield an LOS E or an LOS F in the future with the proposed development where it does not in the future without the proposed development. This is only the case for the eastbound approach at the intersection of Martin Luther King, Jr. Avenue & Chicago Street SE during the morning peak hour. Although this is the only movement in which an LOS E or F is attributable to the development the following section of the report reviews potential ways to address unacceptable conditions at all of the study intersections, as requested by DDOT during the scoping process.

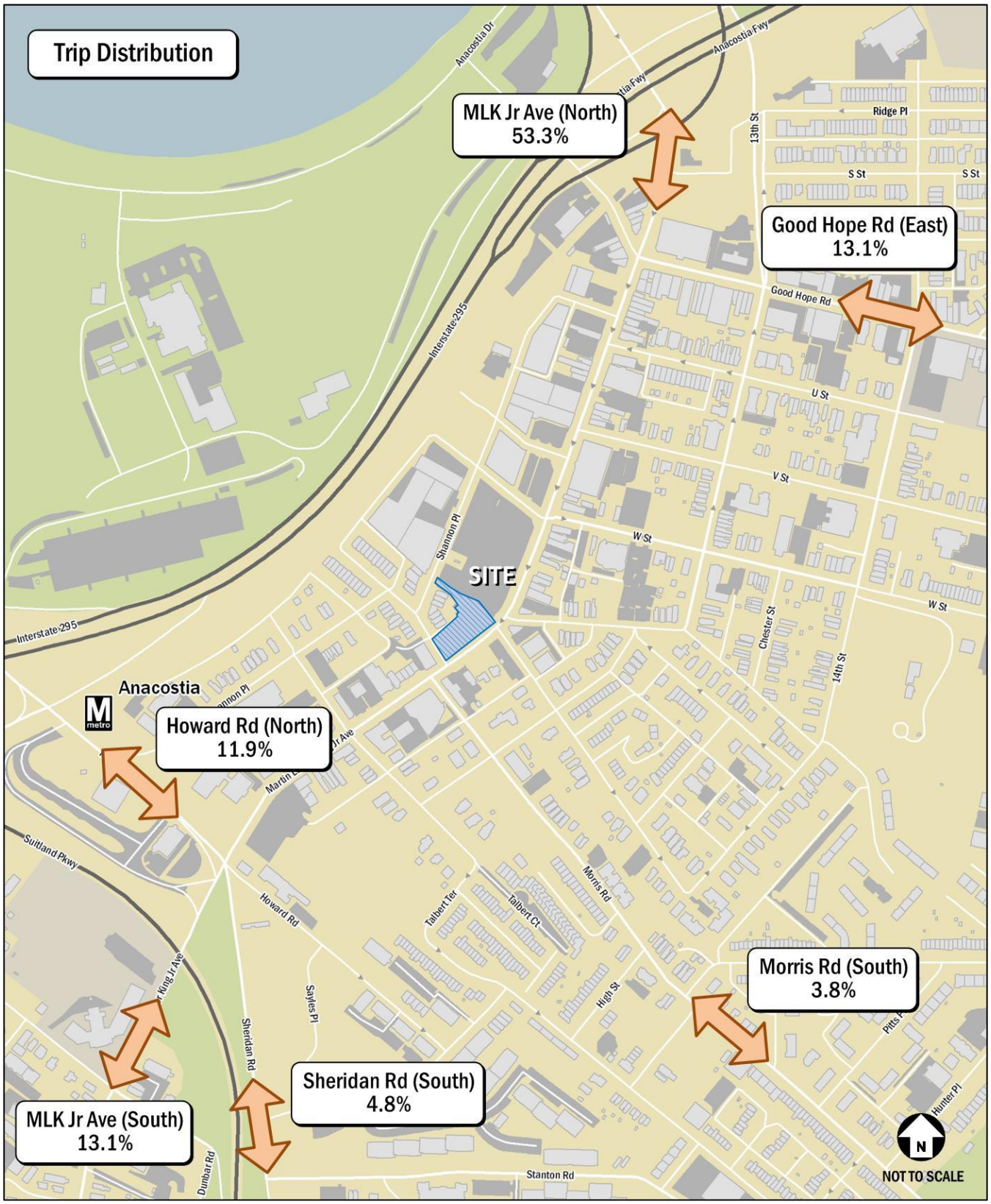


Figure 9: Trip Distribution

Table 7: Intersection Capacity Analysis Results

Intersection	Approach	Existing Conditions (2014)				Future Background Conditions (2017)				Total Future Conditions (2017)			
		AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Martin Luther King, Jr. Avenue & W Street SE	**Overall**	**5.8**	**A**	**18.4**	**B**	**5.5**	**A**	**18.0**	**B**	**5.5**	**A**	**17.9**	**B**
	Eastbound	48.0	D	82.9	F	48.0	D	82.9	F	48.0	D	82.9	F
	Northbound	4.4	A	4.3	A	4.0	A	4.3	A	3.9	A	4.2	A
	Southbound	3.8	A	8.3	A	3.9	A	9.1	A	4.0	A	9.3	A
Martin Luther King, Jr. Avenue & Maple View Place SE	Westbound	12.8	B	13.2	B	13.0	B	14.4	B	13.1	B	14.5	B
	Southbound Left	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
Martin Luther King, Jr. Avenue & Pleasant Street SE	Westbound	28.9	D	35.3	E	32.6	D	43.5	E	33.4	D	44.5	E
	Southbound Left	1.2	A	2.1	A	1.0	A	2.2	A	1.0	A	2.2	A
Martin Luther King, Jr. Avenue & Chicago Street SE	**Overall**	**9.5**	**A**	**10.7**	**B**	**11.4**	**B**	**20.8**	**C**	**12.4**	**B**	**24.4**	**C**
	Eastbound	52.4	D	56.3	E	53.9	D	128.2	F	58.5	E	153.1	F
	Northbound	1.0	A	1.0	A	1.9	A	1.1	A	2.0	A	1.1	A
	Southbound	19.9	B	13.1	B	20.4	C	12.7	B	20.4	C	12.7	B
Martin Luther King, Jr. Avenue & Morris Road SE	**Overall**	**26.0**	**C**	**14.8**	**B**	**25.4**	**C**	**14.4**	**B**	**25.4**	**C**	**14.4**	**B**
	Westbound	59.5	E	67.4	E	59.8	E	67.4	E	60.2	E	67.4	E
	Northbound	22.8	C	13.6	B	23.0	C	13.9	B	23.0	C	13.9	B
	Southbound	1.8	A	2.1	A	1.5	A	2.5	A	1.5	A	2.4	A
Chicago Street & Shannon Place SE	Eastbound Left	3.2	A	5.2	A	3.3	A	5.2	A	3.3	A	5.2	A
	Southbound	9.1	A	9.3	A	9.7	A	10.1	B	9.9	A	10.3	B

Table 8: Queuing Analysis Results

Intersection	Approach	Storage Length (ft)	Existing Conditions (2014)				Future Background Conditions (2017)				Total Future Conditions (2017)			
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
			50th	95th	50th	95th	50th	95th	50th	95th	50th	95th	50th	95th
Martin Luther King, Jr. Avenue & W Street SE	Eastbound	169	22	32	189	157	22	32	189	157	22	32	189	157
	Northbound	304	85	109	63	88	85	113	74	m101	85	110	75	m101
	Northbound Right	304	0	4	0	9	0	4	0	m6	0	4	0	m5
	Southbound	121	39	43	169	161	50	53	194	182	51	53	199	186
Martin Luther King, Jr. Avenue & Chicago Street SE	Eastbound	119	16	29	21	55	23	37	100	#190	42	55	~122	#211
	Southbound	140	108	132	155	m195	132	157	171	m207	133	158	174	m208
Martin Luther King, Jr. Avenue & Morris Road SE	Westbound	260	229	#385	104	#206	230	#387	104	#206	231	#390	104	#208
	Northbound	254	152	197	90	121	158	205	102	135	158	205	103	136

- 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m - Volume for 95th percentile queue is metered by upstream signal.
~ - Volume exceeds capacity, queue is theoretically infinite. Queue shown is max after two cycles.

Potential Improvements

This section of the report reviews potential ways to address unacceptable conditions at the study intersections. The following is the only movement with unacceptable conditions attributable to the site:

- The eastbound approach at the intersection of Martin Luther King, Jr. Avenue & Chicago Street SE during the morning peak hour

For the remaining movements, potential improvements are provided for informational purposes only, and are not intended to become mitigations for the PUD approval. These locations are:

- The eastbound approach at the intersection of Martin Luther King, Jr. Avenue & W Street SE during the afternoon peak hour
- The westbound approach at the intersection of Martin Luther King, Jr. Avenue & Pleasant Street SE during the afternoon peak hour
- The eastbound approach at the intersection of Martin Luther King, Jr. Avenue & Chicago Street SE during the afternoon peak hour
- The westbound approach of Martin Luther King, Jr. Avenue & Morris Road SE during the morning and afternoon peak hour

The common thread between these locations is that they are all side-streets approaches to Martin Luther King, Jr. Avenue. Potential improvements to these include signal timing adjustments and travel/parking lane marking changes. Both of these options were evaluated at all study intersections operating under unacceptable conditions. Improvements that were considered feasible and effective were analyzed using the *Synchro* software. A comparison of the capacity analysis results with improvements is shown in Table 9.

- *Martin Luther King, Jr. Avenue & W Street SE*
  The most effective way to reduce delay at this intersection is to allocate more green time to the W Street approach during the afternoon peak hour. As little as six seconds of green time shifted to W Street from Martin Luther King, Jr. Avenue improves the overall operations of the intersection.

- *Martin Luther King, Jr. Avenue & Pleasant Street SE*
  This intersection currently operates as a stop-controlled intersection where traffic at Pleasant Street must stop and Martin Luther King, Jr. Avenue is free-flowing. Due to the low volumes and close proximity with the adjacent intersection, a signal at this intersection would not be a feasible option. Pleasant Street is also too narrow to accommodate separate right and left turn lanes. Therefore, no improvements are suggested for this intersection at this time.

- *Martin Luther King, Jr. Avenue & Chicago Street SE/Morris Road SE*
  Due to the close proximity of Chicago Street and Morris Road, the signals must operate at a split phase under one controller. For this reason, signal timing adjustments with the existing lane configuration are not capable of improving the overall operations. However, signal timing adjustments in coordination with changes to the parking restrictions along Chicago Street are shown to greatly help the overall operations at both intersections. Because Chicago Street has a wider cross section that Morris Road it can accommodate a right and left turn lane by

restricting some parking along Chicago Street. This option would eliminate several Residential Parking Permit (RPP) on-street parking spaces. This concept is presented for DDOT and the surrounding community to review, as it presents an improvement of traffic operations at the cost of residential on-street parking supply.

Table 9: Summary of Capacity Analysis Results with Improvements

Intersection	Approach	Future Background Conditions (2017)				Future Background Conditions (2017) - with improvements			
		AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Martin Luther King, Jr. Avenue & W Street SE	**Overall**	**5.5**	**A**	**17.9**	**B**	**4.5**	**A**	**17.1**	**B**
	Eastbound	48.0	E	82.9	F	48.0	D	54.0	D
	Northbound	3.9	A	4.2	A	2.0	A	7.4	A
	Southbound	4.0	A	9.3	A	4.0	A	13.0	B
Martin Luther King, Jr. Avenue & Pleasant Street SE	Westbound	33.4	D	44.5	E	32.8	D	37.8	E
	Southbound Left	1.0	A	2.2	A	1.0	A	2.1	A
Martin Luther King, Jr. Avenue & Chicago Street SE	**Overall**	**12.4**	**B**	**24.4**	**C**	**13.1**	**B**	**15.4**	**B**
	Eastbound	58.5	E	153.1	F	50.4	D	52.2	D
	Northbound	2.0	A	1.1	A	2.3	A	1.3	A
	Southbound	20.4	C	12.7	B	23.0	C	18.0	B
Martin Luther King, Jr. Avenue & Morris Road SE	**Overall**	**25.4**	**C**	**14.4**	**B**	**25.3**	**C**	**15.5**	**B**
	Westbound	60.2	E	67.4	E	53.7	D	54.1	D
	Northbound	23.0	C	13.9	B	26.0	C	18.5	B
	Southbound	1.5	A	2.4	A	2.3	A	4.3	A

Crash Data

This section of the report reviews available crash data within the study area, reviews potential impacts of the proposed development on crash rates, and makes recommendations for mitigation measures where needed.

Summary of Available Crash Data

A crash analysis was performed to determine if there was an abnormally high accident rate at any study area intersection. The District Department of Transportation (DDOT) provided the last three years of intersection crash data, from 2011 to 2013. This data set included all intersections adjacent to the site. This data was reviewed and analyzed to determine the crash rate at each location. For intersections, the crash rate is measure in accidents per million-entering vehicles (MEV). The accident rates per intersections are shown in Table 10.

According to the Institute of Transportation Engineer's Transportation Impact Analysis for Site Development, a crash rate of 1.0 or higher is an indication that further study is required. Three intersections in this study area meet this criterion (as shown in red in Table 10 and detailed in Table 11). The proposed site needs to be developed in a manner to help alleviate, or at minimum not add to, the conflicts at these intersections.

Table 10: Intersection Crash Rates

Intersection	Total Crashes	Ped Crashes	Bike Crashes	Rate per

				MEV*
Martin Luther King, Jr. Ave & W St SE	27	2	0	**1.97**
Martin Luther King, Jr. Ave & Pleasant St/Maple View Pl SE	7	0	0	0.53
Martin Luther King, Jr. Ave & Chicago St/Morris Rd SE	24	0	0	**2.43**
Chicago St & Shannon Pl SE	2	0	0	**2.20**

** - Million Entering Vehicles; Volumes estimated based on turning movement count data*

The crash summary data in Table 10 shows three intersections with a crash rate over 1.0 crashes per million entering vehicles – the rate which is considered a threshold for further analysis. A rate over 1.0 does not necessarily mean there is a significant problem at an intersection, but rather it is a threshold used to identify which intersections may have higher crash rates due to operational, geometric, or other issues.

For these three intersections, the crash type information from the DDOT crash data was reviewed to see if there is a high percentage of certain crash types. Generally, the reasons for why an intersection has a high crash rate cannot be derived from crash data, as the exact details of each crash are not represented. However, some summaries of crash data can be used to develop general trends or eliminate some possible causes. Table 11 contains a breakdown of crash types reported for the three intersections with a crash rate over 1.0 per MEV.

Table 11: Breakdown of Intersections with a High Crash Rate

Intersection	Rate per MEV	Right Angle	Left Turn	Right Turn	Rear End	Side Swiped	Head On	Parked	Fixed Object	Ran Off Road	Ped. Involved	Backing	Non-Collision	Under/Over Ride	Unspecified	Total
Martin Luther King, Jr. Ave & W St SE	**1.97**	0	1	4	0	15	0	0	1	1	2	1	0	0	2	**27**
		0%	*4%*	*15%*	*0%*	*56%*	*0%*	*0%*	*4%*	*4%*	*7%*	*4%*	*0%*	*0%*	*7%*	
Martin Luther King, Jr. Ave & Chicago St/Morris Rd SE	**2.43**	2	3	1	5	7	0	0	3	0	2	0	0	0	1	**24**
		8%	*13%*	*4%*	*21%*	*29%*	*0%*	*0%*	*13%*	*0%*	*8%*	*0%*	*0%*	*0%*	*4%*	
Chicago St & Shannon Pl SE	**2.20**	0	0	0	0	1	0	0	0	0	0	1	0	0	0	**2**
		0%	*0%*	*0%*	*0%*	*50%*	*0%*	*0%*	*0%*	*0%*	*0%*	*50%*	*0%*	*0%*	*0%*	

Potential Impacts

This section reviews the three locations with existing crash rates over 1.0 MEV and reviews potential impacts of the proposed development.

- *Martin Luther King, Jr. Avenue & W Street SE*

  This intersection was found to have a high crash rate, with 1.97 crashes per MEV over the course of the 3-year study period. The majority of the crashes at this intersection were side swiped vehicles. In this case, side swipe crashes are likely due to vehicles making a last-second lane change to get around a vehicle waiting for a gap to make a left turn from a shared through/left lane or as a result of significant on-street parking which may result in swipe crashes when vehicles pull out of parking spaces without looking. The Stage 1 PUD proposes to alter the geometry of the intersection slightly, aligning the east-west approaches in a manner that should improve

operations, sight lines, and potential crash rates. This improvement will occur when the Parcels adjacent to the intersection are developed.

- *Martin Luther King, Jr. Avenue & Chicago Street/Morris Road SE*
  This intersection was found to have a high crash rate, with 2.43 crashes per MEV over the course of the 3-year study period. The majority of the crashes at this intersection were side swiped vehicles. Side swipe crashes can often occur when a vehicle going straight through an intersection makes a last-second lane change to get around a vehicle waiting for a gap to make a left turn from a shared through/left lane. This report does not recommend mitigation measures, as the development is not projected to make significant changes to the commuting patterns, operations, or geometry at this intersection.

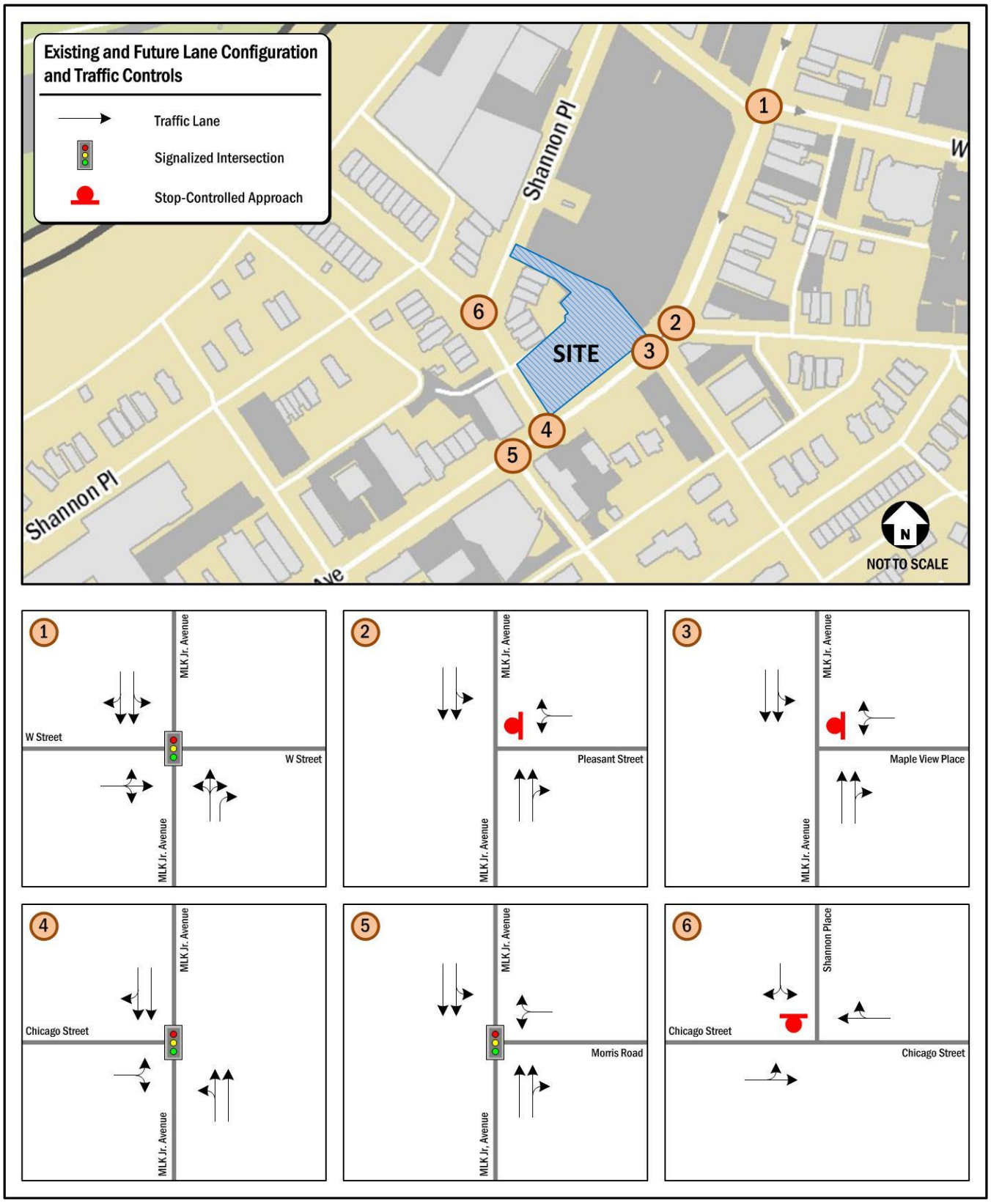
- *Chicago Street & Shannon Place SE*
  This intersection was found to have a high crash rate, with 2.20 crashes per MEV over the course of the 3-year study period; however, there are only two crashes total at this intersection over the course of the study period. The elevated crash rate is more likely generated by the low volume at the intersection. Overall, the distribution of crash types at the intersection does not lead to a likely safety issue at the intersection.

CONCLUSIONS

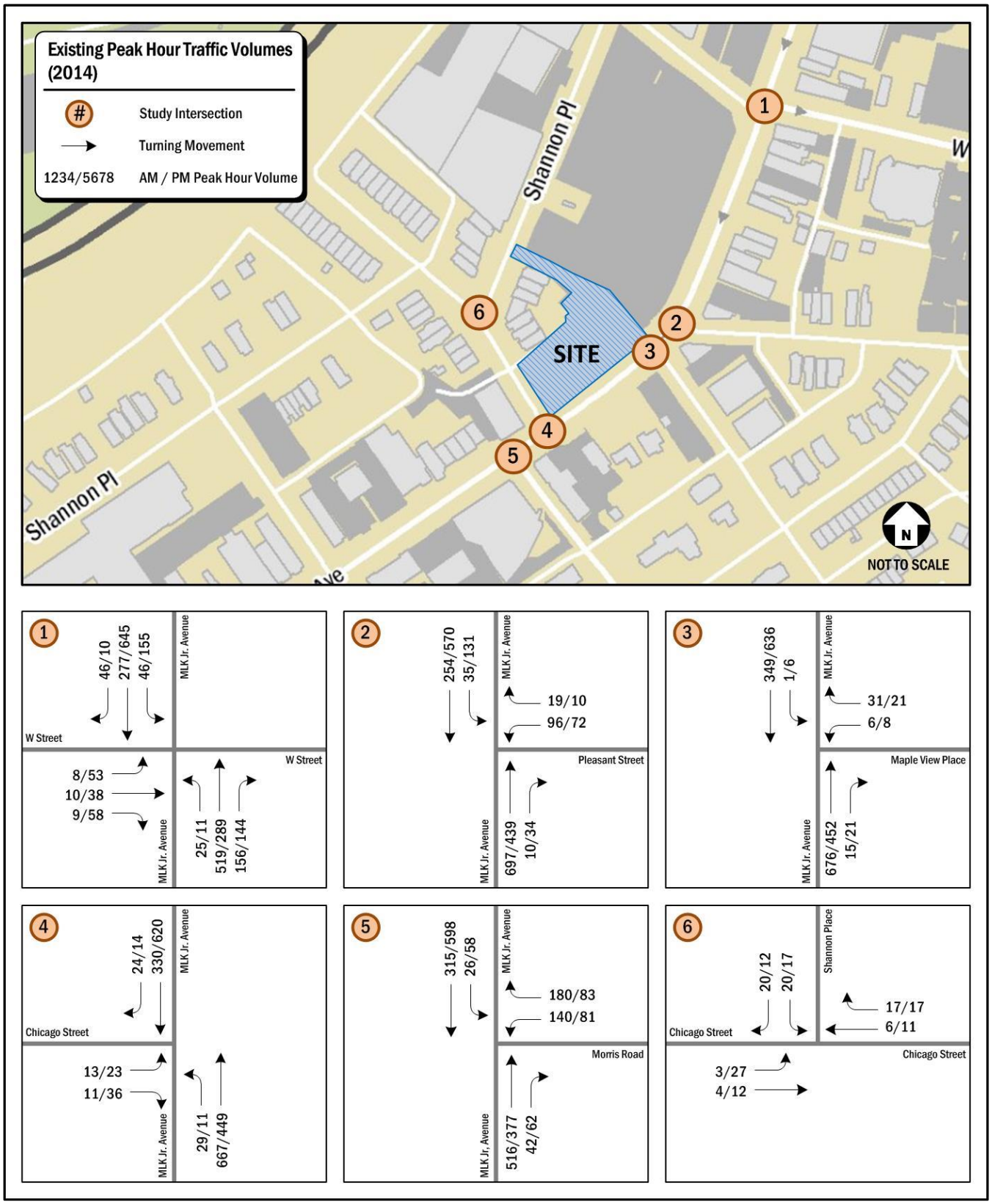
The evaluation contained within this memorandum concludes that the development of Building 1 will not have a detrimental impact to the surrounding neighborhood or transportation system, for the following reasons:

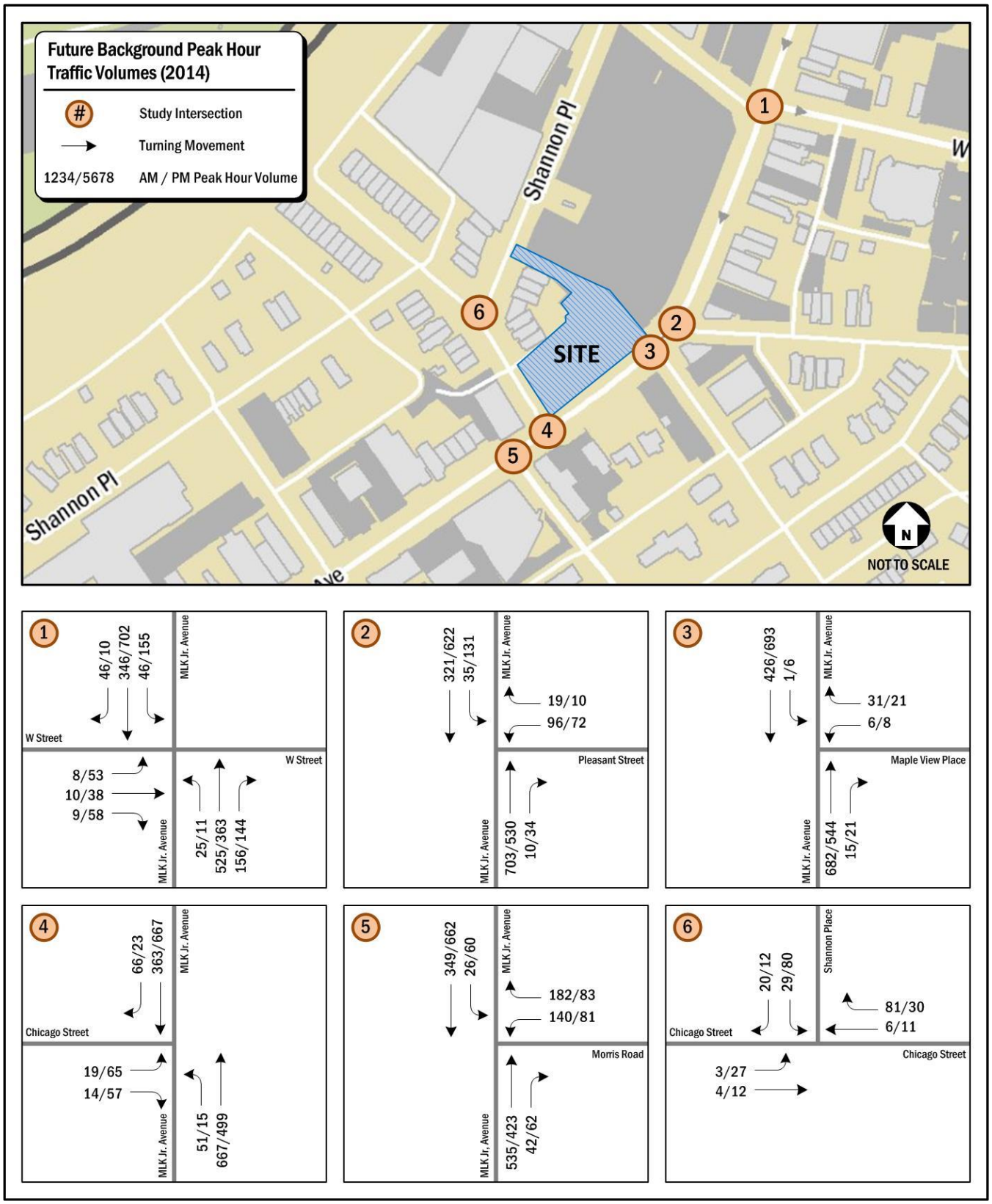
- There is abundant access to public transit near the site; a Metrorail station is located within a half mile and several Metrobus lines are located within a quarter mile of the site.
- Residents of Building 1 will have ample access to bicycle and pedestrian facilities and improvements to the overall pedestrian and bicycle environment around the site will be implemented as part of the development.
- An appropriate amount of loading facilities and parking spaces will be provided to serve the site.
- A robust Transportation Demand Management plan will be implemented to promote non-auto modes of transportation to and from the site.
- The Building 1 development will generate a very small amount of new vehicular traffic. A capacity analysis of nearby intersections showed that these new trips will have a small impact on operations and traffic, in some cases lengthening delays on side street approaches to Martin Luther King Jr. Avenue. This evaluation reviews how this and other existing traffic concerns can be alleviated through signal timing and/or lane marking adjustments.

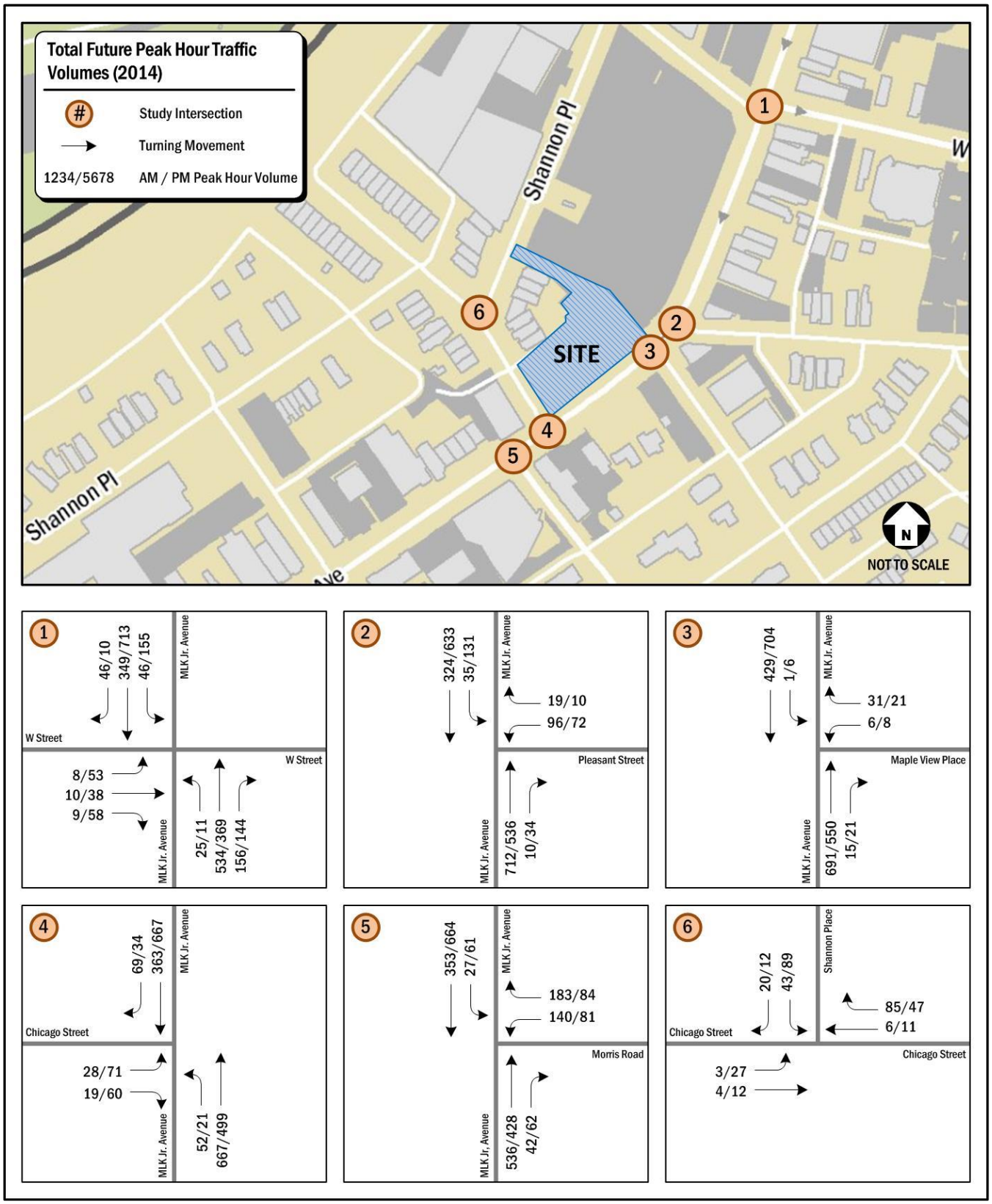
APPENDIX A –
LANE CONFIGURATION AND TRAFFIC CONTROL


Existing and Future Lane Configuration and Traffic Controls
Traffic Lane
Signalized Intersection
Stop-Controlled Approach
Shannon Pl
SITE
1
2
3
4
5
6
N
NOT TO SCALE
MLK Jr. Avenue
W Street
Pleasant Street
Maple View Place
Chicago Street
Morris Road
Shannon Place

APPENDIX B –
MORNING AND AFTERNOON PEAK HOUR TRAFFIC VOLUMES


Existing Peak Hour Traffic Volumes (2014)
Study Intersection
Turning Movement
1234/5678 AM / PM Peak Hour Volume
Shannon Pl
SITE
NOT TO SCALE
1
W Street
MLK Jr. Avenue
46/10
277/645
46/155
8/53
10/38
9/58
25/11
519/289
156/144
2
Pleasant Street
254/570
35/131
19/10
96/72
697/439
10/34
3
Maple View Place
349/636
1/6
31/21
6/8
676/452
15/21
4
Chicago Street
24/14
330/620
13/23
11/36
29/11
667/449
5
Morris Road
315/598
26/58
180/83
140/81
516/377
42/62
6
Shannon Place
20/12
20/17
17/17
6/11
3/27
4/12


Future Background Peak Hour Traffic Volumes (2014)
Study Intersection
Turning Movement
1234/5678 AM / PM Peak Hour Volume
Shannon Pl
SITE
NOT TO SCALE
1
W Street
MLK Jr. Avenue
46/10
346/702
46/155
8/53
10/38
9/58
25/11
525/363
156/144
2
321/622
35/131
19/10
96/72
Pleasant Street
703/530
10/34
3
426/693
1/6
31/21
6/8
Maple View Place
682/544
15/21
4
Chicago Street
66/23
363/667
19/65
14/57
51/15
667/499
5
349/662
26/60
182/83
140/81
Morris Road
535/423
42/62
6
Shannon Place
20/12
29/80
81/30
6/11
Chicago Street
3/27
4/12


Total Future Peak Hour Traffic Volumes (2014)
Study Intersection
Turning Movement
1234/5678 AM / PM Peak Hour Volume
Shannon Pl
SITE
NOT TO SCALE
1
W Street
MLK Jr. Avenue
46/10
349/713
46/155
8/53
10/38
9/58
25/11
534/369
156/144
2
Pleasant Street
324/633
35/131
19/10
96/72
712/536
10/34
3
Maple View Place
429/704
1/6
31/21
6/8
691/550
15/21
4
Chicago Street
69/34
363/667
28/71
19/60
52/21
667/499
5
Morris Road
353/664
27/61
183/84
140/81
536/428
42/62
6
Shannon Place
Chicago Street
20/12
43/89
85/47
6/11
3/27
4/12

APPENDIX C –
DETAILED LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

All capacity analyses are based on the procedures specified by the Transportation Research Board, Special Report 209: Highway Capacity Manual (HCM), 2000. Levels of service (LOS) range from A to F. A brief description of each level of service for signalized and unsignalized intersections is provided below.

Signalized Intersections: Level of service is based upon the traffic volume present in each lane on the roadway, the capacity of each lane at the intersection and the delay associated with each directional movement. The levels of service for signalized intersections are defined below:

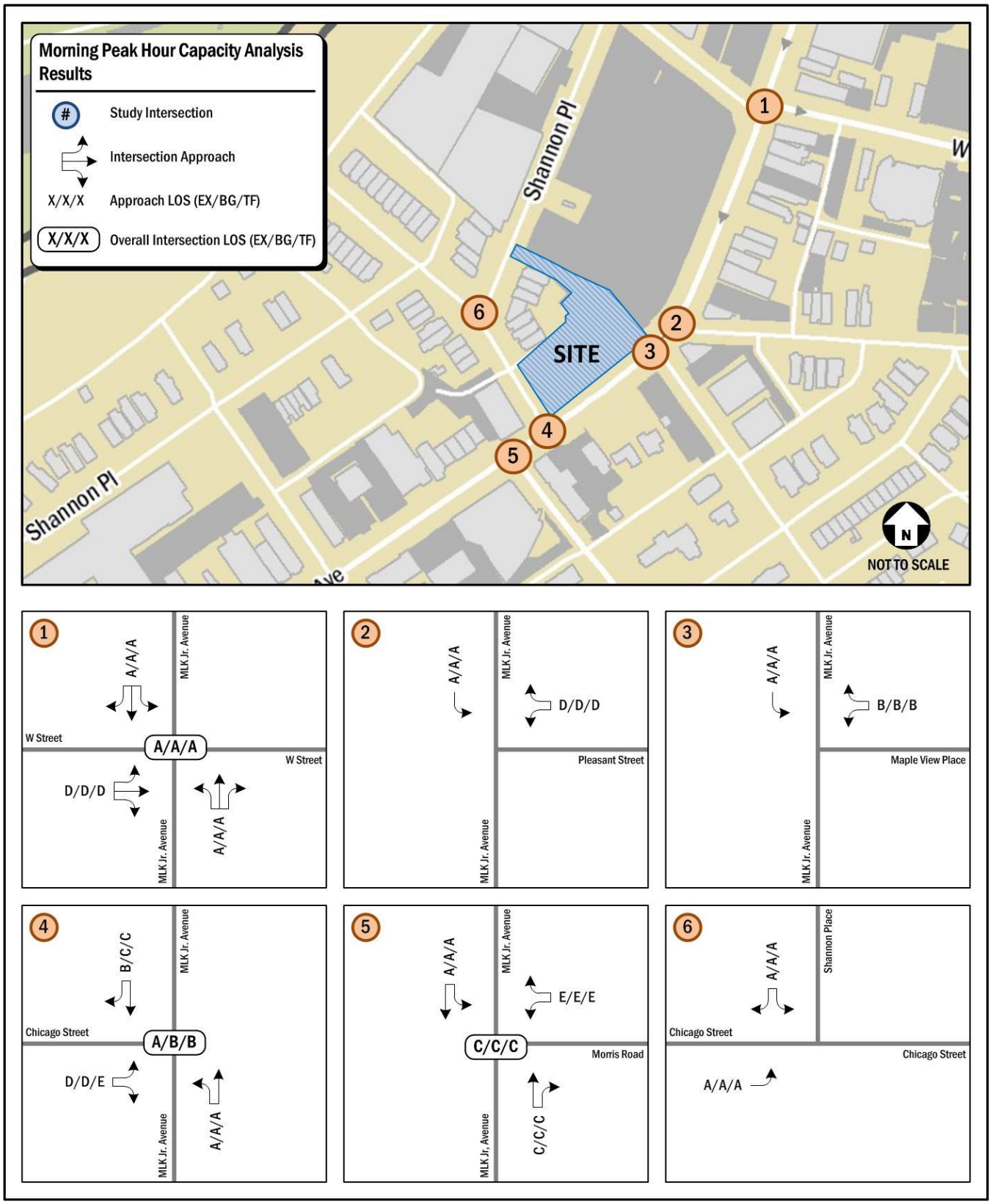
- Level of Service A describes operations with very low average delay per vehicle, i.e., less than 10.0 seconds. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop. Short signal cycle lengths may also contribute to low delay.
- Level of Service B describes operations with average delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
- Level of Service C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level although many still pass through the intersection without stopping. This is generally considered the lower end of the range of the acceptable level of service in rural areas.
- Level of Service D describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and/or high traffic volumes as compared to the roadway capacity. Many vehicles are required to stop and the number of vehicles that do not have to stop declines. Individual signal cycle failures, where all waiting vehicles do not clear the intersection during a single green time, are noticeable. This is generally considered the lower end of the range of the acceptable level of service in urban areas.
- Level of Service E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high traffic volumes. Individual cycle failures are frequent occurrences. LOS E has been set as the limit of acceptable conditions.
- Level of Service F describes operations with average delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over-saturation, i.e., when traffic arrives at a flow rate that exceeds the capacity of the intersection. It may also occur at high volumes with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such delays.

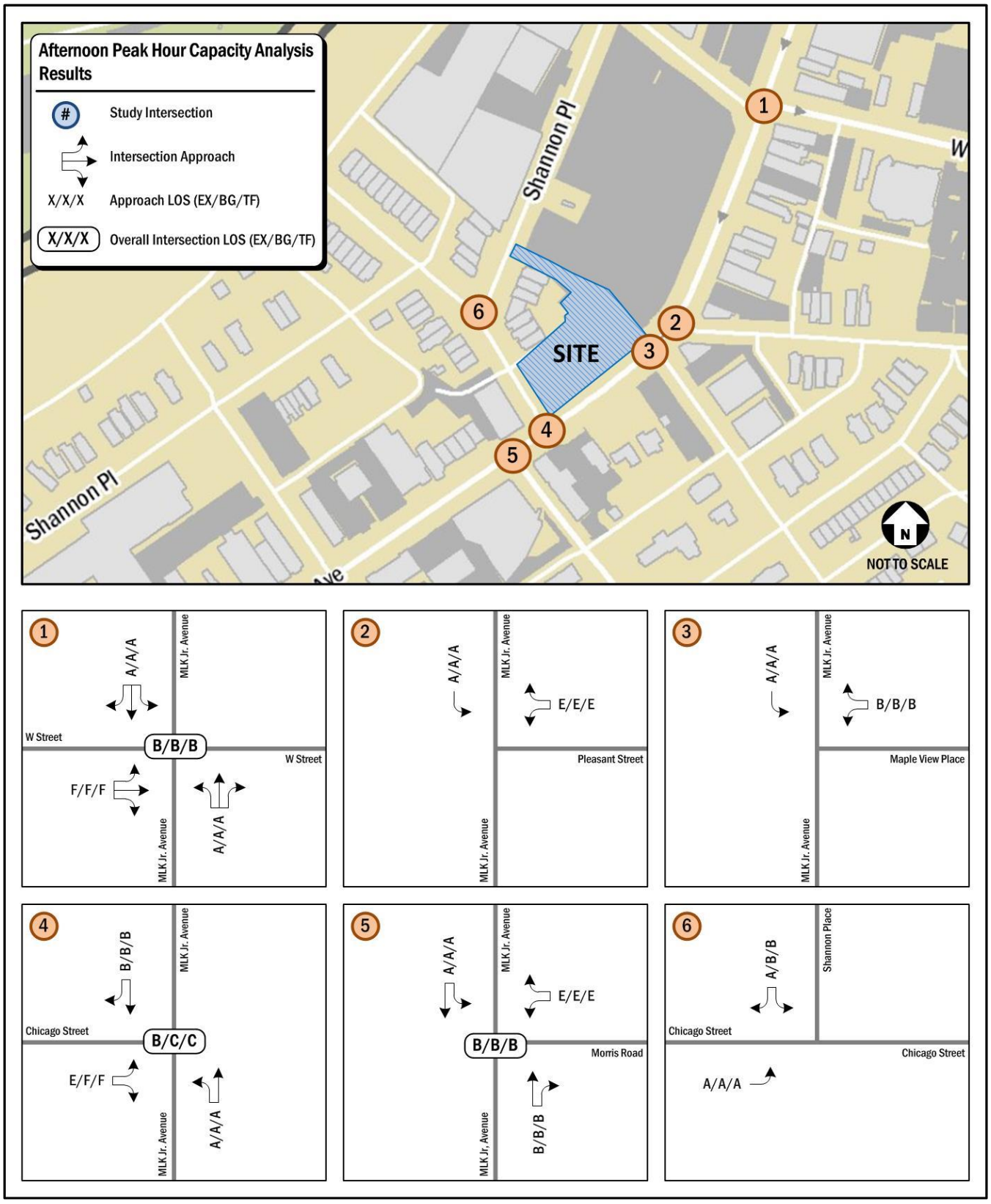
Unsignalized Intersections: At an unsignalized intersection, the major street through traffic and right turns are assumed to operate unimpeded and therefore receive no level of service rating. The level of service for the minor street and the major street left turn traffic is dependent on the volume and capacity of the available lanes, and, the number and frequency of acceptable gaps in the major street traffic to make a conflicting turn. The level of service grade is provided for each conflicting movement at an unsignalized intersection and is based on the total average delay experienced by each vehicle. The delay includes the time it takes a vehicle to move from the back of a queue through the intersection.

The unsignalized intersection level of service analysis does not account for variations in driver behavior or the effects of nearby traffic signals. Therefore, the results from this analysis usually indicate worse levels of service than may be experienced in the field. The unsignalized intersection level of service descriptions are provided below:

- Level of Service A describes operations where there is very little to no conflicting traffic for a minor side street movement, i.e., an average total delay of less than 10.0 seconds per vehicle.
- Level of Service B describes operations with average total delay in the range of 10.1 to 15.0 seconds per vehicle.
- Level of Service C describes operations with average total delay in the range of 15.1 to 25.0 second per vehicle.
- Level of Service D describes operations with average total delay in the range of 25.1 to 35.0 seconds per vehicle.
- Level of Service E describes operations with average total delay in the range of 35.1 to 50.0 seconds per vehicle.
- Level of Service F describes operations with average total delay of 50 seconds per vehicle. LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through or enter a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queuing on the minor approaches. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal driver behavior.

APPENDIX D –
MORNING AND AFTERNOON PEAK HOUR LEVEL OF SERVICE RESULTS


Morning Peak Hour Capacity Analysis Results
Study Intersection
Intersection Approach
X/X/X Approach LOS (EX/BG/TF)
X/X/X Overall Intersection LOS (EX/BG/TF)
Shannon Pl
SITE
1
2
3
4
5
6
N
NOT TO SCALE
1
A/A/A
MLK Jr. Avenue
W Street
A/A/A
W Street
D/D/D
A/A/A
MLK Jr. Avenue
2
A/A/A
MLK Jr. Avenue
D/D/D
Pleasant Street
MLK Jr. Avenue
3
A/A/A
MLK Jr. Avenue
B/B/B
Maple View Place
MLK Jr. Avenue
4
B/C/C
MLK Jr. Avenue
Chicago Street
A/B/B
D/D/E
A/A/A
MLK Jr. Avenue
5
A/A/A
MLK Jr. Avenue
E/E/E
C/C/C
Morris Road
MLK Jr. Avenue
C/C/C
6
A/A/A
Shannon Place
Chicago Street
Chicago Street
A/A/A


Afternoon Peak Hour Capacity Analysis Results
Study Intersection
Intersection Approach
X/X/X Approach LOS (EX/BG/TF)
X/X/X Overall Intersection LOS (EX/BG/TF)
Shannon Pl
SITE
NOT TO SCALE
1 A/A/A MLK Jr. Avenue W Street B/B/B W Street F/F/F A/A/A MLK Jr. Avenue
2 A/A/A MLK Jr. Avenue E/E/E Pleasant Street MLK Jr. Avenue
3 A/A/A MLK Jr. Avenue B/B/B Maple View Place MLK Jr. Avenue
4 B/B/B MLK Jr. Avenue Chicago Street B/C/C E/F/F A/A/A MLK Jr. Avenue
5 A/A/A MLK Jr. Avenue E/E/E B/B/B Morris Road MLK Jr. Avenue B/B/B
6 A/B/B Shannon Place Chicago Street Chicago Street A/A/A

APPENDIX E –
EXISTING TURNING MOVEMENT COUNTS

Gorove/Slade Associates

Project Name :	Portner Palce
Project # :	2493-001
Location	DC
Data Source:	Gorove/Slade Associates, Inc.

Intersection:			**MLK Jr Ave & W Street SE**															
AM PEAK																		
Direction:			Southbound				Westbound				Northbound				Eastbound			
Roadway:			**MLK Jr Ave SE**				**W Street SE**				**MLK Jr Ave SE**				**W Street SE**			
Movement:			Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
6:30 AM	to	6:45 AM	1	41	4	1	0	0	0	3	6	80	0	2	3	1	3	5
6:45 AM	to	7:00 AM	3	53	1	1	0	0	0	5	11	98	5	2	1	1	2	9
7:00 AM	to	7:15 AM	3	43	5	0	0	0	0	1	19	122	1	3	1	2	0	9
7:15 AM	to	7:30 AM	3	78	8	1	0	0	0	5	18	142	2	2	2	1	0	14
7:30 AM	to	7:45 AM	7	65	7	0	0	0	0	13	25	148	4	4	1	1	1	16
7:45 AM	to	8:00 AM	11	60	14	2	0	0	0	8	35	129	3	9	2	3	2	24
8:00 AM	to	8:15 AM	13	61	10	14	0	0	0	10	50	119	9	12	1	2	2	25
8:15 AM	to	8:30 AM	15	91	15	1	0	0	0	8	46	123	9	12	5	4	3	31
8:30 AM	to	8:45 AM	11	63	12	2	0	0	0	11	30	110	15	10	2	5	3	22
8:45 AM	to	9:00 AM	24	58	14	4	0	0	0	23	41	119	10	6	1	2	4	29
9:00 AM	to	9:15 AM	16	78	13	3	0	0	0	17	29	76	20	14	7	2	9	23
9:15 AM	to	9:30 AM	8	74	10	5	0	0	0	21	23	82	7	6	1	3	5	29
PM PEAK																		
Direction:			Southbound				Westbound				Northbound				Eastbound			
Roadway:			**MLK Jr Ave SE**				**W Street SE**				**MLK Jr Ave SE**				**W Street SE**			
Movement:			Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
4:00 PM	to	4:15 PM	5	108	14	5	0	0	0	13	31	62	1	18	7	6	10	39
4:15 PM	to	4:30 PM	0	132	18	2	0	0	0	15	30	73	1	10	5	4	12	33
4:30 PM	to	4:45 PM	2	132	13	9	0	0	0	23	38	62	4	6	13	12	10	26
4:45 PM	to	5:00 PM	1	151	26	2	0	0	0	8	40	74	6	6	7	10	4	28
5:00 PM	to	5:15 PM	1	151	32	9	0	0	0	8	38	62	1	12	19	14	18	21
5:15 PM	to	5:30 PM	4	163	43	3	0	0	0	7	29	74	6	0	11	6	11	24
5:30 PM	to	5:45 PM	2	174	35	4	0	0	0	16	34	67	4	12	16	13	16	16
5:45 PM	to	6:00 PM	3	157	45	8	0	0	0	8	43	86	0	7	12	5	8	7
6:00 PM	to	6:15 PM	2	151	33	3	0	0	0	7	32	69	3	2	8	3	8	23
6:15 PM	to	6:30 PM	5	146	19	16	0	0	0	14	45	55	3	6	3	4	3	19
6:30 PM	to	6:45 PM	0	100	21	2	0	0	0	10	19	49	1	5	9	2	6	8
6:45 PM	to	7:00 PM	3	101	19	3	0	0	0	9	30	53	1	0	6	2	4	7
PEAK HOURS																		
Direction:			Southbound				Westbound				Northbound				Eastbound			
Roadway:			**MLK Jr Ave SE**				**W Street SE**				**MLK Jr Ave SE**				**W Street SE**			
Movement:			Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
AM INTERSECTION PEAK HOUR																		
8:00 AM	to	9:00 AM	63	273	51	21	0	0	0	52	167	471	43	40	9	13	12	107
PM INTERSECTION PEAK HOUR																		
5:00 PM	to	6:00 PM	10	645	155	24	0	0	0	39	144	289	11	31	58	38	53	68
AM SYSTEM PEAK HOUR																		
7:30 AM	to	8:30 AM	46	277	46	17	0	0	0	39	156	519	25	37	9	10	8	96
PM SYSTEM PEAK HOUR																		
5:00 PM	to	6:00 PM	10	645	155	24	0	0	0	39	144	289	11	31	58	38	53	68

PEAK HOUR FACTORS	Southbound				Westbound				Northbound				Eastbound			
	MLK Jr Ave SE				**W Street SE**				**MLK Jr Ave SE**				**W Street SE**			
AM Peak Hour	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
AM PEAK HOUR	0.77	0.76	0.77	**0.76**	0.00	0.00	0.00	**#DIV/0!**	0.78	0.88	0.69	**0.98**	0.45	0.63	0.67	**0.56**
	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
PM PEAK HOUR	0.63	0.93	0.86	**0.96**	0.00	0.00	0.00	**#DIV/0!**	0.84	0.84	0.46	**0.86**	0.76	0.68	0.74	**0.73**

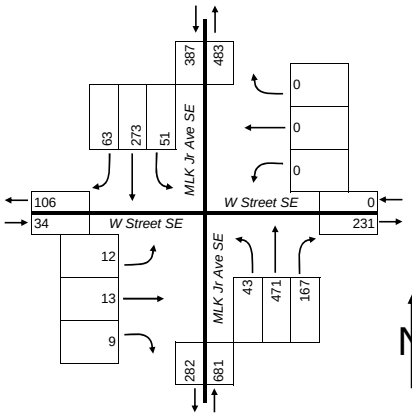
Overall AM PEAK HOUR FACTOR = **0.88** **Overall PM PEAK HOUR FACTOR** = **0.97**

AM Period Intersection Volume: 2847 **PM Period Intersection Volume:** 3545

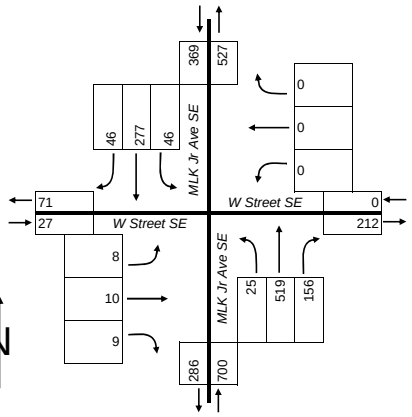
Date of Counts: Wednesday, May 07, 2014

AM Weather Conditions: Clear **PM Weather Conditions:** Clear

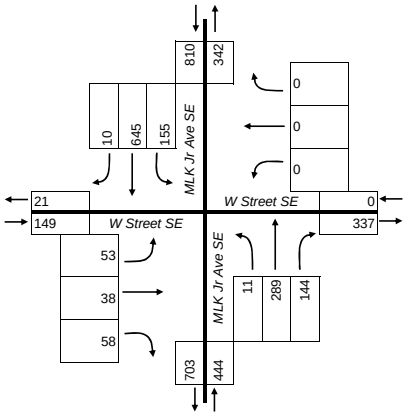
AM INTERSECTION PEAK VOLUMES



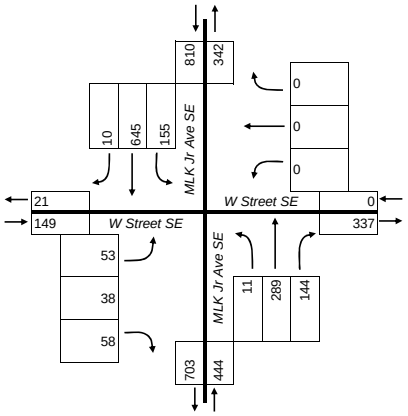
AM SYSTEM PEAK VOLUMES



PM INTERSECTION PEAK VOLUMES



PM SYSTEM PEAK VOLUMES



Gorove/Slade Associates

Project Name :	Portner Palce
Project # :	2493-001
Location	DC
Data Source:	Gorove/Slade Associates, Inc.

Intersection:			**MLK Jr Ave & Pleasant St/Maple View Place SE**															
AM PEAK																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**MLK Jr Ave SE**				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
6:30 AM	to	6:45 AM	37	1	6	1	2	9	0	2	0	10	3	0	1	0	73	1
6:45 AM	to	7:00 AM	47	0	7	2	1	7	0	11	0	6	0	0	1	3	110	2
7:00 AM	to	7:15 AM	37	0	6	1	4	15	0	6	0	10	2	0	1	1	128	0
7:15 AM	to	7:30 AM	72	0	1	1	3	14	0	5	0	16	3	0	3	1	145	7
7:30 AM	to	7:45 AM	64	1	5	3	3	26	0	9	0	8	1	0	4	4	167	5
7:45 AM	to	8:00 AM	56	0	8	5	5	18	0	23	0	9	1	0	5	4	159	4
8:00 AM	to	8:15 AM	48	0	11	4	5	32	0	17	0	8	2	0	1	1	172	4
8:15 AM	to	8:30 AM	85	0	11	2	6	20	0	10	0	6	2	0	5	1	168	6
8:30 AM	to	8:45 AM	58	1	4	0	6	17	0	10	0	8	3	0	6	1	139	8
8:45 AM	to	9:00 AM	45	1	9	3	4	23	0	17	0	4	0	0	3	0	145	9
9:00 AM	to	9:15 AM	74	0	7	3	6	19	0	16	0	4	1	0	4	4	112	6
9:15 AM	to	9:30 AM	69	1	7	1	5	13	0	25	0	3	1	0	4	1	107	13
PM PEAK																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**MLK Jr Ave SE**				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
4:00 PM	to	4:15 PM	88	2	29	7	5	13	0	17	0	2	6	19	7	13	93	1
4:15 PM	to	4:30 PM	99	4	26	0	3	19	0	19	0	5	3	23	8	11	93	1
4:30 PM	to	4:45 PM	117	0	40	3	2	15	0	18	0	5	2	17	4	13	100	4
4:45 PM	to	5:00 PM	121	1	33	4	10	11	0	14	0	7	1	13	2	7	100	7
5:00 PM	to	5:15 PM	147	0	26	1	3	14	0	14	0	2	3	17	5	13	99	4
5:15 PM	to	5:30 PM	133	3	34	0	4	18	0	18	0	4	1	20	5	9	103	1
5:30 PM	to	5:45 PM	153	0	39	2	2	14	0	8	0	7	1	10	2	9	101	1
5:45 PM	to	6:00 PM	131	3	32	1	1	26	0	12	0	8	3	8	9	3	115	2
6:00 PM	to	6:15 PM	128	4	32	5	1	16	0	15	0	4	1	15	4	10	102	2
6:15 PM	to	6:30 PM	123	3	23	3	2	5	0	9	0	2	1	15	1	16	95	2
6:30 PM	to	6:45 PM	85	1	25	2	5	9	0	11	0	2	4	17	8	12	62	4
6:45 PM	to	7:00 PM	79	1	24	0	4	8	0	8	0	3	2	9	3	4	77	5
PEAK HOURS																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**MLK Jr Ave SE**				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
AM INTERSECTION PEAK HOUR																		
7:30 AM	to	8:30 AM	253	1	35	14	19	96	0	59	0	31	6	0	15	10	666	19
PM INTERSECTION PEAK HOUR																		
5:00 PM	to	6:00 PM	564	6	131	4	10	72	0	52	0	21	8	55	21	34	418	8
AM SYSTEM PEAK HOUR																		
7:30 AM	to	8:30 AM	253	1	35	14	19	96	0	59	0	31	6	0	15	10	666	19
PM SYSTEM PEAK HOUR																		
5:00 PM	to	6:00 PM	564	6	131	4	10	72	0	52	0	21	8	55	21	34	418	8

PEAK HOUR FACTORS	Southbound				Westbound				Northbound				Eastbound			
	MLK Jr Ave SE				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
AM PEAK HOUR	0.74	0.25	0.80	**0.75**	0.79	0.75	0.00	**0.78**	0.00	0.86	0.75	**0.93**	0.75	0.63	0.97	**0.99**
	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
PM PEAK HOUR	0.92	0.50	0.84	**0.91**	0.63	0.69	0.00	**0.76**	0.00	0.66	0.67	**0.66**	0.58	0.65	0.91	**0.93**

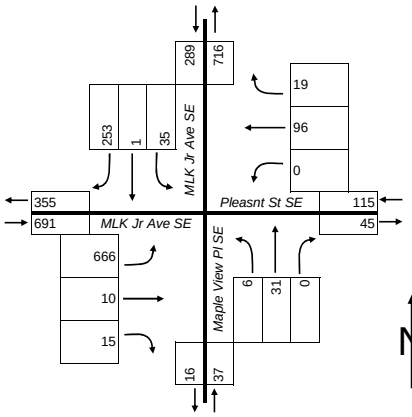
Overall AM PEAK HOUR FACTOR = **0.93** **Overall PM PEAK HOUR FACTOR** = **0.97**

AM Period Intersection Volume: 2837 **PM Period Intersection Volume:** 3396

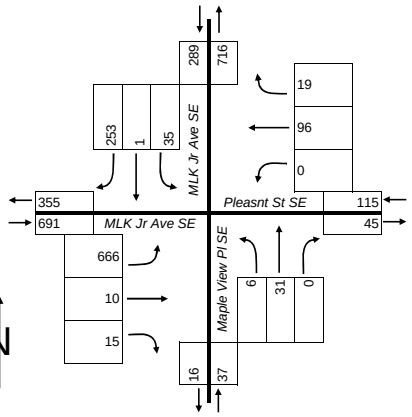
Date of Counts: Wednesday, May 07, 2014

AM Weather Conditions: Clear **PM Weather Conditions:** Clear

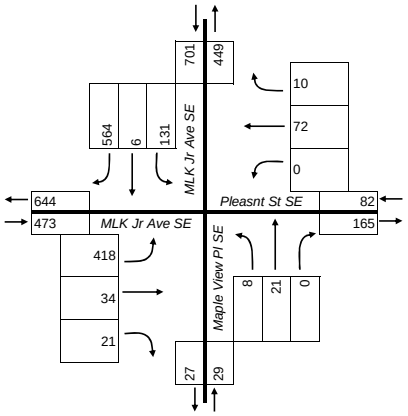
AM INTERSECTION PEAK VOLUMES



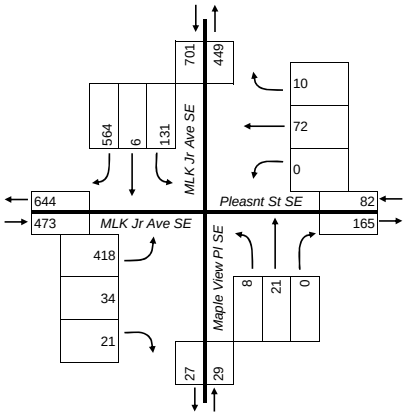
AM SYSTEM PEAK VOLUMES



PM INTERSECTION PEAK VOLUMES



PM SYSTEM PEAK VOLUMES



Gorove/Slade Associates

Project Name :	Portner Palce
Project # :	2493-001
Location	DC
Data Source:	Gorove/Slade Associates, Inc.

Intersection:			**MLK Jr Ave & Pleasant St/Maple View Place SE**															
AM PEAK																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**MLK Jr Ave SE**				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
6:30 AM	to	6:45 AM	37	1	6	1	2	9	0	2	0	10	3	0	1	0	73	1
6:45 AM	to	7:00 AM	47	0	7	2	1	7	0	11	0	6	0	0	1	3	110	2
7:00 AM	to	7:15 AM	37	0	6	1	4	15	0	6	0	10	2	0	1	1	128	0
7:15 AM	to	7:30 AM	72	0	1	1	3	14	0	5	0	16	3	0	3	1	145	7
7:30 AM	to	7:45 AM	64	1	5	3	3	26	0	9	0	8	1	0	4	4	167	5
7:45 AM	to	8:00 AM	56	0	8	5	5	18	0	23	0	9	1	0	5	4	159	4
8:00 AM	to	8:15 AM	48	0	11	4	5	32	0	17	0	8	2	0	1	1	172	4
8:15 AM	to	8:30 AM	85	0	11	2	6	20	0	10	0	6	2	0	5	1	168	6
8:30 AM	to	8:45 AM	58	1	4	0	6	17	0	10	0	8	3	0	6	1	139	8
8:45 AM	to	9:00 AM	45	1	9	3	4	23	0	17	0	4	0	0	3	0	145	9
9:00 AM	to	9:15 AM	74	0	7	3	6	19	0	16	0	4	1	0	4	4	112	6
9:15 AM	to	9:30 AM	69	1	7	1	5	13	0	25	0	3	1	0	4	1	107	13
PM PEAK																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**MLK Jr Ave SE**				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
4:00 PM	to	4:15 PM	88	2	29	7	5	13	0	17	0	2	6	19	7	13	93	1
4:15 PM	to	4:30 PM	99	4	26	0	3	19	0	19	0	5	3	23	8	11	93	1
4:30 PM	to	4:45 PM	117	0	40	3	2	15	0	18	0	5	2	17	4	13	100	4
4:45 PM	to	5:00 PM	121	1	33	4	10	11	0	14	0	7	1	13	2	7	100	7
5:00 PM	to	5:15 PM	147	0	26	1	3	14	0	14	0	2	3	17	5	13	99	4
5:15 PM	to	5:30 PM	133	3	34	0	4	18	0	18	0	4	1	20	5	9	103	1
5:30 PM	to	5:45 PM	153	0	39	2	2	14	0	8	0	7	1	10	2	9	101	1
5:45 PM	to	6:00 PM	131	3	32	1	1	26	0	12	0	8	3	8	9	3	115	2
6:00 PM	to	6:15 PM	128	4	32	5	1	16	0	15	0	4	1	15	4	10	102	2
6:15 PM	to	6:30 PM	123	3	23	3	2	5	0	9	0	2	1	15	1	16	95	2
6:30 PM	to	6:45 PM	85	1	25	2	5	9	0	11	0	2	4	17	8	12	62	4
6:45 PM	to	7:00 PM	79	1	24	0	4	8	0	8	0	3	2	9	3	4	77	5
PEAK HOURS																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**MLK Jr Ave SE**				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
AM INTERSECTION PEAK HOUR																		
7:30 AM	to	8:30 AM	253	1	35	14	19	96	0	59	0	31	6	0	15	10	666	19
PM INTERSECTION PEAK HOUR																		
5:00 PM	to	6:00 PM	564	6	131	4	10	72	0	52	0	21	8	55	21	34	418	8
AM SYSTEM PEAK HOUR																		
7:30 AM	to	8:30 AM	253	1	35	14	19	96	0	59	0	31	6	0	15	10	666	19
PM SYSTEM PEAK HOUR																		
5:00 PM	to	6:00 PM	564	6	131	4	10	72	0	52	0	21	8	55	21	34	418	8

PEAK HOUR FACTORS	Southbound				Westbound				Northbound				Eastbound			
	MLK Jr Ave SE				**Pleasnt St SE**				**Maple View Pl SE**				**MLK Jr Ave SE**			
	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
AM PEAK HOUR	0.74	0.25	0.80	**0.75**	0.79	0.75	0.00	**0.78**	0.00	0.86	0.75	**0.93**	0.75	0.63	0.97	**0.99**
	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
PM PEAK HOUR	0.92	0.50	0.84	**0.91**	0.63	0.69	0.00	**0.76**	0.00	0.66	0.67	**0.66**	0.58	0.65	0.91	**0.93**

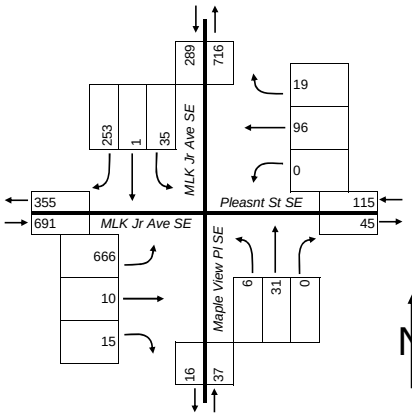
Overall AM PEAK HOUR FACTOR = **0.93** **Overall PM PEAK HOUR FACTOR** = **0.97**

AM Period Intersection Volume: 2837 **PM Period Intersection Volume:** 3396

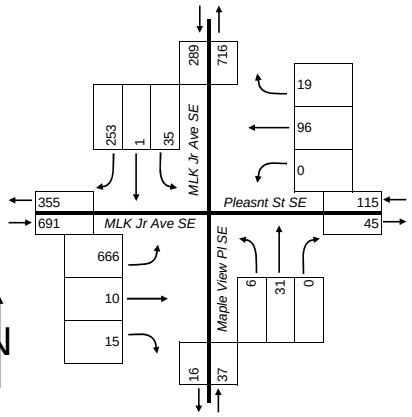
Date of Counts: Wednesday, May 07, 2014

AM Weather Conditions: Clear **PM Weather Conditions:** Clear

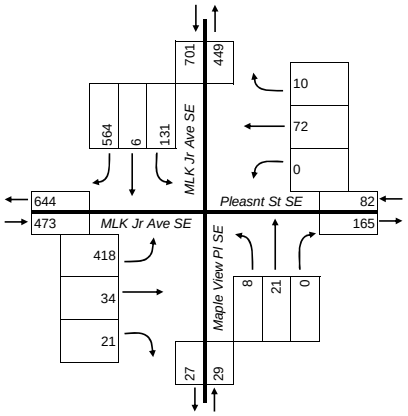
AM INTERSECTION PEAK VOLUMES



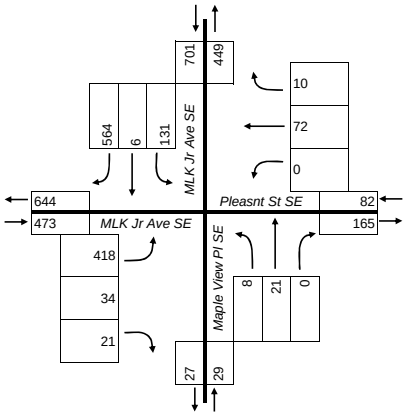
AM SYSTEM PEAK VOLUMES



PM INTERSECTION PEAK VOLUMES



PM SYSTEM PEAK VOLUMES



Gorove/Slade Associates

Project Name :	Curtis Properties - Building 1
Project # :	2098-003
Location	DC
Data Source:	Gorove/Slade Associates, Inc.

Intersection:			**Shannon Place & Chicago Street SE**															
AM PEAK																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**Chicago Street SE**				**Shannon Place SE**				**Chicago Street SE**				**Shannon Place SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
6:30 AM	to	6:45 AM	0	0	4	0	6	1	1	3	2	1	0	1	0	0	0	0
6:45 AM	to	7:00 AM	0	2	2	1	0	0	2	3	0	0	1	0	0	1	0	0
7:00 AM	to	7:15 AM	0	0	1	2	1	0	1	1	2	4	0	0	0	0	0	1
7:15 AM	to	7:30 AM	0	1	2	2	2	0	5	14	2	0	0	7	0	1	0	0
7:30 AM	to	7:45 AM	0	1	1	3	3	0	2	3	2	1	0	1	0	0	0	1
7:45 AM	to	8:00 AM	0	0	1	1	3	1	2	8	1	1	0	1	0	0	0	0
8:00 AM	to	8:15 AM	1	1	0	2	5	1	7	9	5	1	0	5	0	0	0	0
8:15 AM	to	8:30 AM	1	2	1	3	9	0	9	11	9	3	0	4	0	0	0	2
8:30 AM	to	8:45 AM	0	2	2	8	4	1	10	11	7	3	1	3	1	1	0	0
8:45 AM	to	9:00 AM	0	3	0	5	6	0	3	11	7	4	0	5	1	1	0	1
9:00 AM	to	9:15 AM	0	0	4	2	4	0	3	5	11	2	0	4	0	0	0	0
9:15 AM	to	9:30 AM	0	2	1	4	2	1	3	11	5	3	0	2	0	1	0	1
PM PEAK																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**Chicago Street SE**				**Shannon Place SE**				**Chicago Street SE**				**Shannon Place SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
4:00 PM	to	4:15 PM	0	0	7	3	4	1	3	7	4	1	0	0	0	1	0	2
4:15 PM	to	4:30 PM	0	1	3	0	3	1	1	8	0	2	0	1	1	1	1	0
4:30 PM	to	4:45 PM	0	6	7	5	3	0	3	11	5	2	0	2	1	0	0	4
4:45 PM	to	5:00 PM	1	3	5	3	2	0	5	12	1	1	0	2	0	1	0	4
5:00 PM	to	5:15 PM	0	1	8	6	4	0	6	18	5	3	0	3	0	1	0	0
5:15 PM	to	5:30 PM	0	2	9	4	2	1	3	8	3	4	0	2	0	2	0	2
5:30 PM	to	5:45 PM	0	7	9	4	4	0	6	6	3	2	0	3	1	2	0	0
5:45 PM	to	6:00 PM	0	2	1	8	2	0	2	8	6	2	0	1	0	0	0	2
6:00 PM	to	6:15 PM	0	3	3	6	0	0	2	3	3	2	0	0	0	0	0	2
6:15 PM	to	6:30 PM	0	2	1	2	1	1	2	8	4	0	1	0	0	0	0	0
6:30 PM	to	6:45 PM	0	2	1	3	0	0	1	4	3	1	0	1	0	2	0	2
6:45 PM	to	7:00 PM	0	5	0	4	0	0	1	4	1	2	0	0	0	0	0	1
PEAK HOURS																		
		Direction:	Southbound				Westbound				Northbound				Eastbound			
		Roadway:	**Chicago Street SE**				**Shannon Place SE**				**Chicago Street SE**				**Shannon Place SE**			
		Movement:	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
AM INTERSECTION PEAK HOUR																		
8:15 AM	to	9:15 AM	1	7	7	18	23	1	25	38	34	12	1	16	2	2	0	3
PM INTERSECTION PEAK HOUR																		
4:45 PM	to	5:45 PM	1	13	31	17	12	1	20	44	12	10	0	37	1	6	0	6
AM SYSTEM PEAK HOUR																		
7:30 AM	to	8:30 AM	2	4	3	9	20	2	20	31	17	6	0	11	0	0	0	3
PM SYSTEM PEAK HOUR																		
5:00 PM	to	6:00 PM	0	12	27	22	12	1	17	40	17	11	0	9	1	5	0	4

PEAK HOUR FACTORS	Southbound				Westbound				Northbound				Eastbound			
	Chicago Street SE				**Shannon Place SE**				**Chicago Street SE**				**Shannon Place SE**			
AM Peak Hour	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
AM PEAK HOUR	0.50	0.50	0.75	**0.56**	0.56	0.50	0.56	**0.58**	0.47	0.50	0.00	**0.48**	0.00	0.00	0.00	**#DIV/0!**
	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach	Right	Thru	Left	Approach
PM PEAK HOUR	0.00	0.43	0.75	**0.61**	0.75	0.25	0.71	**0.75**	0.71	0.69	0.00	**0.88**	0.25	0.63	0.00	**0.50**

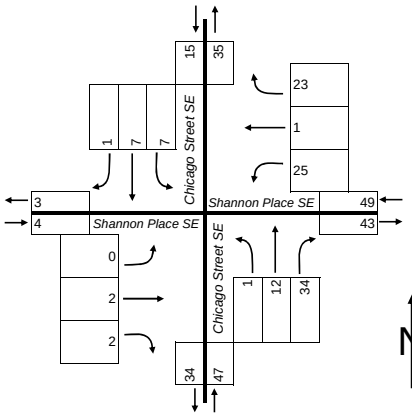
Overall AM PEAK HOUR FACTOR = **0.54** **Overall PM PEAK HOUR FACTOR** = **0.76**

AM Period Intersection Volume: 218 **PM Period Intersection Volume:** 228

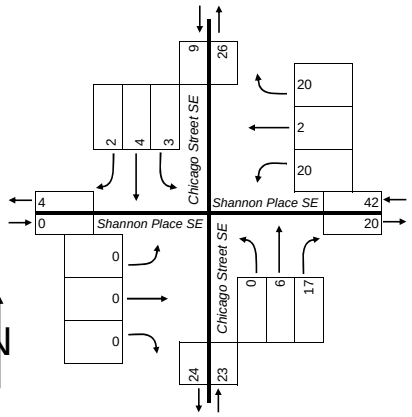
Date of Counts: Wednesday, May 07, 2014

AM Weather Conditions: Clear **PM Weather Conditions:** Clear

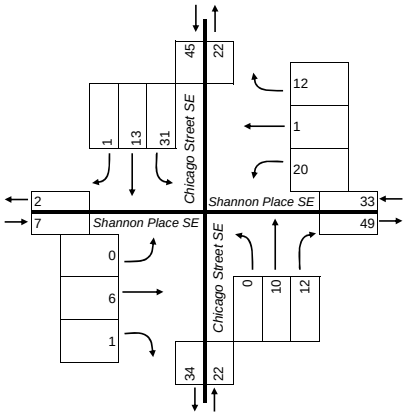
AM INTERSECTION PEAK VOLUMES



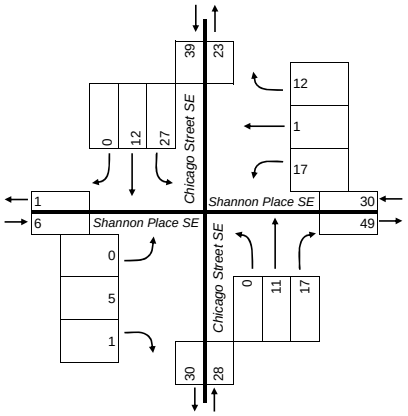
AM SYSTEM PEAK VOLUMES



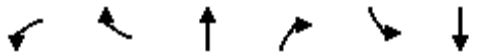
PM INTERSECTION PEAK VOLUMES



PM SYSTEM PEAK VOLUMES

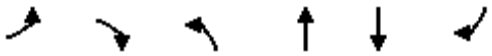


APPENDIX F –
CAPACITY ANALYSIS WORKSHEETS



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	140	180	516	42	26	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.98		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.92		0.99			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1653		3450			3526
Flt Permitted	0.98		1.00			0.70
Satd. Flow (perm)	1653		3450			2464
Peak-hour factor, PHF	0.90	0.90	0.96	0.96	0.82	0.82
Adj. Flow (vph)	156	200	538	44	32	384
RTOR Reduction (vph)	38	0	5	0	0	0
Lane Group Flow (vph)	318	0	577	0	0	416
Confl. Peds. (#/hr)	19	17		45	45	
Turn Type					pm+pt	
Protected Phases	3		2		1	7 10
Permitted Phases					7 10	
Actuated Green, G (s)	28.5		53.5			77.0
Effective Green, g (s)	28.5		53.5			77.0
Actuated g/C Ratio	0.24		0.45			0.64
Clearance Time (s)	5.5		5.5			
Lane Grp Cap (vph)	393		1538			1661
v/s Ratio Prot	c0.19		c0.17			c0.02
v/s Ratio Perm						0.14
v/c Ratio	0.81		0.38			0.25
Uniform Delay, d1	43.2		22.1			9.2
Progression Factor	1.00		1.00			0.16
Incremental Delay, d2	16.3		0.7			0.4
Delay (s)	59.5		22.8			1.8
Level of Service	E		C			A
Approach Delay (s)	59.5		22.8			1.8
Approach LOS	E		C			A

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



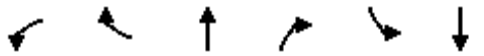
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	13	11	29	667	330	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.5	5.5	
Lane Util. Factor	1.00			0.95	0.95	
Frpb, ped/bikes	0.97			1.00	0.98	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.94			1.00	0.99	
Flt Protected	0.97			1.00	1.00	
Satd. Flow (prot)	1654			3532	3429	
Flt Permitted	0.97			0.88	1.00	
Satd. Flow (perm)	1654			3119	3429	
Peak-hour factor, PHF	0.60	0.60	0.96	0.96	0.82	0.82
Adj. Flow (vph)	22	18	30	695	402	29
RTOR Reduction (vph)	16	0	0	0	4	0
Lane Group Flow (vph)	24	0	0	725	427	0
Confl. Peds. (#/hr)	17	19	81			81
Turn Type			Perm			
Protected Phases	4			5 6	2	
Permitted Phases			5 6			
Actuated Green, G (s)	11.0			87.5	53.5	
Effective Green, g (s)	11.0			85.5	53.5	
Actuated g/C Ratio	0.09			0.71	0.45	
Clearance Time (s)	5.0				5.5	
Lane Grp Cap (vph)	152			2222	1529	
v/s Ratio Prot	c0.01				0.12	
v/s Ratio Perm				c0.23		
v/c Ratio	0.16			0.33	0.28	
Uniform Delay, d1	50.2			6.5	21.0	
Progression Factor	1.00			0.11	0.92	
Incremental Delay, d2	2.2			0.3	0.5	
Delay (s)	52.4			1.0	19.9	
Level of Service	D			A	B	
Approach Delay (s)	52.4			1.0	19.9	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	31	676	15	1	349
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.99	0.99	0.75	0.75
Hourly flow rate (vph)	6	33	683	15	1	465
Pedestrians	59					59
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	5					5
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			220			442
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	985	467			757	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	837	281			592	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	94			100	
cM capacity (veh/h)	270	603			868	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	40	455	243	156	310
Volume Left	6	0	0	1	0
Volume Right	33	0	15	0	0
cSH	503	1700	1700	868	1700
Volume to Capacity	0.08	0.27	0.14	0.00	0.18
Queue Length 95th (ft)	6	0	0	0	0
Control Delay (s)	12.8	0.0	0.0	0.1	0.0
Lane LOS	B			A	
Approach Delay (s)	12.8	0.0		0.0	
Approach LOS	B				

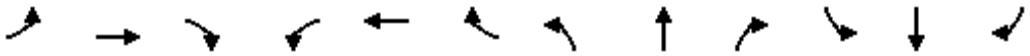
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	96	19	697	10	35	254
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.78	0.78	0.99	0.99	0.75	0.75
Hourly flow rate (vph)	123	24	704	10	47	339
Pedestrians			14			59
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			1			5
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			278			384
pX, platoon unblocked	0.94	0.94			0.94	
vC, conflicting volume	986	416			714	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	847	238			557	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	53	96			95	
cM capacity (veh/h)	264	679			945	

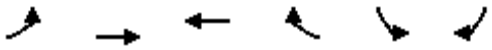
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	147	469	245	160	226
Volume Left	123	0	0	47	0
Volume Right	24	0	10	0	0
cSH	294	1700	1700	945	1700
Volume to Capacity	0.50	0.28	0.14	0.05	0.13
Queue Length 95th (ft)	66	0	0	4	0
Control Delay (s)	28.9	0.0	0.0	3.0	0.0
Lane LOS	D			A	
Approach Delay (s)	28.9	0.0		1.2	
Approach LOS	D				

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	10	9	0	0	0	25	519	156	46	277	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5						5.5	5.5		5.5	
Lane Util. Factor		1.00						0.95	0.95		0.95	
Frpb, ped/bikes		1.00						1.00	0.89		0.99	
Flpb, ped/bikes		0.95						1.00	1.00		1.00	
Frt		0.95						1.00	0.85		0.98	
Flt Protected		0.99						1.00	1.00		0.99	
Satd. Flow (prot)		1674						1750	1346		3398	
Flt Permitted		0.99						0.97	1.00		0.81	
Satd. Flow (perm)		1674						1694	1346		2763	
Peak-hour factor, PHF	0.56	0.56	0.56	0.92	0.92	0.92	0.98	0.98	0.98	0.76	0.76	0.76
Adj. Flow (vph)	14	18	16	0	0	0	26	530	159	61	364	61
RTOR Reduction (vph)	0	14	0	0	0	0	0	1	32	0	9	0
Lane Group Flow (vph)	0	34	0	0	0	0	0	571	111	0	477	0
Confl. Peds. (#/hr)	39					39	17		37	37		17
Turn Type	Perm						Perm		Perm	Perm		
Protected Phases		4						2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		15.5						93.5	93.5		93.5	
Effective Green, g (s)		15.5						93.5	93.5		93.5	
Actuated g/C Ratio		0.13						0.78	0.78		0.78	
Clearance Time (s)		5.5						5.5	5.5		5.5	
Lane Grp Cap (vph)		216						1320	1049		2153	
v/s Ratio Prot												
v/s Ratio Perm		0.02						c0.34	0.08		0.17	
v/c Ratio		0.16						0.43	0.11		0.22	
Uniform Delay, d1		46.4						4.4	3.2		3.5	
Progression Factor		1.00						0.97	0.25		1.00	
Incremental Delay, d2		1.6						1.0	0.2		0.2	
Delay (s)		48.0						5.3	1.0		3.8	
Level of Service		D						A	A		A	
Approach Delay (s)		48.0			0.0			4.4			3.8	
Approach LOS		D			A			A			A	

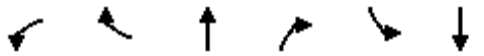
Intersection Summary			
HCM Average Control Delay	5.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	4	6	17	20	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.56	0.56	0.48	0.48	0.58	0.58
Hourly flow rate (vph)	5	7	12	35	34	34
Pedestrians		31	3		14	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		3	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			199			
pX, platoon unblocked						
vC, conflicting volume	62				65	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	62				65	75
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				96	96
cM capacity (veh/h)	1523				924	949

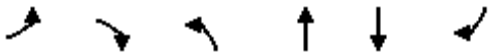
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	48	69
Volume Left	5	0	34
Volume Right	0	35	34
cSH	1523	1700	937
Volume to Capacity	0.00	0.03	0.07
Queue Length 95th (ft)	0	0	6
Control Delay (s)	3.2	0.0	9.1
Lane LOS	A		A
Approach Delay (s)	3.2	0.0	9.1
Approach LOS			A

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	81	83	377	62	58	598
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.94		0.98			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.93		0.98			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1588		3411			3524
Flt Permitted	0.98		1.00			0.75
Satd. Flow (perm)	1588		3411			2644
Peak-hour factor, PHF	0.95	0.95	0.91	0.91	0.98	0.98
Adj. Flow (vph)	85	87	414	68	59	610
RTOR Reduction (vph)	30	0	11	0	0	0
Lane Group Flow (vph)	142	0	471	0	0	669
Confl. Peds. (#/hr)	47	49		24	24	
Turn Type					pm+pt	
Protected Phases	3		2		1	7 10
Permitted Phases					7 10	
Actuated Green, G (s)	15.5		67.5			90.0
Effective Green, g (s)	15.5		67.5			90.0
Actuated g/C Ratio	0.13		0.56			0.75
Clearance Time (s)	5.5		5.5			
Lane Grp Cap (vph)	205		1919			2049
v/s Ratio Prot	c0.09		0.14			c0.02
v/s Ratio Perm						c0.22
v/c Ratio	0.69		0.25			0.33
Uniform Delay, d1	50.0		13.3			5.0
Progression Factor	1.00		1.00			0.35
Incremental Delay, d2	17.4		0.3			0.4
Delay (s)	67.4		13.6			2.1
Level of Service	E		B			A
Approach Delay (s)	67.4		13.6			2.1
Approach LOS	E		B			A

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



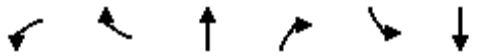
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	23	36	11	449	620	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.5	5.5	
Lane Util. Factor	1.00			0.95	0.95	
Frpb, ped/bikes	0.91			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.92			1.00	1.00	
Flt Protected	0.98			1.00	1.00	
Satd. Flow (prot)	1533			3535	3520	
Flt Permitted	0.98			0.94	1.00	
Satd. Flow (perm)	1533			3316	3520	
Peak-hour factor, PHF	0.78	0.78	0.91	0.91	0.98	0.98
Adj. Flow (vph)	29	46	12	493	633	14
RTOR Reduction (vph)	42	0	0	0	1	0
Lane Group Flow (vph)	33	0	0	505	646	0
Confl. Peds. (#/hr)	49	47	21			21
Turn Type			Perm			
Protected Phases	4			5 6	2	
Permitted Phases			5 6			
Actuated Green, G (s)	10.0			88.5	67.5	
Effective Green, g (s)	10.0			86.5	67.5	
Actuated g/C Ratio	0.08			0.72	0.56	
Clearance Time (s)	5.0				5.5	
Lane Grp Cap (vph)	128			2390	1980	
v/s Ratio Prot	c0.02				c0.18	
v/s Ratio Perm				c0.15		
v/c Ratio	0.26			0.21	0.33	
Uniform Delay, d1	51.5			5.5	14.1	
Progression Factor	1.00			0.15	0.90	
Incremental Delay, d2	4.8			0.2	0.4	
Delay (s)	56.3			1.0	13.1	
Level of Service	E			A	B	
Approach Delay (s)	56.3			1.0	13.1	
Approach LOS	E			A	B	

Intersection Summary			
HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	21	452	21	6	636
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.66	0.66	0.93	0.93	0.91	0.91
Hourly flow rate (vph)	12	32	486	23	7	699
Pedestrians	52					52
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	4					4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			220			442
pX, platoon unblocked	0.96	0.96			0.96	
vC, conflicting volume	912	358			561	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	828	253			463	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	95			99	
cM capacity (veh/h)	283	657			1007	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	324	185	240	466
Volume Left	12	0	0	7	0
Volume Right	32	0	23	0	0
cSH	481	1700	1700	1007	1700
Volume to Capacity	0.09	0.19	0.11	0.01	0.27
Queue Length 95th (ft)	7	0	0	0	0
Control Delay (s)	13.2	0.0	0.0	0.3	0.0
Lane LOS	B			A	
Approach Delay (s)	13.2	0.0		0.1	
Approach LOS	B				

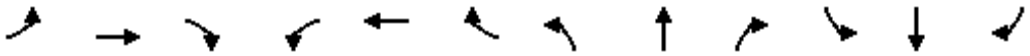
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	72	10	439	34	131	570
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.76	0.76	0.93	0.93	0.91	0.91
Hourly flow rate (vph)	95	13	472	37	144	626
Pedestrians	55		4			52
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	5		0			4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			278			384
pX, platoon unblocked	0.96	0.97			0.97	
vC, conflicting volume	1150	361			564	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	942	279			487	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	54	98			85	
cM capacity (veh/h)	205	636			992	

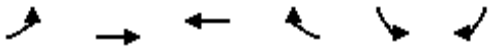
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	108	315	194	353	418
Volume Left	95	0	0	144	0
Volume Right	13	0	37	0	0
cSH	224	1700	1700	992	1700
Volume to Capacity	0.48	0.19	0.11	0.15	0.25
Queue Length 95th (ft)	60	0	0	13	0
Control Delay (s)	35.3	0.0	0.0	4.7	0.0
Lane LOS	E			A	
Approach Delay (s)	35.3	0.0		2.1	
Approach LOS	E				

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	38	58	0	0	0	11	289	144	155	645	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5						5.5	5.5		5.5	
Lane Util. Factor		1.00						0.95	0.95		0.95	
Frpb, ped/bikes		0.93						1.00	0.91		1.00	
Flpb, ped/bikes		0.94						1.00	1.00		0.99	
Frt		0.95						0.99	0.85		1.00	
Flt Protected		0.98						1.00	1.00		0.99	
Satd. Flow (prot)		1528						1746	1369		3462	
Flt Permitted		0.98						0.96	1.00		0.78	
Satd. Flow (perm)		1528						1675	1369		2717	
Peak-hour factor, PHF	0.56	0.56	0.56	0.92	0.92	0.92	0.98	0.98	0.98	0.76	0.76	0.76
Adj. Flow (vph)	95	68	104	0	0	0	11	295	147	204	849	13
RTOR Reduction (vph)	0	19	0	0	0	0	0	1	36	0	1	0
Lane Group Flow (vph)	0	248	0	0	0	0	0	320	96	0	1065	0
Confl. Peds. (#/hr)	39		68	68		39	24		31	31		24
Turn Type	Perm						Perm		Perm	Perm		
Protected Phases		4						2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		21.5						87.5	87.5		87.5	
Effective Green, g (s)		21.5						87.5	87.5		87.5	
Actuated g/C Ratio		0.18						0.73	0.73		0.73	
Clearance Time (s)		5.5						5.5	5.5		5.5	
Lane Grp Cap (vph)		274						1221	998		1981	
v/s Ratio Prot												
v/s Ratio Perm		0.16						0.19	0.07		c0.39	
v/c Ratio		0.91						0.26	0.10		0.54	
Uniform Delay, d1		48.3						5.4	4.7		7.2	
Progression Factor		1.00						0.84	0.48		1.00	
Incremental Delay, d2		34.7						0.5	0.2		1.1	
Delay (s)		82.9						5.1	2.5		8.3	
Level of Service		F						A	A		A	
Approach Delay (s)		82.9			0.0			4.3			8.3	
Approach LOS		F			A			A			A	

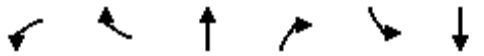
Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	27	12	11	17	17	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.88	0.88	0.75	0.75
Hourly flow rate (vph)	44	20	12	19	23	16
Pedestrians		40	4		9	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		3	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			199			
pX, platoon unblocked						
vC, conflicting volume	41				143	71
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41				143	71
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				97	98
cM capacity (veh/h)	1557				816	951

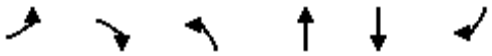
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	64	32	39
Volume Left	44	0	23
Volume Right	0	19	16
cSH	1557	1700	867
Volume to Capacity	0.03	0.02	0.04
Queue Length 95th (ft)	2	0	3
Control Delay (s)	5.2	0.0	9.3
Lane LOS	A		A
Approach Delay (s)	5.2	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	140	182	535	42	26	349
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.98		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.92		0.99			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1653		3453			3527
Flt Permitted	0.98		1.00			0.69
Satd. Flow (perm)	1653		3453			2456
Peak-hour factor, PHF	0.90	0.90	0.96	0.96	0.82	0.82
Adj. Flow (vph)	156	202	557	44	32	426
RTOR Reduction (vph)	39	0	5	0	0	0
Lane Group Flow (vph)	319	0	596	0	0	458
Confl. Peds. (#/hr)	19	17		45	45	
Turn Type					pm+pt	
Protected Phases	3		2		1	7 10
Permitted Phases					7 10	
Actuated Green, G (s)	28.5		53.5			77.0
Effective Green, g (s)	28.5		53.5			77.0
Actuated g/C Ratio	0.24		0.45			0.64
Clearance Time (s)	5.5		5.5			
Lane Grp Cap (vph)	393		1539			1656
v/s Ratio Prot	c0.19		c0.17			c0.02
v/s Ratio Perm						0.16
v/c Ratio	0.81		0.39			0.28
Uniform Delay, d1	43.2		22.3			9.4
Progression Factor	1.00		1.00			0.12
Incremental Delay, d2	16.5		0.7			0.4
Delay (s)	59.8		23.0			1.5
Level of Service	E		C			A
Approach Delay (s)	59.8		23.0			1.5
Approach LOS	E		C			A

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	19	14	51	667	363	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.5	5.5	
Lane Util. Factor	1.00			0.95	0.95	
Frpb, ped/bikes	0.97			1.00	0.95	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.94			1.00	0.98	
Flt Protected	0.97			1.00	1.00	
Satd. Flow (prot)	1663			3527	3290	
Flt Permitted	0.97			0.76	1.00	
Satd. Flow (perm)	1663			2687	3290	
Peak-hour factor, PHF	0.60	0.60	0.96	0.96	0.82	0.82
Adj. Flow (vph)	32	23	53	695	443	80
RTOR Reduction (vph)	21	0	0	0	12	0
Lane Group Flow (vph)	34	0	0	748	511	0
Confl. Peds. (#/hr)	17	19	81			81
Turn Type			Perm			
Protected Phases	4			5 6	2	
Permitted Phases			5 6			
Actuated Green, G (s)	11.0			87.5	53.5	
Effective Green, g (s)	11.0			85.5	53.5	
Actuated g/C Ratio	0.09			0.71	0.45	
Clearance Time (s)	5.0				5.5	
Lane Grp Cap (vph)	152			1914	1467	
v/s Ratio Prot	c0.02				0.16	
v/s Ratio Perm				c0.28		
v/c Ratio	0.22			0.39	0.35	
Uniform Delay, d1	50.5			6.9	21.8	
Progression Factor	1.00			0.20	0.91	
Incremental Delay, d2	3.4			0.5	0.6	
Delay (s)	53.9			1.9	20.4	
Level of Service	D			A	C	
Approach Delay (s)	53.9			1.9	20.4	
Approach LOS	D			A	C	

Intersection Summary			
HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	31	682	15	1	426
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.99	0.99	0.75	0.75
Hourly flow rate (vph)	6	33	689	15	1	568
Pedestrians	59					59
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	5					5
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			220			442
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1042	470			763	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	896	281			596	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	94			100	
cM capacity (veh/h)	247	602			864	

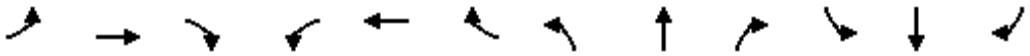
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	40	459	245	191	379
Volume Left	6	0	0	1	0
Volume Right	33	0	15	0	0
cSH	488	1700	1700	864	1700
Volume to Capacity	0.08	0.27	0.14	0.00	0.22
Queue Length 95th (ft)	7	0	0	0	0
Control Delay (s)	13.0	0.0	0.0	0.1	0.0
Lane LOS	B			A	
Approach Delay (s)	13.0	0.0		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	96	19	703	10	35	321
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.78	0.78	0.99	0.99	0.75	0.75
Hourly flow rate (vph)	123	24	710	10	47	428
Pedestrians			14			59
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			1			5
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			278			384
pX, platoon unblocked	0.94	0.94			0.94	
vC, conflicting volume	1036	419			720	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	900	240			562	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	50	96			95	
cM capacity (veh/h)	244	677			940	

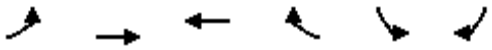
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	147	473	247	189	285
Volume Left	123	0	0	47	0
Volume Right	24	0	10	0	0
cSH	273	1700	1700	940	1700
Volume to Capacity	0.54	0.28	0.15	0.05	0.17
Queue Length 95th (ft)	74	0	0	4	0
Control Delay (s)	32.6	0.0	0.0	2.6	0.0
Lane LOS	D			A	
Approach Delay (s)	32.6	0.0		1.0	
Approach LOS	D				

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	10	9	0	0	0	25	525	156	46	346	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5						5.5	5.5		5.5	
Lane Util. Factor		1.00						0.95	0.95		0.95	
Frpb, ped/bikes		1.00						1.00	0.89		0.99	
Flpb, ped/bikes		0.95						1.00	1.00		1.00	
Frt		0.95						1.00	0.85		0.98	
Flt Protected		0.99						1.00	1.00		0.99	
Satd. Flow (prot)		1674						1751	1346		3420	
Flt Permitted		0.99						0.96	1.00		0.82	
Satd. Flow (perm)		1674						1685	1346		2829	
Peak-hour factor, PHF	0.56	0.56	0.56	0.92	0.92	0.92	0.98	0.98	0.98	0.76	0.76	0.76
Adj. Flow (vph)	14	18	16	0	0	0	26	536	159	61	455	61
RTOR Reduction (vph)	0	14	0	0	0	0	0	1	32	0	8	0
Lane Group Flow (vph)	0	34	0	0	0	0	0	577	111	0	569	0
Confl. Peds. (#/hr)	39					39	17		37	37		17
Turn Type	Perm						Perm		Perm	Perm		
Protected Phases		4						2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		15.5						93.5	93.5		93.5	
Effective Green, g (s)		15.5						93.5	93.5		93.5	
Actuated g/C Ratio		0.13						0.78	0.78		0.78	
Clearance Time (s)		5.5						5.5	5.5		5.5	
Lane Grp Cap (vph)		216						1313	1049		2204	
v/s Ratio Prot												
v/s Ratio Perm		0.02						c0.34	0.08		0.20	
v/c Ratio		0.16						0.44	0.11		0.26	
Uniform Delay, d1		46.4						4.5	3.2		3.7	
Progression Factor		1.00						0.83	0.24		1.00	
Incremental Delay, d2		1.6						1.0	0.2		0.3	
Delay (s)		48.0						4.7	1.0		3.9	
Level of Service		D						A	A		A	
Approach Delay (s)		48.0			0.0			4.0			3.9	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



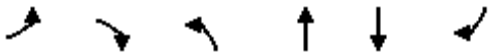
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	4	6	81	29	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.56	0.56	0.48	0.48	0.58	0.58
Hourly flow rate (vph)	5	7	12	169	50	34
Pedestrians		31	3		14	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		3	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			199			
pX, platoon unblocked						
vC, conflicting volume	195				132	142
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195				132	142
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				94	96
cM capacity (veh/h)	1362				847	872

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	181	84
Volume Left	5	0	50
Volume Right	0	169	34
cSH	1362	1700	857
Volume to Capacity	0.00	0.11	0.10
Queue Length 95th (ft)	0	0	8
Control Delay (s)	3.3	0.0	9.7
Lane LOS	A		A
Approach Delay (s)	3.3	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	81	83	423	62	60	662
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.94		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.93		0.98			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1588		3424			3525
Flt Permitted	0.98		1.00			0.73
Satd. Flow (perm)	1588		3424			2599
Peak-hour factor, PHF	0.95	0.95	0.91	0.91	0.98	0.98
Adj. Flow (vph)	85	87	465	68	61	676
RTOR Reduction (vph)	30	0	10	0	0	0
Lane Group Flow (vph)	142	0	523	0	0	737
Confl. Peds. (#/hr)	47	49		24	24	
Turn Type					pm+pt	
Protected Phases	3		2		1	7 10
Permitted Phases					7 10	
Actuated Green, G (s)	15.5		67.5			90.0
Effective Green, g (s)	15.5		67.5			90.0
Actuated g/C Ratio	0.13		0.56			0.75
Clearance Time (s)	5.5		5.5			
Lane Grp Cap (vph)	205		1926			2019
v/s Ratio Prot	c0.09		0.15			c0.03
v/s Ratio Perm						c0.25
v/c Ratio	0.69		0.27			0.37
Uniform Delay, d1	50.0		13.6			5.2
Progression Factor	1.00		1.00			0.39
Incremental Delay, d2	17.4		0.3			0.5
Delay (s)	67.4		13.9			2.5
Level of Service	E		B			A
Approach Delay (s)	67.4		13.9			2.5
Approach LOS	E		B			A

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



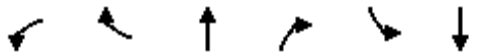
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	65	57	15	499	667	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.5	5.5	
Lane Util. Factor	1.00			0.95	0.95	
Frpb, ped/bikes	0.93			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.94			1.00	1.00	
Flt Protected	0.97			1.00	1.00	
Satd. Flow (prot)	1589			3534	3511	
Flt Permitted	0.97			0.93	1.00	
Satd. Flow (perm)	1589			3283	3511	
Peak-hour factor, PHF	0.78	0.78	0.91	0.91	0.98	0.98
Adj. Flow (vph)	83	73	16	548	681	23
RTOR Reduction (vph)	27	0	0	0	2	0
Lane Group Flow (vph)	129	0	0	564	702	0
Confl. Peds. (#/hr)	49	47	21			21
Turn Type			Perm			
Protected Phases	4			5 6	2	
Permitted Phases			5 6			
Actuated Green, G (s)	10.0			88.5	67.5	
Effective Green, g (s)	10.0			86.5	67.5	
Actuated g/C Ratio	0.08			0.72	0.56	
Clearance Time (s)	5.0				5.5	
Lane Grp Cap (vph)	132			2366	1975	
v/s Ratio Prot	c0.08				c0.20	
v/s Ratio Perm				c0.17		
v/c Ratio	0.98			0.24	0.36	
Uniform Delay, d1	54.9			5.6	14.4	
Progression Factor	1.00			0.15	0.86	
Incremental Delay, d2	73.3			0.2	0.4	
Delay (s)	128.2			1.1	12.7	
Level of Service	F			A	B	
Approach Delay (s)	128.2			1.1	12.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	21	544	21	6	693
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.66	0.66	0.93	0.93	0.91	0.91
Hourly flow rate (vph)	12	32	585	23	7	762
Pedestrians	52					52
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	4					4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			220			442
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1042	408			660	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	950	285			549	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	95			99	
cM capacity (veh/h)	234	622			929	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	390	218	260	508
Volume Left	12	0	0	7	0
Volume Right	32	0	23	0	0
cSH	427	1700	1700	929	1700
Volume to Capacity	0.10	0.23	0.13	0.01	0.30
Queue Length 95th (ft)	9	0	0	1	0
Control Delay (s)	14.4	0.0	0.0	0.3	0.0
Lane LOS	B			A	
Approach Delay (s)	14.4	0.0		0.1	
Approach LOS	B				

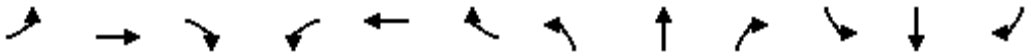
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	72	10	530	34	131	622
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.76	0.76	0.93	0.93	0.91	0.91
Hourly flow rate (vph)	95	13	570	37	144	684
Pedestrians	55		4			52
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	5		0			4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			278			384
pX, platoon unblocked	0.95	0.96			0.96	
vC, conflicting volume	1277	410			661	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1010	309			570	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	47	98			84	
cM capacity (veh/h)	180	604			917	

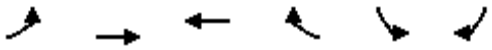
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	108	380	227	372	456
Volume Left	95	0	0	144	0
Volume Right	13	0	37	0	0
cSH	197	1700	1700	917	1700
Volume to Capacity	0.55	0.22	0.13	0.16	0.27
Queue Length 95th (ft)	72	0	0	14	0
Control Delay (s)	43.5	0.0	0.0	4.8	0.0
Lane LOS	E			A	
Approach Delay (s)	43.5	0.0		2.2	
Approach LOS	E				

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	38	58	0	0	0	11	363	144	155	702	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5						5.5	5.5		5.5	
Lane Util. Factor		1.00						0.95	0.95		0.95	
Frpb, ped/bikes		0.93						1.00	0.91		1.00	
Flpb, ped/bikes		0.94						1.00	1.00		0.99	
Frt		0.95						0.99	0.85		1.00	
Flt Protected		0.98						1.00	1.00		0.99	
Satd. Flow (prot)		1528						1750	1369		3473	
Flt Permitted		0.98						0.96	1.00		0.75	
Satd. Flow (perm)		1528						1686	1369		2635	
Peak-hour factor, PHF	0.56	0.56	0.56	0.92	0.92	0.92	0.98	0.98	0.98	0.76	0.76	0.76
Adj. Flow (vph)	95	68	104	0	0	0	11	370	147	204	924	13
RTOR Reduction (vph)	0	19	0	0	0	0	0	1	36	0	1	0
Lane Group Flow (vph)	0	248	0	0	0	0	0	395	96	0	1140	0
Confl. Peds. (#/hr)	39		68	68		39	24		31	31		24
Turn Type	Perm						Perm		Perm	Perm		
Protected Phases		4						2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		21.5						87.5	87.5		87.5	
Effective Green, g (s)		21.5						87.5	87.5		87.5	
Actuated g/C Ratio		0.18						0.73	0.73		0.73	
Clearance Time (s)		5.5						5.5	5.5		5.5	
Lane Grp Cap (vph)		274						1229	998		1921	
v/s Ratio Prot												
v/s Ratio Perm		0.16						0.23	0.07		c0.43	
v/c Ratio		0.91						0.32	0.10		0.59	
Uniform Delay, d1		48.3						5.7	4.7		7.8	
Progression Factor		1.00						0.77	0.32		1.00	
Incremental Delay, d2		34.7						0.7	0.2		1.4	
Delay (s)		82.9						5.1	1.7		9.1	
Level of Service		F						A	A		A	
Approach Delay (s)		82.9			0.0			4.3			9.1	
Approach LOS		F			A			A			A	

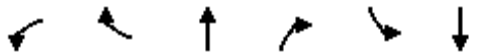
Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	27	12	11	30	80	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.88	0.88	0.75	0.75
Hourly flow rate (vph)	44	20	12	34	107	16
Pedestrians		40	4		9	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		3	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			199			
pX, platoon unblocked						
vC, conflicting volume	56				151	79
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	56				151	79
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				87	98
cM capacity (veh/h)	1538				808	942

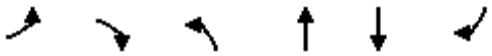
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	64	47	123
Volume Left	44	0	107
Volume Right	0	34	16
cSH	1538	1700	823
Volume to Capacity	0.03	0.03	0.15
Queue Length 95th (ft)	2	0	13
Control Delay (s)	5.2	0.0	10.1
Lane LOS	A		B
Approach Delay (s)	5.2	0.0	10.1
Approach LOS			B

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	140	183	536	42	27	353
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.98		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.92		0.99			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1652		3453			3527
Flt Permitted	0.98		1.00			0.69
Satd. Flow (perm)	1652		3453			2438
Peak-hour factor, PHF	0.90	0.90	0.96	0.96	0.82	0.82
Adj. Flow (vph)	156	203	558	44	33	430
RTOR Reduction (vph)	39	0	5	0	0	0
Lane Group Flow (vph)	320	0	597	0	0	463
Confl. Peds. (#/hr)	19	17		45	45	
Turn Type					pm+pt	
Protected Phases	3		2		1	7 10
Permitted Phases					7 10	
Actuated Green, G (s)	28.5		53.5			77.0
Effective Green, g (s)	28.5		53.5			77.0
Actuated g/C Ratio	0.24		0.45			0.64
Clearance Time (s)	5.5		5.5			
Lane Grp Cap (vph)	392		1539			1646
v/s Ratio Prot	c0.19		c0.17			c0.02
v/s Ratio Perm						0.16
v/c Ratio	0.82		0.39			0.28
Uniform Delay, d1	43.3		22.3			9.4
Progression Factor	1.00		1.00			0.12
Incremental Delay, d2	17.0		0.7			0.4
Delay (s)	60.2		23.0			1.5
Level of Service	E		C			A
Approach Delay (s)	60.2		23.0			1.5
Approach LOS	E		C			A

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



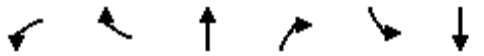
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	28	19	52	667	363	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.5	5.5	
Lane Util. Factor	1.00			0.95	0.95	
Frpb, ped/bikes	0.97			1.00	0.95	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.95			1.00	0.98	
Flt Protected	0.97			1.00	1.00	
Satd. Flow (prot)	1666			3527	3280	
Flt Permitted	0.97			0.75	1.00	
Satd. Flow (perm)	1666			2671	3280	
Peak-hour factor, PHF	0.60	0.60	0.96	0.96	0.82	0.82
Adj. Flow (vph)	47	32	54	695	443	84
RTOR Reduction (vph)	20	0	0	0	13	0
Lane Group Flow (vph)	59	0	0	749	514	0
Confl. Peds. (#/hr)	17	19	81			81
Turn Type			Perm			
Protected Phases	4			5 6	2	
Permitted Phases			5 6			
Actuated Green, G (s)	11.0			87.5	53.5	
Effective Green, g (s)	11.0			85.5	53.5	
Actuated g/C Ratio	0.09			0.71	0.45	
Clearance Time (s)	5.0				5.5	
Lane Grp Cap (vph)	153			1903	1462	
v/s Ratio Prot	c0.04				0.16	
v/s Ratio Perm				c0.28		
v/c Ratio	0.39			0.39	0.35	
Uniform Delay, d1	51.3			6.9	21.8	
Progression Factor	1.00			0.21	0.91	
Incremental Delay, d2	7.2			0.5	0.7	
Delay (s)	58.5			2.0	20.4	
Level of Service	E			A	C	
Approach Delay (s)	58.5			2.0	20.4	
Approach LOS	E			A	C	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	31	691	15	1	429
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.99	0.99	0.75	0.75
Hourly flow rate (vph)	6	33	698	15	1	572
Pedestrians	59					59
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	5					5
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			220			442
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1053	475			772	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	909	288			607	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	94			100	
cM capacity (veh/h)	243	597			856	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	40	465	248	192	381
Volume Left	6	0	0	1	0
Volume Right	33	0	15	0	0
cSH	483	1700	1700	856	1700
Volume to Capacity	0.08	0.27	0.15	0.00	0.22
Queue Length 95th (ft)	7	0	0	0	0
Control Delay (s)	13.1	0.0	0.0	0.1	0.0
Lane LOS	B			A	
Approach Delay (s)	13.1	0.0		0.0	
Approach LOS	B				

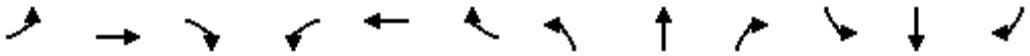
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	96	19	712	10	35	324
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.78	0.78	0.99	0.99	0.75	0.75
Hourly flow rate (vph)	123	24	719	10	47	432
Pedestrians			14			59
Lane Width (ft)			12.0			12.0
Walking Speed (ft/s)			4.0			4.0
Percent Blockage			1			5
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			278			384
pX, platoon unblocked	0.94	0.94			0.94	
vC, conflicting volume	1048	424			729	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	910	247			573	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	49	96			95	
cM capacity (veh/h)	241	670			932	

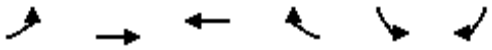
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	147	479	250	191	288
Volume Left	123	0	0	47	0
Volume Right	24	0	10	0	0
cSH	269	1700	1700	932	1700
Volume to Capacity	0.55	0.28	0.15	0.05	0.17
Queue Length 95th (ft)	76	0	0	4	0
Control Delay (s)	33.4	0.0	0.0	2.6	0.0
Lane LOS	D			A	
Approach Delay (s)	33.4	0.0		1.0	
Approach LOS	D				

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	10	9	0	0	0	25	534	156	46	349	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5						5.5	5.5		5.5	
Lane Util. Factor		1.00						0.95	0.95		0.95	
Frpb, ped/bikes		1.00						1.00	0.89		0.99	
Flpb, ped/bikes		0.95						1.00	1.00		1.00	
Frt		0.95						1.00	0.85		0.98	
Flt Protected		0.99						1.00	1.00		0.99	
Satd. Flow (prot)		1674						1751	1346		3421	
Flt Permitted		0.99						0.96	1.00		0.82	
Satd. Flow (perm)		1674						1686	1346		2826	
Peak-hour factor, PHF	0.56	0.56	0.56	0.92	0.92	0.92	0.98	0.98	0.98	0.76	0.76	0.76
Adj. Flow (vph)	14	18	16	0	0	0	26	545	159	61	459	61
RTOR Reduction (vph)	0	14	0	0	0	0	0	1	32	0	8	0
Lane Group Flow (vph)	0	34	0	0	0	0	0	586	111	0	573	0
Confl. Peds. (#/hr)	39					39	17		37	37		17
Turn Type	Perm						Perm		Perm	Perm		
Protected Phases		4						2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		15.5						93.5	93.5		93.5	
Effective Green, g (s)		15.5						93.5	93.5		93.5	
Actuated g/C Ratio		0.13						0.78	0.78		0.78	
Clearance Time (s)		5.5						5.5	5.5		5.5	
Lane Grp Cap (vph)		216						1314	1049		2202	
v/s Ratio Prot												
v/s Ratio Perm		0.02						c0.35	0.08		0.20	
v/c Ratio		0.16						0.45	0.11		0.26	
Uniform Delay, d1		46.4						4.5	3.2		3.7	
Progression Factor		1.00						0.79	0.22		1.00	
Incremental Delay, d2		1.6						1.0	0.2		0.3	
Delay (s)		48.0						4.6	0.9		4.0	
Level of Service		D						A	A		A	
Approach Delay (s)		48.0			0.0			3.9			4.0	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



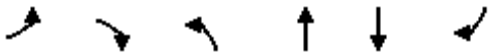
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	4	6	85	43	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.56	0.56	0.48	0.48	0.58	0.58
Hourly flow rate (vph)	5	7	12	177	74	34
Pedestrians		31	3		14	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		3	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			199			
pX, platoon unblocked						
vC, conflicting volume	204				136	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	204				136	146
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				91	96
cM capacity (veh/h)	1352				842	868

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	12	190	109
Volume Left	5	0	74
Volume Right	0	177	34
cSH	1352	1700	850
Volume to Capacity	0.00	0.11	0.13
Queue Length 95th (ft)	0	0	11
Control Delay (s)	3.3	0.0	9.9
Lane LOS	A		A
Approach Delay (s)	3.3	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	81	84	428	62	61	664
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0
Lane Util. Factor	1.00		0.95			0.95
Frpb, ped/bikes	0.94		0.99			1.00
Flpb, ped/bikes	1.00		1.00			1.00
Frt	0.93		0.98			1.00
Flt Protected	0.98		1.00			1.00
Satd. Flow (prot)	1587		3425			3524
Flt Permitted	0.98		1.00			0.73
Satd. Flow (perm)	1587		3425			2584
Peak-hour factor, PHF	0.95	0.95	0.91	0.91	0.98	0.98
Adj. Flow (vph)	85	88	470	68	62	678
RTOR Reduction (vph)	31	0	10	0	0	0
Lane Group Flow (vph)	142	0	528	0	0	740
Confl. Peds. (#/hr)	47	49		24	24	
Turn Type					pm+pt	
Protected Phases	3		2		1	7 10
Permitted Phases					7 10	
Actuated Green, G (s)	15.5		67.5			90.0
Effective Green, g (s)	15.5		67.5			90.0
Actuated g/C Ratio	0.13		0.56			0.75
Clearance Time (s)	5.5		5.5			
Lane Grp Cap (vph)	205		1927			2009
v/s Ratio Prot	c0.09		0.15			c0.03
v/s Ratio Perm						c0.25
v/c Ratio	0.69		0.27			0.37
Uniform Delay, d1	50.0		13.6			5.2
Progression Factor	1.00		1.00			0.37
Incremental Delay, d2	17.4		0.4			0.5
Delay (s)	67.4		13.9			2.4
Level of Service	E		B			A
Approach Delay (s)	67.4		13.9			2.4
Approach LOS	E		B			A

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.5
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



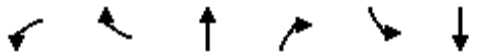
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	71	60	21	499	667	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.5	5.5	
Lane Util. Factor	1.00			0.95	0.95	
Frpb, ped/bikes	0.94			1.00	1.00	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.94			1.00	0.99	
Flt Protected	0.97			1.00	1.00	
Satd. Flow (prot)	1593			3532	3497	
Flt Permitted	0.97			0.91	1.00	
Satd. Flow (perm)	1593			3215	3497	
Peak-hour factor, PHF	0.78	0.78	0.91	0.91	0.98	0.98
Adj. Flow (vph)	91	77	23	548	681	35
RTOR Reduction (vph)	26	0	0	0	3	0
Lane Group Flow (vph)	142	0	0	571	713	0
Confl. Peds. (#/hr)	49	47	21			21
Turn Type			Perm			
Protected Phases	4			5 6	2	
Permitted Phases			5 6			
Actuated Green, G (s)	10.0			88.5	67.5	
Effective Green, g (s)	10.0			86.5	67.5	
Actuated g/C Ratio	0.08			0.72	0.56	
Clearance Time (s)	5.0				5.5	
Lane Grp Cap (vph)	133			2317	1967	
v/s Ratio Prot	c0.09				c0.20	
v/s Ratio Perm				c0.18		
v/c Ratio	1.07			0.25	0.36	
Uniform Delay, d1	55.0			5.7	14.4	
Progression Factor	1.00			0.15	0.85	
Incremental Delay, d2	98.1			0.2	0.4	
Delay (s)	153.1			1.1	12.7	
Level of Service	F			A	B	
Approach Delay (s)	153.1			1.1	12.7	
Approach LOS	F			A	B	

Intersection Summary			
HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	21	550	21	6	704
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.66	0.66	0.93	0.93	0.91	0.91
Hourly flow rate (vph)	12	32	591	23	7	774
Pedestrians	52					52
Lane Width (ft)	12.0					12.0
Walking Speed (ft/s)	4.0					4.0
Percent Blockage	4					4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			220			442
pX, platoon unblocked	0.95	0.95			0.95	
vC, conflicting volume	1055	411			666	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	963	289			556	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	95			99	
cM capacity (veh/h)	230	619			923	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	394	220	264	516
Volume Left	12	0	0	7	0
Volume Right	32	0	23	0	0
cSH	422	1700	1700	923	1700
Volume to Capacity	0.10	0.23	0.13	0.01	0.30
Queue Length 95th (ft)	9	0	0	1	0
Control Delay (s)	14.5	0.0	0.0	0.3	0.0
Lane LOS	B			A	
Approach Delay (s)	14.5	0.0		0.1	
Approach LOS	B				

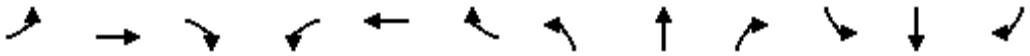
Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	72	10	536	34	131	633
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.76	0.76	0.93	0.93	0.91	0.91
Hourly flow rate (vph)	95	13	576	37	144	696
Pedestrians	55		4			52
Lane Width (ft)	12.0		12.0			12.0
Walking Speed (ft/s)	4.0		4.0			4.0
Percent Blockage	5		0			4
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			278			384
pX, platoon unblocked	0.95	0.96			0.96	
vC, conflicting volume	1289	413			668	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1017	313			577	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	47	98			84	
cM capacity (veh/h)	177	600			912	

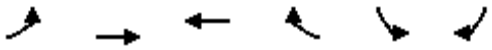
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	108	384	229	376	464
Volume Left	95	0	0	144	0
Volume Right	13	0	37	0	0
cSH	194	1700	1700	912	1700
Volume to Capacity	0.56	0.23	0.13	0.16	0.27
Queue Length 95th (ft)	74	0	0	14	0
Control Delay (s)	44.5	0.0	0.0	4.8	0.0
Lane LOS	E			A	
Approach Delay (s)	44.5	0.0		2.2	
Approach LOS	E				

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	38	58	0	0	0	11	369	144	155	713	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.5						5.5	5.5		5.5	
Lane Util. Factor		1.00						0.95	0.95		0.95	
Frpb, ped/bikes		0.93						1.00	0.91		1.00	
Flpb, ped/bikes		0.94						1.00	1.00		0.99	
Frt		0.95						0.99	0.85		1.00	
Flt Protected		0.98						1.00	1.00		0.99	
Satd. Flow (prot)		1528						1751	1369		3474	
Flt Permitted		0.98						0.96	1.00		0.75	
Satd. Flow (perm)		1528						1686	1369		2630	
Peak-hour factor, PHF	0.56	0.56	0.56	0.92	0.92	0.92	0.98	0.98	0.98	0.76	0.76	0.76
Adj. Flow (vph)	95	68	104	0	0	0	11	377	147	204	938	13
RTOR Reduction (vph)	0	19	0	0	0	0	0	1	36	0	1	0
Lane Group Flow (vph)	0	248	0	0	0	0	0	402	96	0	1154	0
Confl. Peds. (#/hr)	39		68	68		39	24		31	31		24
Turn Type	Perm						Perm		Perm	Perm		
Protected Phases		4						2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		21.5						87.5	87.5		87.5	
Effective Green, g (s)		21.5						87.5	87.5		87.5	
Actuated g/C Ratio		0.18						0.73	0.73		0.73	
Clearance Time (s)		5.5						5.5	5.5		5.5	
Lane Grp Cap (vph)		274						1229	998		1918	
v/s Ratio Prot												
v/s Ratio Perm		0.16						0.24	0.07		c0.44	
v/c Ratio		0.91						0.33	0.10		0.60	
Uniform Delay, d1		48.3						5.8	4.7		7.8	
Progression Factor		1.00						0.76	0.31		1.00	
Incremental Delay, d2		34.7						0.7	0.2		1.4	
Delay (s)		82.9						5.1	1.6		9.3	
Level of Service		F						A	A		A	
Approach Delay (s)		82.9			0.0			4.2			9.3	
Approach LOS		F			A			A			A	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	27	12	11	47	89	12
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.61	0.61	0.88	0.88	0.75	0.75
Hourly flow rate (vph)	44	20	12	53	119	16
Pedestrians		40	4		9	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		3	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)			199			
pX, platoon unblocked						
vC, conflicting volume	75				160	88
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	75				160	88
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				85	98
cM capacity (veh/h)	1513				798	931

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	64	66	135
Volume Left	44	0	119
Volume Right	0	53	16
cSH	1513	1700	811
Volume to Capacity	0.03	0.04	0.17
Queue Length 95th (ft)	2	0	15
Control Delay (s)	5.2	0.0	10.3
Lane LOS	A		B
Approach Delay (s)	5.2	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX G –
QUEUING ANALYSIS WORKSHEETS

Lane Group	WBL	NBT	SBT
Lane Group Flow (vph)	356	582	416
v/c Ratio	0.83	0.38	0.28
Control Delay	54.3	22.7	1.7
Queue Delay	0.0	0.0	0.0
Total Delay	54.3	22.7	1.7
Queue Length 50th (ft)	229	152	11
Queue Length 95th (ft)	#385	197	10
Internal Link Dist (ft)	260	254	1
Turn Bay Length (ft)			
Base Capacity (vph)	431	1544	1510
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.83	0.38	0.28

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBT	SBT
Lane Group Flow (vph)	40	725	431
v/c Ratio	0.24	0.32	0.28
Control Delay	36.3	0.9	19.7
Queue Delay	0.0	0.0	0.0
Total Delay	36.3	0.9	19.7
Queue Length 50th (ft)	16	6	108
Queue Length 95th (ft)	29	7	132
Internal Link Dist (ft)	119	1	140
Turn Bay Length (ft)			
Base Capacity (vph)	168	2274	1533
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	51
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.24	0.32	0.29

Intersection Summary

Lane Group	EBT	NBT	NBR	SBT
Lane Group Flow (vph)	48	572	143	486
v/c Ratio	0.21	0.43	0.13	0.22
Control Delay	36.7	5.4	0.4	3.5
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	36.7	5.4	0.4	3.5
Queue Length 50th (ft)	22	85	0	39
Queue Length 95th (ft)	32	109	4	43
Internal Link Dist (ft)	169	304		121
Turn Bay Length (ft)				
Base Capacity (vph)	230	1322	1080	2161
Starvation Cap Reductn	0	85	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.21	0.46	0.13	0.22

Intersection Summary

Lane Group	WBL	NBT	SBT
Lane Group Flow (vph)	172	482	669
v/c Ratio	0.73	0.25	0.35
Control Delay	58.5	13.0	1.9
Queue Delay	0.0	0.0	0.0
Total Delay	58.5	13.0	1.9
Queue Length 50th (ft)	104	90	26
Queue Length 95th (ft)	#206	121	32
Internal Link Dist (ft)	265	240	1
Turn Bay Length (ft)			
Base Capacity (vph)	236	1930	1895
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.73	0.25	0.35

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBT	SBT
Lane Group Flow (vph)	75	505	647
v/c Ratio	0.44	0.21	0.33
Control Delay	33.0	0.9	13.1
Queue Delay	0.0	0.0	0.0
Total Delay	33.1	0.9	13.1
Queue Length 50th (ft)	21	6	155
Queue Length 95th (ft)	55	7	m195
Internal Link Dist (ft)	119	1	140
Turn Bay Length (ft)			
Base Capacity (vph)	170	2446	1982
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	1	0	95
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.44	0.21	0.34

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	NBT	NBR	SBT
Lane Group Flow (vph)	267	321	132	1066
v/c Ratio	0.91	0.26	0.13	0.54
Control Delay	78.9	5.1	0.6	8.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	78.9	5.1	0.6	8.4
Queue Length 50th (ft)	189	63	0	169
Queue Length 95th (ft)	157	88	9	161
Internal Link Dist (ft)	176	304		120
Turn Bay Length (ft)				
Base Capacity (vph)	293	1223	1034	1981
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.91	0.26	0.13	0.54

Intersection Summary

Lane Group	WBL	NBT	SBT
Lane Group Flow (vph)	358	601	458
v/c Ratio	0.83	0.39	0.30
Control Delay	54.4	22.9	1.5
Queue Delay	0.1	0.0	0.0
Total Delay	54.5	22.9	1.5
Queue Length 50th (ft)	230	158	7
Queue Length 95th (ft)	#387	205	2
Internal Link Dist (ft)	248	247	1
Turn Bay Length (ft)			
Base Capacity (vph)	432	1544	1507
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	1	68	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.83	0.41	0.30

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBT	SBT
Lane Group Flow (vph)	55	748	523
v/c Ratio	0.32	0.38	0.35
Control Delay	38.4	1.8	19.7
Queue Delay	0.0	0.0	0.0
Total Delay	38.4	1.8	19.7
Queue Length 50th (ft)	23	17	132
Queue Length 95th (ft)	37	14	157
Internal Link Dist (ft)	119	1	140
Turn Bay Length (ft)			
Base Capacity (vph)	173	1959	1479
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.32	0.38	0.35

Intersection Summary

Lane Group	EBT	NBT	NBR	SBT
Lane Group Flow (vph)	48	578	143	577
v/c Ratio	0.21	0.44	0.13	0.26
Control Delay	36.7	4.8	0.4	3.7
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	36.7	4.9	0.4	3.7
Queue Length 50th (ft)	22	85	0	50
Queue Length 95th (ft)	32	113	4	53
Internal Link Dist (ft)	170	304		136
Turn Bay Length (ft)				
Base Capacity (vph)	230	1315	1080	2212
Starvation Cap Reductn	0	81	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.21	0.47	0.13	0.26

Intersection Summary

Lane Group	WBL	NBT	SBT
Lane Group Flow (vph)	172	533	737
v/c Ratio	0.73	0.28	0.40
Control Delay	58.5	13.4	2.2
Queue Delay	0.0	0.0	0.0
Total Delay	58.5	13.4	2.2
Queue Length 50th (ft)	104	102	30
Queue Length 95th (ft)	#206	135	m30
Internal Link Dist (ft)	268	245	1
Turn Bay Length (ft)			
Base Capacity (vph)	236	1936	1865
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.73	0.28	0.40

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	NBT	SBT
Lane Group Flow (vph)	156	564	704
v/c Ratio	0.98	0.23	0.36
Control Delay	111.8	1.0	12.8
Queue Delay	1.5	0.0	0.0
Total Delay	113.3	1.0	12.8
Queue Length 50th (ft)	100	7	171
Queue Length 95th (ft)	#190	8	m207
Internal Link Dist (ft)	119	1	140
Turn Bay Length (ft)			
Base Capacity (vph)	159	2422	1977
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	1	0	101
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.99	0.23	0.38

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	NBT	NBR	SBT
Lane Group Flow (vph)	267	396	132	1141
v/c Ratio	0.91	0.32	0.13	0.59
Control Delay	78.9	5.2	0.5	9.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	78.9	5.2	0.5	9.3
Queue Length 50th (ft)	189	74	0	194
Queue Length 95th (ft)	157	m101	m6	182
Internal Link Dist (ft)	180	304		113
Turn Bay Length (ft)				
Base Capacity (vph)	293	1230	1034	1921
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.91	0.32	0.13	0.59

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	WBL	NBT	SBT
Lane Group Flow (vph)	359	602	463
v/c Ratio	0.83	0.39	0.31
Control Delay	54.7	22.9	1.5
Queue Delay	0.1	0.0	0.0
Total Delay	54.8	22.9	1.5
Queue Length 50th (ft)	231	158	6
Queue Length 95th (ft)	#390	205	3
Internal Link Dist (ft)	257	260	1
Turn Bay Length (ft)			
Base Capacity (vph)	432	1544	1497
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	1	75	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.83	0.41	0.31

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	NBT	SBT
Lane Group Flow (vph)	79	749	527
v/c Ratio	0.46	0.38	0.36
Control Delay	46.8	1.8	19.7
Queue Delay	0.0	0.0	0.0
Total Delay	46.8	1.8	19.7
Queue Length 50th (ft)	42	17	133
Queue Length 95th (ft)	55	15	158
Internal Link Dist (ft)	119	1	140
Turn Bay Length (ft)			
Base Capacity (vph)	173	1948	1475
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.46	0.38	0.36

Intersection Summary

Lane Group	EBT	NBT	NBR	SBT
Lane Group Flow (vph)	48	587	143	581
v/c Ratio	0.21	0.45	0.13	0.26
Control Delay	36.7	4.7	0.4	3.8
Queue Delay	0.0	0.1	0.0	0.0
Total Delay	36.7	4.8	0.4	3.8
Queue Length 50th (ft)	22	85	0	51
Queue Length 95th (ft)	32	110	4	53
Internal Link Dist (ft)	177	304		127
Turn Bay Length (ft)				
Base Capacity (vph)	230	1315	1080	2209
Starvation Cap Reductn	0	82	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.21	0.48	0.13	0.26

Intersection Summary

Lane Group	WBL	NBT	SBT
Lane Group Flow (vph)	173	538	740
v/c Ratio	0.73	0.28	0.40
Control Delay	58.5	13.5	2.2
Queue Delay	0.0	0.0	0.0
Total Delay	58.5	13.5	2.2
Queue Length 50th (ft)	104	103	27
Queue Length 95th (ft)	#208	136	m26
Internal Link Dist (ft)	258	257	1
Turn Bay Length (ft)			
Base Capacity (vph)	236	1936	1856
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.73	0.28	0.40

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBL	NBT	SBT
Lane Group Flow (vph)	168	571	716
v/c Ratio	1.06	0.24	0.36
Control Delay	133.1	1.0	12.7
Queue Delay	2.3	0.0	0.0
Total Delay	135.4	1.0	12.7
Queue Length 50th (ft)	~122	7	174
Queue Length 95th (ft)	#211	8	m208
Internal Link Dist (ft)	119	1	140
Turn Bay Length (ft)			
Base Capacity (vph)	158	2370	1971
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	1	0	95
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	1.07	0.24	0.38

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Lane Group	EBT	NBT	NBR	SBT
Lane Group Flow (vph)	267	403	132	1155
v/c Ratio	0.91	0.33	0.13	0.60
Control Delay	78.9	5.1	0.5	9.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	78.9	5.1	0.5	9.5
Queue Length 50th (ft)	189	75	0	199
Queue Length 95th (ft)	157	m101	m5	186
Internal Link Dist (ft)	183	304		120
Turn Bay Length (ft)				
Base Capacity (vph)	293	1230	1034	1917
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.91	0.33	0.13	0.60

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.