Zone A Mixed-Use Development
Armed Forces Retirement Home- Washington, D.C.
Transportation Management Program

July 10, 2008

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1.0 Introduction

This document is the Transportation Management Program (TMP) for the development located on a 77-acre portion of the Armed Forces Retirement Home in Washington, DC (AFRH-W). The TMP is one of the transaction documents prepared between Crescent North Capitol Development Two, LLC ("Master Developer") and the AFRH-W as part of the mixed use development plan for the area of the AFRH-W designated as Zone A. Revenue from the development of Zone A will be used to supplement the AFRH-W trust fund. This document focuses on the Zone A Transportation Demand Management (TDM) strategies that will ensure the success of the TMP as they are implemented by development phase and will be managed onsite. The TDM strategies, implementation measures, and monitoring & evaluation techniques presented were selected to reduce potential impacts to traffic and air quality from the mixed use development within the project area and surrounding vicinity.

The goals of the TMP are:

- Encourage alternative commuting options in the use of transit services, participation in transportation programs, and other commuting options to minimize single occupancy vehicles (SOV) for workers and residents and to achieve a minimum of 30% non-SOV mode split;
- Promote the use of transit services including local/regional bus, Metrorail and commuter rail, subscription bus, and shuttle bus services to and from transit centers;
- Promote participation in transportation programs including carpooling, vanpooling, flexible work hour programs, flexible work week programs, guaranteed ride home, virtual offices (teleworking/telecommuting), transit subsidy, pre-tax benefits, car-sharing, preferential parking, and marketing incentive programs;
- Reduce the impact of trips generated by workers and residents in the Zone A Development on the local and regional roadway system; and
- Develop the site to promote safe and aesthetic pedestrian and bike paths.

1.1 Project Description

The Zone A Development is located adjacent to Irving and North Capitol Streets in the southeast corner of the AFRH-W site as shown in Figure 1. The zone is designated for mixed use with a combination of office, residential, hotel, retail, medical clinic, and open space uses. The development in Zone A will be phased beginning in 2009 with an anticipated construction completion date of 2021. Table 1 shows the proposed use and construction phase for each building shown in Figure 2. Phase 1 of construction will only include the onsite roads and infrastructure.

The TMP consists of six parts:

- Assessment of traffic (Existing and With Future Zone A Development) and transit in the vicinity of Zone A. An assessment of traffic conditions along with mitigation required for the development is provided in Section 2.0 of this report. The complete *Traffic Impact Study* (TIS) prepared for this project is contained within Appendix A. The TIS was developed for an earlier development plan with a larger square footage than the final plan shown in Figure 2. The TIS analyzed a worse traffic scenario than will occur with the revised smaller development. The TIS and the information related to traffic in Section 2.0 were not updated to match the final development plan.

- TDM strategies that are planned for the site;

- TDM strategy implementation relative to the phasing of the development to total build out;

- TDM estimated funding for the implementation of strategies;

- TDM marketing plan for strategies discussed; and

- TDM monitoring and evaluation plan to measure the success of the TMP.

Table 1. Zone A Development Plan

Building	Use	Construction Phase*
A/B2	Hotel/Meeting Facility	Phase 2
B	Assisted Living	Phase 5
B1	Transitional Facility	Phase 4
C	Office/Retail	Phase 2
D	Office/Retail	Phase 2
E	Office	Phase 3
F	Office	Phase 3
H	Residential/Retail	Phase 2
I	Residential/Retail	Phase 2
K	Residential/Retail	Phase 2
L	Retail	Phase 2
M	Residential/Retail	Phase 2
N	Residential	Phase 3
O	Residential/Retail	Phase 2
P	Residential	Phase 3
Q	Residential	Phase 3
S	Residential/Office	Phase 3
T	Residential/Retail	Phase 3

Note: Buildings G, J, and R have been removed from the development plan

* Phase 2 Construction Years: 2011-2015
Phase 3 Construction Years: 2013-2019
Phase 4 Construction Years: TBD (est. 2017-2020)
Phase 5 Construction Years: TBD (est. 2020-2021)

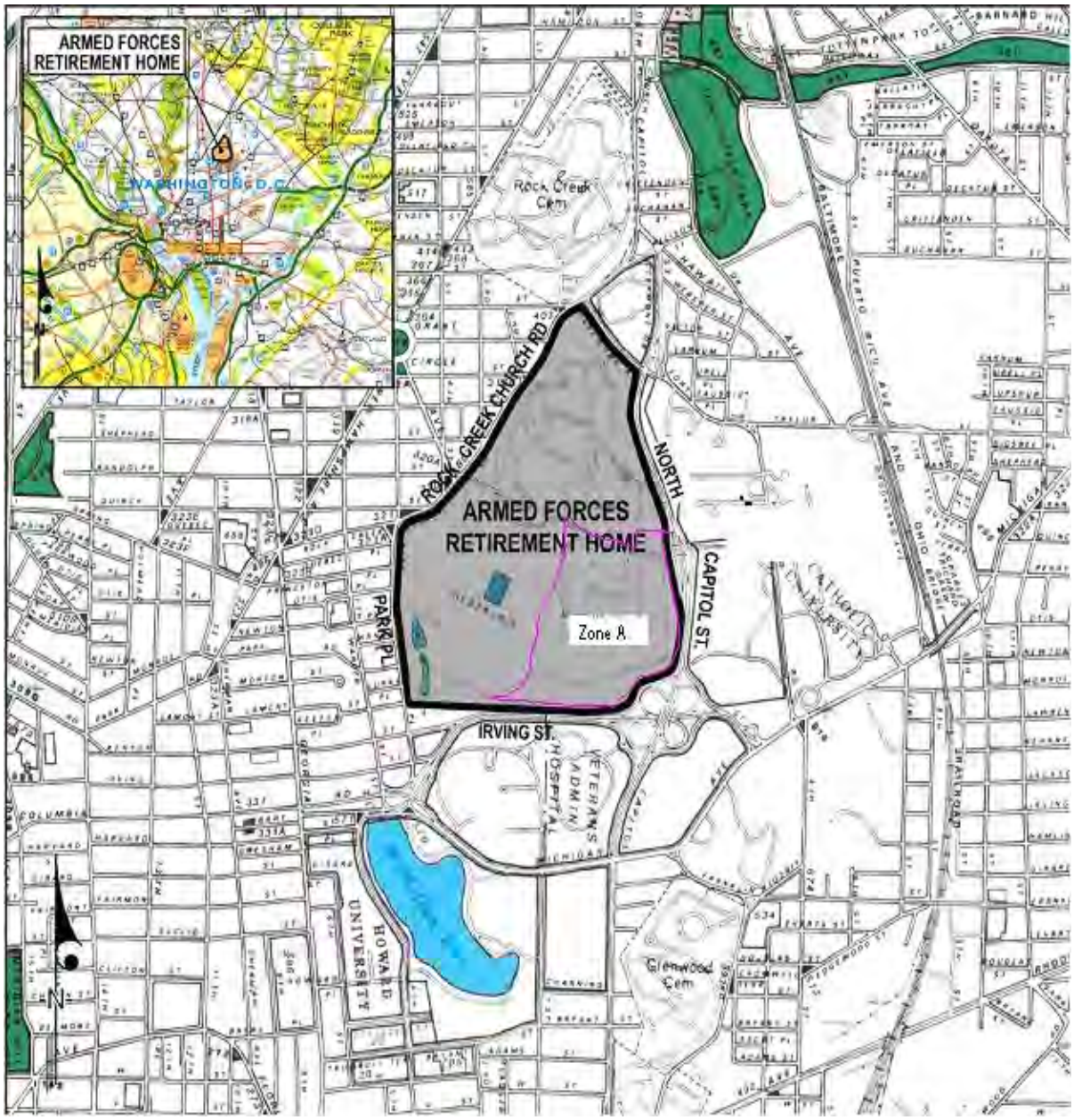


Figure 1: Location Map (source: DFEIS, May 2005)

Figure 2: Proposed Development for Zone A

1.2 TMP ORGANIZATION

The Master Association is responsible for the management and operation of the TMP. The Master Developer, as the Master Association member with majority voting rights, will require each parcel developer to participate in the TMP and the implementation of TDM strategies outlined in this document.

A. Master Association: The Master Developer, in agreement with the AFRH-W, will establish a Master Association to manage the site. Management of the Master Association will be the responsibility of a board of directors. The Master Association will consist of all commercial and rental residential tenants and a representative(s) of the Tenants Association for the condominium component of the site. The Master Association will have the responsibility to monitor and assess the overall success of the TMP.

B. Transportation Management Plan Coordinator (TMPC): The responsibility of the TMPC is the implementation of the TMP, TDM strategies, and continued maintenance of all services and programs, both during site development and after full site build-out. The TMPC will be hired by the Master Developer either as a direct employee or a consultant and will have the expertise necessary to implement and manage a successful TMP. As part of their responsibilities, the TMPC will evaluate both the phasing and effectiveness of the TMP and the corresponding TDM strategies. The Master Association will be responsible for the annual monitoring and evaluation of the TMP and the TMPC. The proposed TDM strategies implementation schedule for the TMPC is outlined in Section 5 of this report. The following is a brief summary of the TMPC role and responsibilities during the development of the project:

Initial Land Development (2009 – 2011)

- The TMPC will be a consultant hired by the Master Developer within six months of initiation of the land development construction activities. It is anticipated that this will be a part-time position until the vertical development leasing activities commence.
- Initial responsibilities for the TMPC will be to develop a sound and realistic TDM Strategic Plan that will include a Marketing Plan that will be coordinated with the developer's leasing department and a detailed Monitoring and Evaluation Plan that will measure TDM strategy performance using web-based tools.
- Additional responsibilities for the TMPC will include development of a TDM program brand or identity; development of materials to support the implementation of the Marketing Plan; development of a Parking Management Plan for current and future vertical development; coordination with WMATA and other transit service providers on transit usage(including routes and scheduling); potential coordination with the adjacent hospital complexes and other adjacent businesses on mutually beneficial TDM strategies; and participation/membership in local transportation organizations, such as DC Business Improvement District (BID).

Vertical Development (2011 – 2020)

- The TMPC will either be a consultant or an employee of the Master Developer. The position will continue initially to be a part-time position and focus on completion of the Initial Land Development tasks. It will become a full-time management position at a later date upon completion of a specified amount of development in Phase II.
- Responsibilities for the TMPC will include: participation in Commuter Connections programs and services, establishment of Shuttle Service to Metrorail station, the opening of the Commuter Store/Center, establishment of car-sharing services (such as Flexcar or Zipcar) onsite, and the development and production of marketing materials for the implementation of the TDM Strategic Plan for transit services and transportation programs for residents and tenants.

Post Development / Project Stabilization (post 2020)

- The position of TMPC will remain a full-time position either as a direct employee of the Master Developer or as a consultant. The TMPC will manage the continued implementation of the TMP which includes providing current information to tenants and residents on the advantages and types of available transit services and transportation programs.
- As the project site matures, the TMPC, in conjunction with the Master Association, will monitor and evaluate the TDM strategies to determine if modifications are needed to meet the objectives of the plan.

C. Funding: Each parcel developer will pay into the TMP on a pro rata basis, dependent on the number of units and/or square footage of their site. Payment will be made on an annual basis. The annual fees will be determined once the operating budget and building program are finalized. Some of the TDM strategies, such as the TMPC and operation of the Metrorail shuttle, will be the direct responsibility of the Master Association; others will be the responsibility of the individual parcel developers. Estimated initial costs for the TDM strategies are discussed in Section 6 of this document.

2.0 Assessment of Transportation Conditions

An assessment of traffic conditions and transit service in the vicinity of the Zone A Development, along with mitigation required for the development, is provided in this section.

2.1 Base Traffic Conditions

The assessment was conducted to determine baseline conditions so that proposed impacts on traffic from the development could be determined and appropriate mitigation steps taken, if necessary. It also provides a baseline from which the effectiveness of the TDM strategies can be measured.

The existing 2006 base conditions in the vicinity of the AFRH-W, which includes the site of the proposed Zone A Development, were analyzed at specific intersections adjacent to the development site. This analysis consisted of peak hour vehicle trips at these intersections and the amount of congestion and delay that were experienced at these intersections.

Traffic volumes per intersection approach, detailed by turning movements (through, left or right) for 2006 were provided at the following locations from the data developed for the *Draft Environmental Impact Statement for the Armed Forces Retirement Home Master Plan (DEIS)*:

- Rock Creek Church Road/Harewood Road
- Rock Creek Church Road/Randolph Road and Illinois Avenue
- Rock Creek Church Road/Upshur Street
- Park Place and Kenyon Street
- Park Place and Irving Street
- Columbia Road and Irving Street
- Kenyan Street and Irving Street
- First Street and Irving Street
- Scale Gate at North Capitol Street
- North Capitol Street/Harewood Road

The existing a.m. and p.m. peak hour traffic volumes at the above referenced intersections are shown in Figure 3. The a.m. peak hour is defined as the four highest consecutive 15-minute intervals for one hour between 7 am and 9 am. The p.m. peak hour is defined as the four highest consecutive 15-minute intervals for one hour between 4 pm and 6 pm.

The performance of the transportation system for 2006 base conditions is measured from two interrelated perspectives: LOS/traffic congestion generated by vehicular traffic on public roadways; and modal split defined as users of public transportation and non-motorized modes of travel.

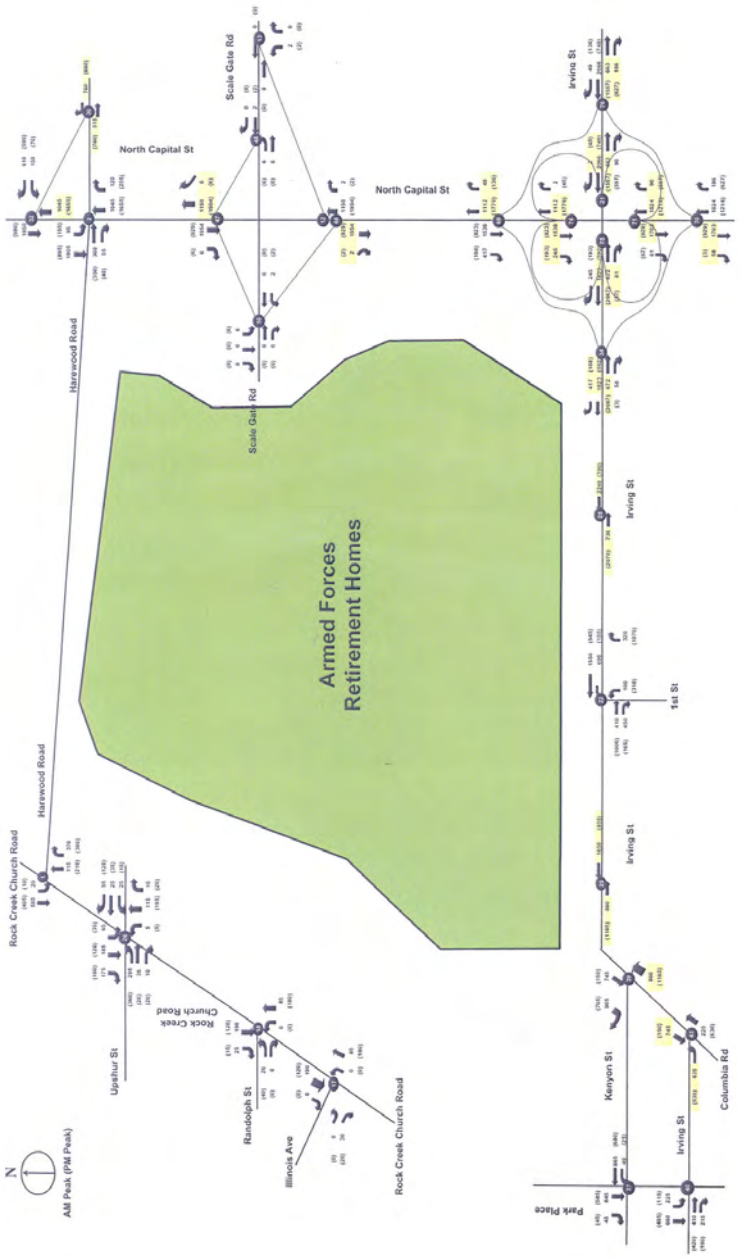


Figure 3: Existing Peak Hour Traffic Volumes (2006)

2.1.1 LOS /Traffic Congestion

Using the peak hour traffic volumes and existing lane geometries, an intersection capacity analysis was performed for both the a.m. and p.m. peak hours. Analyses were performed using Synchro and Highway Capacity Manual (HCM) methodologies which calculate LOS for each intersection. The HCM defines six levels of service ranging from A to F, with A representing the optimal operating conditions with minimal delays and F representing gridlock congestion. The District Department of Transportation (DDOT) defines LOS D as an acceptable LOS in Washington, DC.

In the May 2005 DEIS, the interchange of North Capitol Street/Irving Street was under construction at the time. The interchange is now fully functional, and is included in the TIS for this TMP found in Appendix A. Peak hour traffic counts for interchange ramps at North Capitol Street/Irving Street were not available at the time of this study. Volumes on the ramps were generated based on the traffic volume counts at neighboring intersections and the distribution of traffic from the Metropolitan Washington Council of Government's (MWCOG) regional traffic model. Table 2 shows the existing conditions LOS for the intersections in the vicinity of the AFRH-W and the range of delay associated with each LOS. Delay is measured in seconds, and is considered the average time a vehicle would have to spend trying to pass through the intersection. The calculations and procedures used to determine the LOS are included in Appendix A.

Table 2: Existing Conditions Intersection LOS: 2006 A.M. & P.M. Peak Hours

Intersection	Existing AM	Existing PM
Signalized	(sec delay)	(sec delay)
Irving St and 1St St NW	B (17.4)	D (46.2)
Irving St and Columbia Road	C (20.2)	B (12.1)
Irving Street and Park Place	B (10.2)	B (11.7)
Kenyon Street and Park Place	C (20.1)	B (13.7)
North Capitol and Michigan Avenue	C(30.4)	C (25.6)
Rock Creek Church Road/Upshur Road	B (16.5)	D (37.9)
Rock Creek Church Road/Harewood Road	A (0.4)	A (0.3)
North Capitol Street and Harewood Road	B (18.3)	C (26.6)
Unsignalized		
Rock Creek Church Rd & Illinois Ave (EB Right Turn)	A (9.5)	A (9.0)
Rock Creek Church Rd & Randolph St (EB Left Turn)	B (10.5)	B (10.8)
Scale Gate Rd & N. Capitol St SB-Off Ramp (SB Approach)	A (8.6)	A (8.6)

As shown in Table 2, the overall LOS for these intersections is D or better during 2006 existing conditions. However, there are two individual approach legs that fail. These are

the eastbound approach of Irving and 1St Streets which operates at LOS E in the p.m., and the eastbound approach of Rock Creek Church Road and Upshur Road which operates at LOS F in the p.m.

2.1.2 Modal Split

Travel options to and from the site can be categorized as either vehicular, transit or non-motorized. Modal split refers to those individuals that prefer to take transit, high-occupancy and non-motorized modes over their single-personal vehicle option. Modal split also includes those individuals that share a vehicle to make daily trips and are referred to as high-occupancy vehicles. Data is available on these modal splits from the U.S. Census Bureau in predefined *census tracts* (CT), and estimates made by MWCOG as part of their regional traffic model in predefined *traffic analysis zones* (TZ).

Existing development in Zone A is limited to transitional housing and the Smithsonian Institute's greenhouses, which both generate minimal traffic. Therefore, existing information in the vicinity of the AFRH-W was evaluated to determine modal split. This information is used for a point of reference for existing conditions in the vicinity of the project site; it is recognized that the Zone A development will have different land uses and corresponding different users. It is also used as a "pivot" point from which to start the mode split analysis.

The U.S. Census Tract (CT 23.02) that includes the AFRH-W and the Washington Hospital Center (WHC) is loosely bordered by North Capitol Street to the east, Michigan Avenue to the south, Park Place to the west, and Allison Street/Harwood Road to the north (and does include a small vacant portion of Catholic University adjacent to North Capitol Street). This census data is collected every 10 years with the most recent data being available for the year 2000. The data is also specific to work activity only and does not include non-work travel. Census statistics are shown for this census tract in Table 3. The modal split to and from this census tract indicates a 30% transit mode split, focused on delivering employees to the WHC. Individuals using carpool or vanpool comprise another 10% of the mode split. Because the census tract includes both the AFRH-W and WHC, the mode splits between the two properties cannot be determined.

Table 3: 2000 U.S. Census Modal Split

	Mode
Mode of Travel	**%**
Single Occupant Vehicles	54%
High-Occupancy Vehicles	10%
Metro Bus	4%
Metro Rail (with Metro Bus)	26%
Walk/Bicycle	4%
Telecommute	3%

The MWCOG regional traffic model builds upon the U.S. Census data to include non-work travel. The regional model is calibrated against the U.S. Census data for work travel and provides the best prediction of all travel in the metropolitan Washington area. One

limitation of the MWCOG model is that it is limited in predicting non-motorized travel. Whereas the U.S. Census collects non-motorized data from individuals, the MWCOG model is limited in making this definition (as walk and bicycle transportation systems are beyond the capability of regional modeling). The MWCOG model is also developed for the year 2000 to allow for validation against the U.S. Census and other data sources. It also provides finer detail than the U.S. Census Tract data. Table 4 shows the results of the 2000 MWCOG model for three traffic analysis zones including the AFRH-W (AFRH TZ 141), WHC (WHC TZ 137) and the highly residential Park View (TZ 136) neighborhood. The numbers shown for the AFRH-W are most likely developed from employees at the facility since most residents do not travel. The Park View traffic analysis zone is defined by Park Place to the west, Columbia Road to the south, Sherman Avenue to the west, and Allison Street to the north.

Table 4: 2000 MWCOG Modal Split

	141 AFRH	137 WHC	137 Park View
Work Travel			
Single Occupant Vehicles	85%	84%	61%
High-Occupancy Vehicles	1%	1%	0%
All Transit	14%	15%	39%
Non-Work Travel			
Single Occupant Vehicles	95%	96%	92%
High-Occupancy Vehicles	0%	0%	0%
All Transit	5%	4%	8%
Total Travel			
Single Occupant Vehicles	91%	92%	89%
High-Occupancy Vehicles	>1%	>1%	0%
All Transit	8%	8%	11%

Mode split differs considerably between work and non-work travel. A work trip that is made each day from the same residential location to the same workplace is much more sensitive to the cost and time associated with that trip. The traveler will find the most economical and convenient mode to make this trip each day and therefore trips using high-occupancy vehicle and transit modes are higher. Transit trips to employment destinations such as the AFRH-W and WHC exhibit 14-15% mode split. Note that the Park View residential zone is almost twice the two employment zones, a function of availability of transit options and non-preference towards the use of personal vehicles for travel.

2.2 Future Background Traffic Conditions

The TIS included in Appendix A was developed from an earlier development plan than that shown in Figure 2. The earlier plan had a larger square footage of development as

compared to the final plan, with a worst case scenario for land development. The final plan calls for less development and removed a ring roadway that encompassed the OS-1 area in the Zone A development.

Although the removal of the interior road will change the traffic patterns onsite, it will not impact the traffic patterns at the entrances/exits to the site. Therefore the TIS was not revised to reflect these changes in the final development plan.

Based on the project development phasing for the approved buildings in Zone A, a future year 2020 was established for this analysis when the site would be fully developed (built-out) and operational. As part of the fully developed analysis, a background traffic forecast for future traffic without any development at the site was first evaluated to assess potential short and long-term needs to the transportation network. As a result, the background traffic forecast assumes that no capacity, system or roadway improvements are made to the roadway system.

Following the same methodology used in the existing LOS analysis, the results for the 2020 background analysis show that all signalized intersections within the study area operate at LOS D or better for all intersections for both peak hours. Similarly, the forecasted 2020 unsignalized analysis shows that all the unsignalized intersections and key turning movement approaches operate at an acceptable LOS. However, there are two individual approach legs that fail: the eastbound approach of Irving Street and 1st Street operates at LOS F in the p.m. and the eastbound approach of Rock Creek Church Road and Upshur Street operates at LOS F in the p.m.

2.2.1 Future Zone A Development Traffic Forecast and Analysis

The lane geometry for the three new access points to the development from Irving Street were included in the 2020 full-build (with Zone A development) traffic analysis as shown in Figure 4. The "main gate" egress point from Zone A at the intersection of Irving Street and 1st Street was assumed to have a single left-turn lane and a shared through and right-turn lane. The other two access points on Irving Street at the "west gate" and "east gate" will be right-in-right-out movements, the initial configuration prior to any changes to accommodate mitigation of traffic problems. These secondary access points will be a single right-turn lane into the site and a single right-turn lane coming out of the site with a stop sign control for coming out of Zone A. The approach for site egress at Scale Gate Road would be a shared through and right-turn lane. The signal timing was optimized in Synchro for all the signalized intersections in the study area. New signal phasing was assumed for the intersection of Irving Street and 1st Street. Details of the traffic modeling and signal timing can be found in Appendix A.

The 2020 future traffic analysis shows that the signalized intersection at Irving Street and 1st Street will operate at a LOS F in both the a.m. and p.m. peak hours. The analysis also shows that the southbound approach at the unsignalized intersection at Scale Gate Road and the southbound off-ramp from North Capitol Street will operate at a LOS F in the a.m. peak hour. All other signalized and unsignalized intersections within the study area

will operate at an acceptable LOS D or better for both peak hours. In general, the operations at all intersections are similar or slightly worse compared with the No-Build analysis, with the exception of the intersection at Rock Creek Church Road and Upshur Street which operates at an improved LOS. This is mainly because the traffic volumes at the intersection are not greatly affected from the Zone A generated traffic and the signal timing was optimized for the intersection.

Some individual intersection approach legs operate at an unacceptable LOS due to additional traffic added by the project. The eastbound approach at the intersection of North Capitol Street and Harewood Road operates at a LOS E in the a.m. and at a LOS F in the p.m. peak hours. The southbound approach at the intersection of North Capitol Street and Michigan Avenue operates at a LOS E in the a.m. peak hours.

2.2.2 Mitigation and Analysis

The future Zone A traffic analysis presented in Section 2.2.1 assumed no improvements to the access/egress configurations from an initial configuration developed at the beginning of the project. To address traffic LOS issues, different mitigation strategies were developed.

Two alternative mitigation designs were considered as presented in the TIS in Appendix A. Alternative 2 was selected as the preferred alternative because it best addressed the mitigation needs of the problem locations.

To mitigate for the degradation of LOS for the failing LOS intersections in the future Zone A development scenario, a new signal plan along with improved lane geometry was developed as part of Alternative 2. The proposed new signal plan at the signalized intersection of Irving Street and 1st Street includes converting the signal type from a pre-timed to an actuated controller. This allows for the vehicles to trigger the signal when green time is needed for vehicle at each approach by reading loop detectors installed into the roadway. This signal type will also work to maximize green time on Irving Street. Irving Street is considered to be the main street having maximum recall and will always command maximum green time. The side street green phases may be actuated and can be skipped if there are no vehicles. The process of optimizing signal phasing was developed to allocate more green time to approaches that presented the greatest demand of vehicles within the determined optimal cycle length.

In the preferred Alternative 2, both the intersection of 1St Street and Irving Street and the Western Gate entrance on Irving Street are full movement, signalized intersections. The West Gate is geometrically aligned with the entrance to the MedStar parking garage at the Washington Hospital Center on the other side of Irving Street. The East Gate entrance on Irving Street is right-in, right-out intersection as defined in the TIS. With the considerable pedestrian traffic that is anticipated to cross Irving Street, the East Gate entrance will require further analysis to determine if a signalized T-intersection is warranted for this location to alleviate traffic congestion and to maximize pedestrian safety. At Scale Gate Road, a right turn only lane will be added from southbound North Capitol Street into the development. A right turn only lane will be added for traffic

exiting Scale Gate onto the southbound ramp to North Capitol Street. Note that if the approach intersections from North Capitol Street at the top of the Scale Gate bridge are signalized, lane geometry modifications will not be required and both intersections will operate at acceptable LOS. Table 5 shows the LOS for the intersections with the future Zone A development with the mitigation Preferred Alternative 2 conditions. Figure 5 shows the traffic analysis for this alternative.

The Alternative 2 mitigation strategy brings all analyzed intersections to LOS D or better. Some individual intersection approach legs operate at marginal or unacceptable LOS even with the addition of mitigation strategies. Typically marginal or unacceptable delays require waiting for two or more signal cycles. These locations include:

LOS F Irving Street/1st Street – PM northbound
North Capitol Street/Harewood Road – PM eastbound

LOS E Irving Street/1st Street – AM westbound and northbound
Irving Street/West Gate – AM westbound, PM westbound and southbound
North Capitol Street/Harewood Road – AM eastbound
North Capitol Street/Michigan Avenue – AM southbound

The calculation of acceptable intersection LOS has assumed Zone A development with the calculation of total vehicular trips, excluding additional trip reductions that would occur with the implementation of demand management strategies. These strategies can be found in subsequent sections of this report and would work to further improve the intersection and approach LOS of intersections analyzed for AFRH Zone A development.

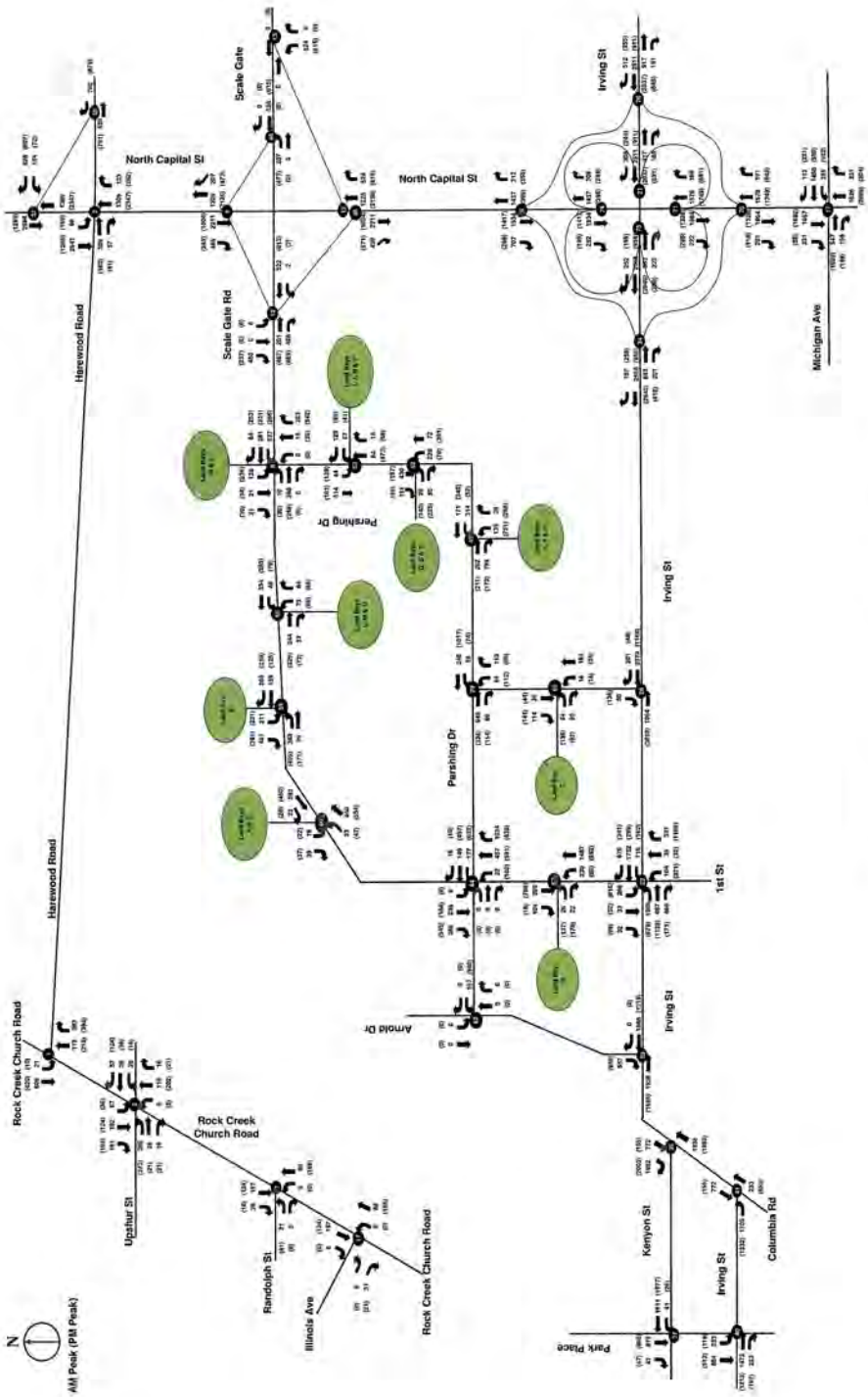


Figure 4: Full-Build Peak Hour Traffic Volumes (2020)

Table 5: Future Conditions Intersection LOS: 2020 Full-Build With Mitigation, A.M. & P.M. Peak Hours

Intersection	Full-Build with Mitigation	Full-Build with Mitigation
	AM	PM
Signalized	(sec delay)	(sec delay)
Irving Street & 1st Street NW	D (54.0)	D (54.6)
Irving Street & West Gate Entrance	D (50.7)	D (53.7)
Irving Street & Columbia Road	C (24.2)	C (20.6)
Irving Street & Park Place	B (11.5)	A (9.3)
Kenyon Street & Park Place	C (21.0)	B (17.9)
North Capitol and Michigan Avenue	D (51.8)	C (34.5)
Rock Creek Church Road & Upshur Street	C (20.9)	B (19.8)
Rock Creek Church Road & Harewood Road	A (0.4)	A (0.3)
North Capitol Street & Harewood Road	C (26.8)	D (44.7)
Unsignalized		
Rock Creek Church Road & Illinois Avenue (EB Right Turn)	A (9.5)	A (9.0)
Rock Creek Church Road & Randolph Street (EB Left Turn)	B (10.6)	B (10.9)
Scale Gate Road & North Capitol Street SB-Off Ramp (SB Approach)	C (21.7)	C (17.8)

The following individual intersection approach legs operate at unacceptable LOS:

- Irving Street and 1st Street NW- AM peak hours, westbound and northbound approaches, LOS E
- Irving Street and 1st Street NW- PM peak hours, northbound approach, LOS F
- Irving Street and West Gate Entrance- AM peak hours, westbound approach, LOS E
- Irving Street and West Gate Entrance- PM peak hours, westbound and southbound approaches, LOS E
- North Capitol Street and Harewood Road- AM peak hours, eastbound approach, LOS E
- North Capitol Street and Harwood Road- PM peak hours, eastbound approach, LOS F
- North Capitol Street and Michigan Avenue- AM peak hours, southbound approach, LOS E

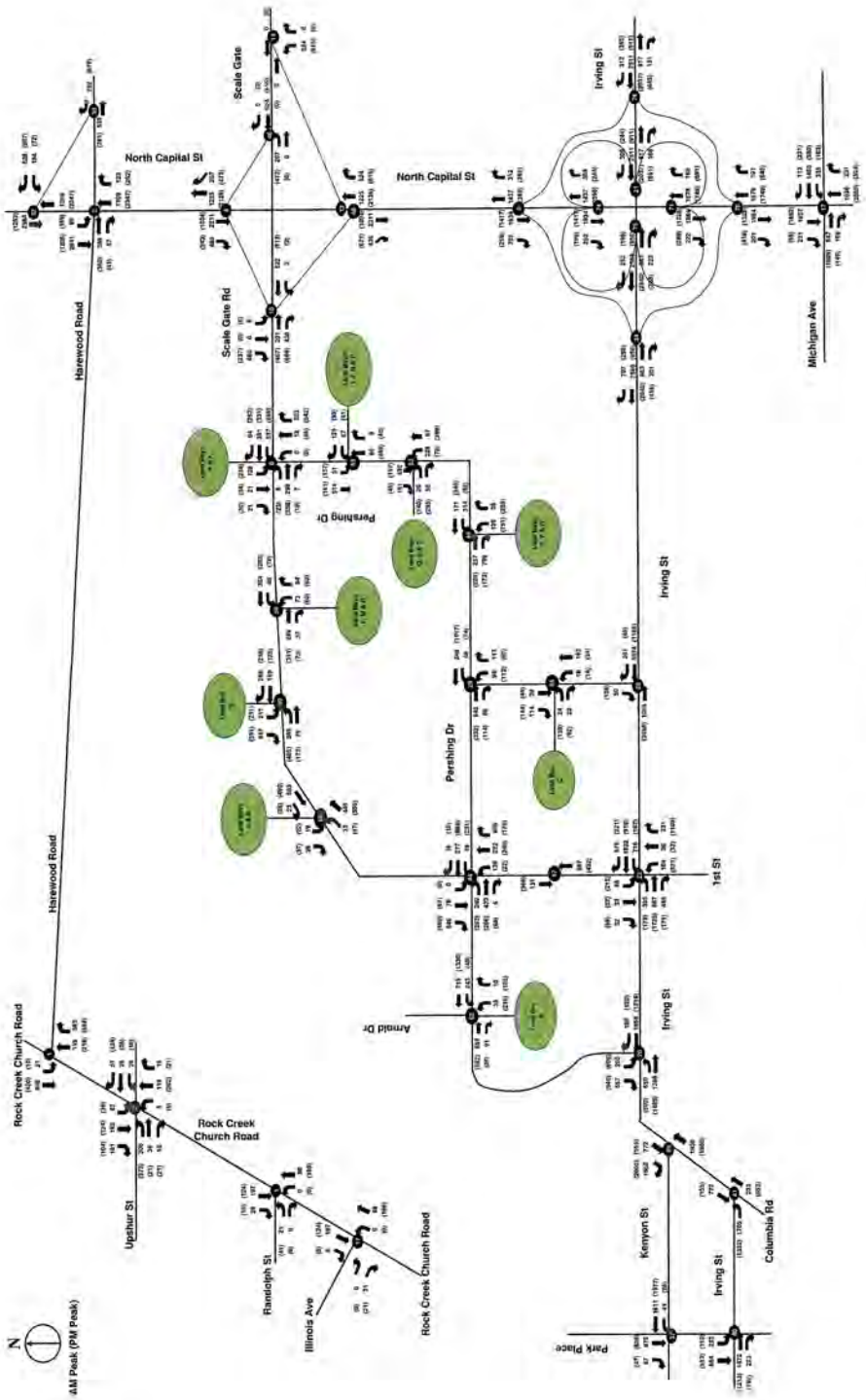


Figure 5: Full-Build With Mitigation (Alt-2) Peak Hour Traffic Volumes (2020)

2.3 Work Setting Evaluation

The worksite analysis examined the current demand on the transportation infrastructure by specifically focusing on local roadways site access, peak hour vehicle trips, and LOS / traffic congestion. The worksite analysis also examined the current modes of transportation available in the vicinity of the Zone A Development, including metro rail, metro bus, pedestrian and bike trails.

2.3.1 Local Area Roadways

The Zone A Development can be accessed by an extensive network of local streets including Irving Street, North Capitol Street, and Rock Creek Church Road as shown in Figure 6. A brief description of these streets follows:

North Capitol Street- In the vicinity of the site, North Capitol Street is a six-lane roadway which runs in a north-south direction. It runs from Louisiana Avenue in the south and ends at New Hampshire Avenue to the north. There is an exit for Scale Gate Road, an access point to the AFRH-W, along North Capitol Street; currently, this gate is closed and the site cannot be accessed from North Capitol Street. The intersections with Harewood Road and Michigan Avenue are signal controlled. Left turns from North Capitol Street are prohibited at the Michigan Avenue intersection. There is a full cloverleaf interchange at Irving Street and North Capitol Street. Sidewalks are located along North Capitol Street north and south of the AFRH-W; however, there are no sidewalks on the portion of the road that parallels the site. The speed limit on North Capitol Street is 35 miles per hour (mph). Based on 2002 data from DDOT, the Average Annual Weekday Volume of traffic along North Capitol Street was 30,000 vehicles.

Irving Street- This is an east-west roadway that runs from Michigan Avenue in the east to the Harvard Street-Columbia Road one-way street system. Irving Street, Michigan Avenue, Harvard Street, and Columbia Road intersect each other via ramps, which in some instances are grade separated and/or yield controlled. The intersection of eastbound Irving Street/Michigan Avenue is signalized. In most of the sections near the AFRH-W, Irving Street has a three-lane cross section where the third lane serves as shared right/left turns where it intersects other roadways. There are sidewalks on the south side of Irving Street in the vicinity of the AFRH-W. The speed limit on Irving Street is 25 mph. Based on DDOT's 2002 data, the Average Annual Weekday Volume of traffic was 25,100 vehicles.

Rock Creek Church Road- This is a two-lane roadway which stretches in a north-south direction between Park Place and North Capitol Street. Its intersection with Harewood Road and Upshur Street are signalized, and its intersection with Randolph Road/Illinois Avenue is stop sign controlled. Based on 2002 data from DDOT, the Average Annual Weekday Volume of traffic was estimated to be 7,800 vehicles north of Upshur Street and approximately 3,500 south of it. There are sidewalks on both sides of Rock Creek Church Road in the vicinity of the AFRH-W. The speed limit on Rock Creek Church Road is 25 mph.

Harewood Road: This a two-lane, east-west roadway, which extends between Rock Creek Church Road and extends past North Capitol Street, eventually connecting to Michigan Avenue. A majority of the traffic along this roadway appears to be cut through traffic from Taylor Street, which provides access to Catholic University of America. Its intersections with North Capitol Street, Rock Creek Church Road, and Michigan Avenue are signalized. There are sidewalks along both sides of Harewood Road in the vicinity of the AFRH-W. The speed limit on Harewood Road is 25 mph. Based on 2002 data from DDOT, the Average Annual Weekday Volume of traffic was estimated to be 10,800 vehicles between Rock Creek Church Road and North Capitol Street.

Columbia Road/Harvard Street- This is a one-way roadway couplet which runs in an east-west direction from 16th Street to Michigan Avenue. Its intersections with Irving Street and Michigan Avenue are either via grade separated or yield controlled ramps. These two roadways are a major part of the east-west roadway network in the vicinity of the project site. Based on 2002 data from DDOT, the Average Annual Weekday Volume of traffic on Columbia Road was estimated to be 8,200 vehicles west of 14th Street and 4,100 vehicles east of 14th Street. For Harvard Street, the Average Annual Weekday Volume of traffic was estimated to be 9,700 vehicles west of 14th Street and 4,200 east of the 14th Street. There are sidewalks on both sides of Columbia Road/Harvard Street in the vicinity of the AFRH-W. The speed limit on Columbia Road/Harvard Street is 25 mph.

New Hampshire Avenue- This is a major north-south corridor in the study area. It runs from Washington, DC to Maryland and connects to the capital beltway. It intersects North Capitol Street approximately 3.5 miles north of the site at a signalized intersection. Based on 2002 data from DDOT, the Average Annual Weekday Volume of traffic was estimated to range between 14,000 and 16,000 vehicles. There are sidewalks on both sides of New Hampshire Avenue in the vicinity of the AFRH-W. The speed limit on New Hampshire Avenue is 35 mph.

Michigan Avenue- This is an east-west, three-lane, roadway which loops around the southern part of the WHC and continues past Dakota Avenue to the east. This roadway is part of the major east-west route in the vicinity of the site. Its intersections with North Capitol Street and Harewood Road are signal controlled and its intersection with Columbia Road-Harvard Street is grade separated. Based on 2002 data from DDOT, the Average Annual Weekday Volume of traffic was estimated to be 19,500 vehicles west of North Capitol Street and 31,800 vehicles east of North Capitol Street. There are sidewalks on both sides of Michigan Avenue in the vicinity of the AFRH-W. The speed limit on Michigan Avenue is 35 mph.

2.3.2 Mass Transit Services

The public transportation system in the vicinity of the site consists of Metro bus and Metro rail service. There is also commuter rail service to Union Station; commuters to Union Station then must use Metro and bus service to access the site. Figure 7 shows the Metro services within the project area.

Metrorail

There are several Metrorail stations in the vicinity of the Zone A Development although none are within easy walking distance of the site. The closest stations are: Georgia Avenue-Petworth, Brookland-CUA, Fort Totten, and Columbia Heights. The Georgia Avenue-Petworth Station is located on Georgia Avenue and serves the Metro Green Line. It is approximately 1.4 miles northwest of the Zone A Development as measured from the intersection of Irving and 1st Streets. The Brookland-CUA Metrorail Station is located on Metro's Red Line at Michigan Avenue and Bunker Hill Road. As measured from the intersection of Irving and 1st Streets, it is approximately 1.1 miles from the Zone A Development. The Fort Totten Station is located on Galloway Street, NE, and serves both the Green and Red Metro Lines. This station is approximately 3 miles from the Zone A Development as measured from the intersection of Irving and 1st Streets. The Columbia Heights Station is located at 14th Street and Irving Street and serves both the Green and Yellow Metro Lines. This station is approximately 6.5 miles from the Zone A Development as measured from the intersection of Irving and 1st Streets.

Metro Bus

There are several bus lines that provide service to the area surrounding the project site. The H8 and 60 Metro buses operate on Rock Creek Church Road and provide the closest stops to the currently only open gate, Eagle Gate at Upshur Street and Rock Creek Church Road. The bus routes are listed below:

Park Road-Brookland Line, H8

- Traveling eastbound from the Brookland-CUA Metrorail Station, the buses run on headways of 10 minutes during the AM and 12 minutes in the PM.
- Traveling westbound from Rock Creek Church Road, the buses run on headways of 13 minutes in the AM and 12 minutes in the PM.

Fort Totten-Petworth Line, 60

- Traveling southbound from the Fort Totten Metrorail Station to Allison Street and Rock Creek Church Road, the buses run on headways of 20 minutes during the AM and PM.
- Traveling northbound from the Georgia Ave-Petworth Metrorail Station, the buses run on headways of 20 minutes during the AM and PM.

Brookland-CUA/Potomac Park, H1

- The closest stop to the AFRH-W is Michigan Avenue and 1st Street, NW.
- Traveling between the Brookland-CUA Metrorail Station to Michigan Avenue and 1St Street, NW, the buses only run southbound in the AM and northbound in the PM.
- Buses run on headways of 20 minutes in the AM and PM.

Figure 6 Roadway Network in the vicinity of the AFRH-W (shown as US Soldiers & Airmens Golf Course (source: 2007 Google Map)

Crosstown Line, H2/H3/H4

- Traveling along Michigan Avenue with a stop at the Veterans Administration Medical Center, providing service to/from the Brookland-CUA Metrorail Station.
- During the AM traveling westbound, the Route H2 buses run on headways of 24 minutes, the H3 buses on headways of 25 minutes, and the H4 buses on headways of 10 minutes.
- During the AM traveling eastbound, the H2 buses run on headways between 23-53 minutes, the H3 runs on headways of 54 minutes, and the H4 buses run on headways between 8 and 26 minutes.
- During the PM traveling westbound, the Route H2 buses run on headways of 33 minutes, and the H4 buses on headways of 10 minutes. The H3 bus does not run westbound in the PM.
- During the PM traveling eastbound, the H2 buses run on headways of 30 minutes, the H3 buses run on headways between 20 and 29 minutes, and the H4 buses run on headways between 8 and 18 minutes.

Brightwood-Petworth, Georgia Avenue-7th Street Line, 70/71

- Travels along Georgia Avenue between the Silver Spring and the Georgia Ave-Petworth Metrorail Stations.
- Traveling southbound, the Route 70 buses run on headways between 10-15 minutes and the Route 71 buses run on headways of 15 minutes in the AM.
- Traveling southbound in the PM the Route 70 buses run on headways between 10 and 15 minutes and the Route 71 buses run on headways between 15 and 20 minutes.
- Traveling northbound, the Route 70 buses run on headways between 11 and 20 minutes and the Route 71 buses run on headways between 18 and 30 minutes in the AM.
- Traveling southbound in the PM, the Route 70 and 71 buses run on headways of 15 minutes

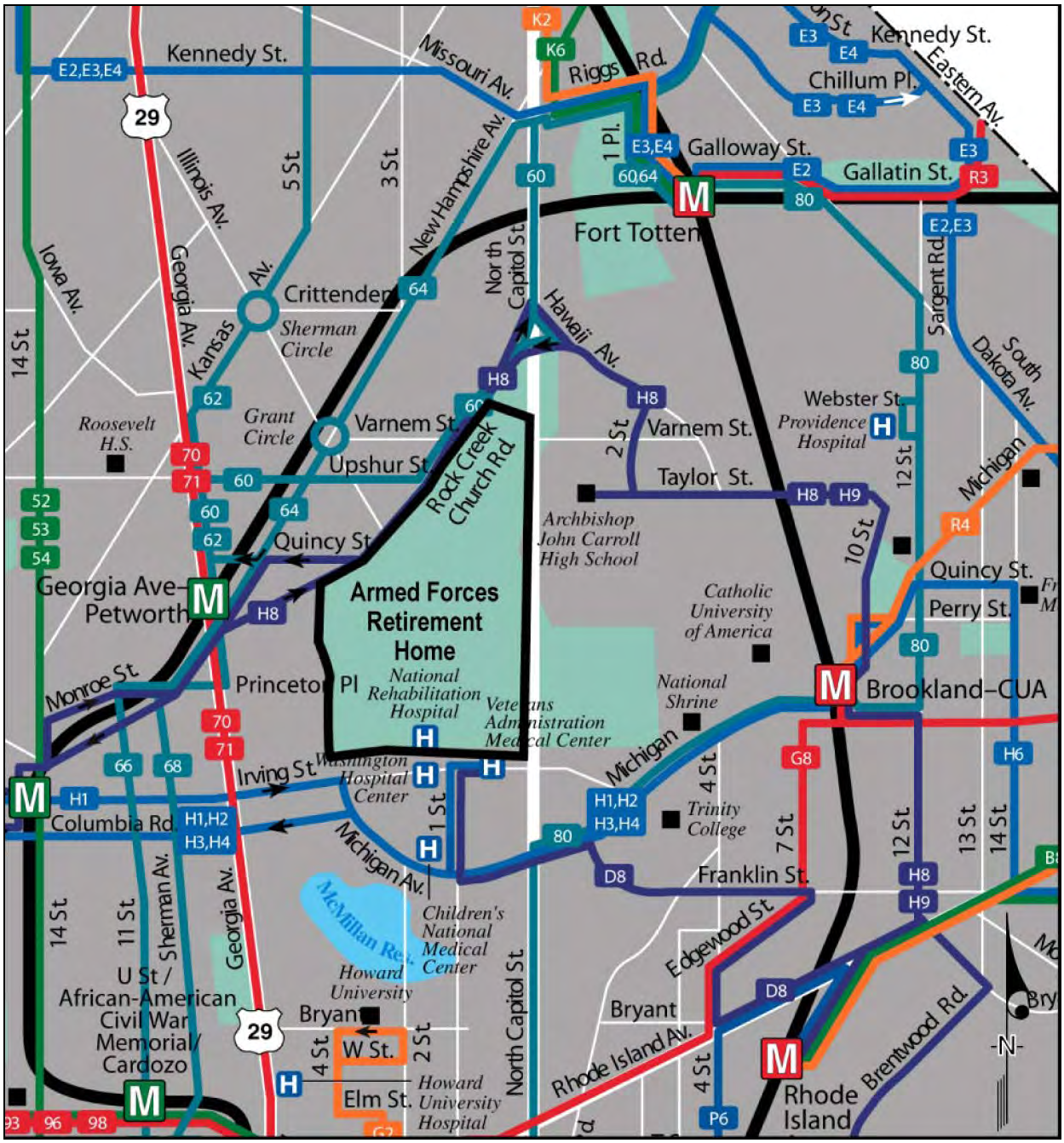


Figure 7 Metro Services in vicinity of the Zone A Development (source: Washington Metropolitan Area Transit Authority (WMATA))

Train Service

Train service is available into Washington, DC, via the Maryland Commuter Rail (MARC), AMTRAK, and the Virginia Railway Express (VRE). However, commuters must then take a bus or Metro from Union Station to reach the project site. The Maryland Department of Transportation operates the MARC service to Union Station on three separate lines. These lines operate only on weekdays:

- The Brunswick Line serves western Maryland through Silver Spring, Rockville, Harper's Ferry, and continues to Martinsburg, West Virginia. At the Point of Rocks Station, shuttle bus service is available to Frederick, Maryland. Seven scheduled morning arrivals (at 15-25 minute intervals) and five scheduled afternoon/evening departures (at 25 to 45 minute intervals) serve Union Station.
- The Camden Line serves downtown Baltimore through College Park, Laurel, and Jessup. There are six scheduled morning arrivals (at 24 to 55 minute intervals) and six scheduled afternoon/early evening departures (at 33 to 55 minute intervals).
- The Penn Line serves northeastern Maryland through Bowie, Baltimore-Washington Airport, Penn Station in Baltimore, Aberdeen, and terminates in Perryville. There are eight schedule morning arrivals (at 5 to 53 minute intervals) and nine scheduled afternoon/evening departures (at 9 to 50 minute intervals).

The VRE operates two, weekday only, intercity lines to Union Stations. VRE tickets are also honored on weekday Amtrak trains. The VRE lines are:

- The Manassas Line serves Northern Virginia through Crystal City, Alexandria, and Fairfax. There are six scheduled VRE morning arrivals and one Amtrak arrival (at 30 to 42 minute intervals) and five scheduled afternoon/evening VRE departures and one Amtrak departure (at 30 to 40 minute intervals).
- The Fredericksburg Line serves Fredericksburg through Crystal City, Alexandria, and Woodbridge. There are five scheduled VRE morning arrivals and one Amtrak arrival (at 10 to 29 minute intervals) and five scheduled afternoon/evening VRE departures and two Amtrak departures (at 29 to 42 minute intervals).

2.3.3 Bicycle and Pedestrian Facilities

In the vicinity of the Zone A Development, there are sidewalks for pedestrians throughout the residential community west of the AFRH-W. There are sidewalks along the west side of Park Place west of the AFRH-W and sidewalks along Rock Creek Church Road along the northern boundary of the facility to Harewood Road. Sidewalks continue southeasterly on Harewood to North Capitol Street. There are no pedestrian walkways along North Capitol Street in the project vicinity. Sidewalks are located on the southside of Irving Street adjacent to the hospital center. There are existing bike lanes along Park Place and Warder Street to the west of the facility and a bike route on the sidewalk on the southside of Irving Street. There are no bike lanes along North Capitol Street which is designated as poor traffic conditions for bicycling. There are bike lanes along Harewood Road, east of North Capitol Street, adjacent to Catholic University of

America, and also along Michigan Avenue. There are no bike lanes to the Metro stations in the vicinity of the project. Figure 8 shows the bicycle path information in the vicinity of the project.

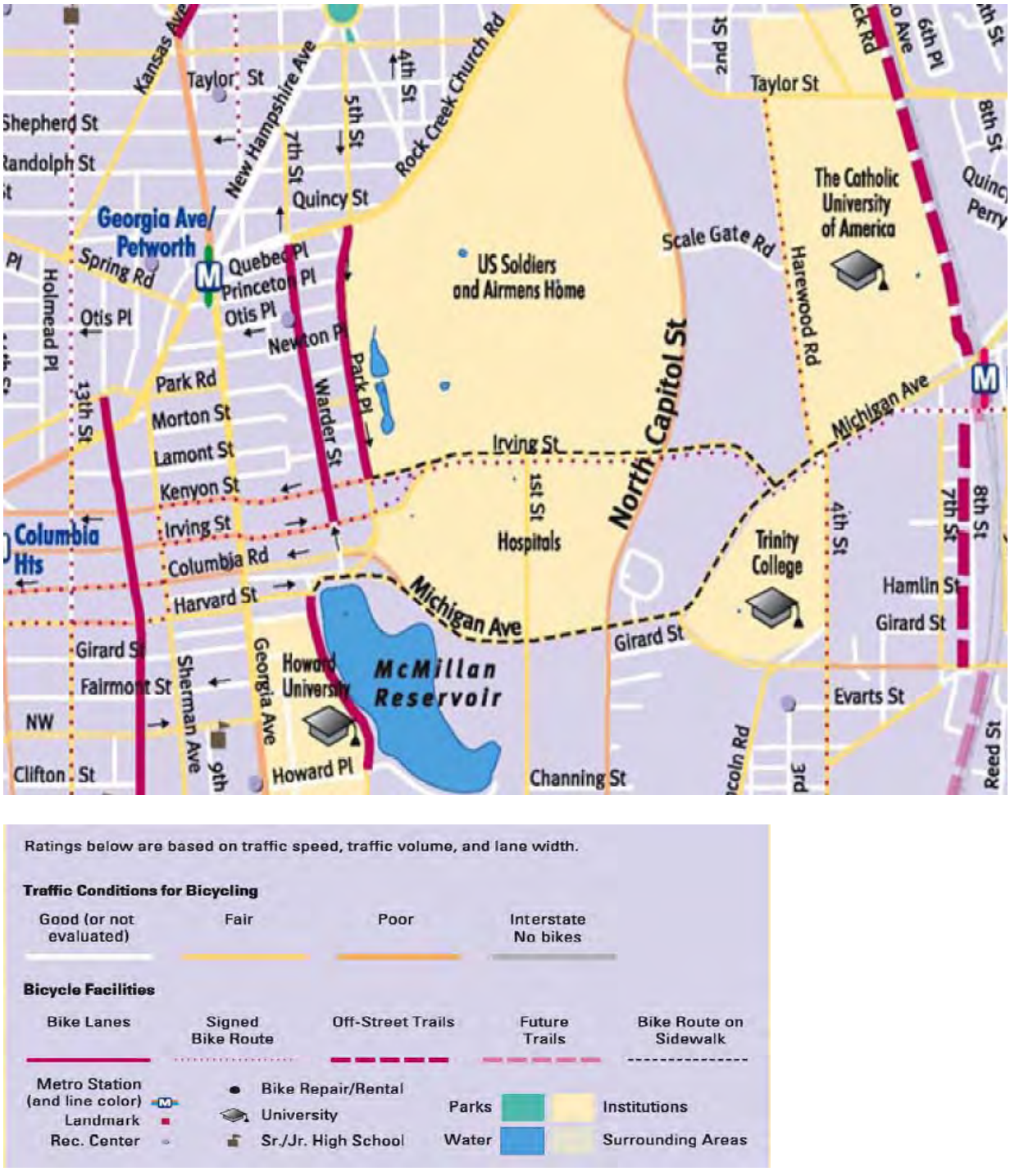


Figure 8: BICYCLE PATHS IN THE VICINITY OF Zone A DEVELOPMENT (Source: DDOT Website)

3.0 Selection of TDM Strategies

The following TDM strategies will be implemented in Phases II-IV, as shown in Figure 11, as the construction of the site is completed for the Zone A Development over a 10-year period. The strategies were selected to provide a range of activities that will be used by the Master Association to meet the goals of the TMP as set forth in Section 1 of this report:

- Establish a Commuter Center/Transit Store (CCTS)
- Utilize Commuter Connections
    - Carpool matching
    - Vanpool matching
    - Guaranteed Ride Home
    - Live Near Your Work
    - Telework/Virtual Office
- Join Clean Air Partners and other related organizations
    - Air Quality Action Days
    - Local DC BID
- Establish a Parking Management Plan
- Provide Shuttle service to Metrorail Station
- Install Multimedia Displays in commercial space and in common areas of the residential development
- Promote Transit usage
- Promote Bike/Pedestrian mode of transportation
- Promote alternate work schedules and work hour programs for workers onsite
- Prepare Master Association website with links to other transportation related organizations
- Establish taxi stand(s) onsite
- Promote participation in existing local and regional transportation services programs, organizations, and incentive programs:
    - Transit benefit programs
    - Transit subsidy programs
    - Carsharing
    - SmartBenefits
    - Smart Commute Initiative
    - Washington Area Bicycle Association
    - SmartBike DC
    - GoDCgo.com
    - Vanpool provider programs

A brief description of each TDM strategy follows.

3.1 Commuter Center/Transit Store

The Master Developer will centralize the commuter assistance provided on-site by creating an information distribution center that will provide personalized, tailored service and multi-modal marketing. The purpose of the CCTS will be to provide information on available transit services and transportation programs to all tenant employees, residents, and visitors to the site. Additional functions of the CCTS will be to sell transit fare media, assist with applications for Commuter Connections programs and services including ridematching for carpooling and vanpooling and the region-wide guaranteed ride home program. The center will be onsite (within the Zone A Development area) and located in a site easily accessible for both residents and workers. The center's operating hours will be structured such that residents, employees, and visitors may access the CCTS after normal working hours (i.e. 5 pm) at least one day a week.
The TMPC's office will be located at the CCTS.

3.2 Commuter Connections

Commuter Connections is a regional network of local jurisdictions and transportation organizations coordinated by MWCOG. Commuter Connections offers a host of free services and resources to those who work in the Metropolitan Washington DC area including: ridematching for carpools and vanpools and the region-wide Guaranteed Ride Home program. Commuter Connections also provides information to businesses on how to set up virtual offices for employees who telework/telecommute.

Carpooling

This arrangement requires employees and/or residents to share auto use, and is formed with a minimum of two (2) persons. To encourage and sustain carpool use, the following conditions need to exist at the Zone A Development: employees with commutes typically greater than 10 miles and/or 20 minutes, high concentrations of employees in a general residential area and residents that work in the general same area. Because this is a new site, the residential locations of proposed employees are not known. However, on-site parking will be available to employees who carpool for a discounted parking fee which may encourage carpool use.

Vanpooling

Vanpools are most effective when an adequate number of employees live near each other and work similar hours. The following factors should be considered when implementing a vanpool strategy: the highest vanpool potential is among employees who live 20 miles or more from work and have travel times of 30 minutes or greater. It is best to cluster 15 to 30 people for a 12 or 15 passenger vanpool. The cluster area should generally be no greater than two to three miles in size, but with commuting distances of greater than 30 miles, larger cluster areas may become viable. Clusters oriented to the vanpool route can be set up. These are composed of smaller groups picked up along the route to work. Vanpools can be formed through either a private or third party vanpool service.

Guaranteed Ride Home

The Guaranteed Ride Home Program provides an opportunity to increase interest in transit and ridesharing (carpool/vanpool). The program addresses one of the major concerns expressed by commuters when considering alternate modes of transportation:

the ability to get home quickly in case of an emergency or to get home following unscheduled overtime. By providing transportation, available for urgent situations, guaranteed rides home lessen commuter concerns regarding the use of alternate travel modes, likely increasing the use of transit, carpool and vanpools. Commuter Connections, coordinated by MWCOG, has a working Guaranteed Ride Home program in place which serves the entire National Capitol region.

Telework/Virtual Office

Teleworking, also known as telecommuting or "virtual offices", uses information technology and telecommunications to replace work-related travel. Employees work at home or at a local telework center one or more days per week. Communication is accomplished by phone, fax, modem, and teleconferencing. This workplace alternative reduces traffic congestion and air pollution. However, much like the alternative work schedule, individual employers must voluntarily offer the option to their employees.

Live Near Your Work

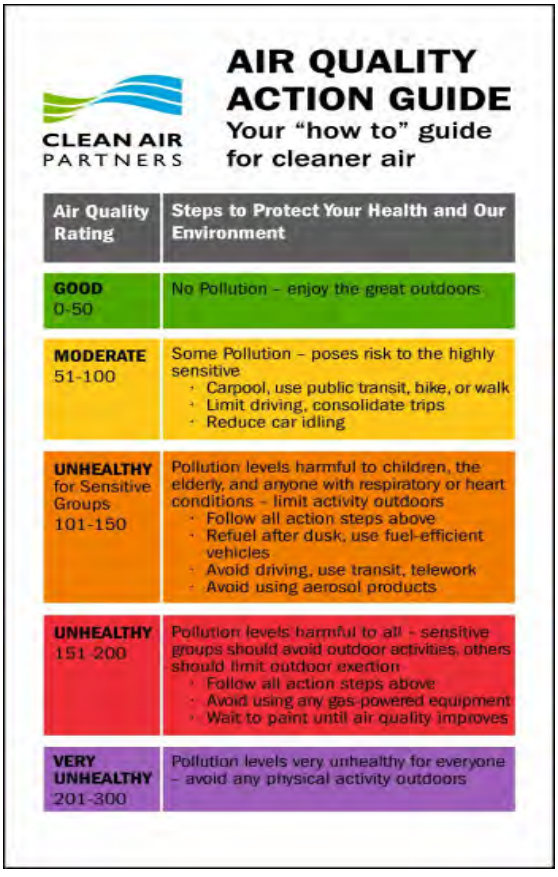
The Live Near Your Work initiative is one of the employer programs offered by Commuter Connections. It is designed to help employers provide consolidated regional housing information to their employees via the online Employers Resource Guide. The Master Developer will provide updated housing information to Commuter Connections for incorporation into this guide. Housing information will also be available at the Commuter Center. Information on housing will be provided to the area hospitals and universities.

3.3 Clean Air Partners

Clean Air Partners is a volunteer, nonprofit, public-private consortium. It is the air quality, public education campaign that serves the Baltimore and Washington Metropolitan regions. The Partnership seeks to improve health and the quality of life in the region by educating the public to take voluntary action to reduce air pollution and to protect health.

AQAD

Air Quality Action Days are called when pollutant concentrations are predicted to approach unhealthy levels and the federal air quality standards could be exceeded. When an Air Quality Action Day is forecasted, all participants are either emailed or faxed an unhealthy air alert. The media is also notified. Individuals and organizations are informed on Air Quality Action Days, so that they may take appropriate steps in order to protect their health and also to reduce air pollution (see guide to the right).



Public and private sector Air Quality Action Days participants agree to develop voluntary Air Quality Action Day plans. These plans range from notifying employees and customers of an Air Quality Action Day to rescheduling operational activities.

3.4 Parking Management

The parking management plan for this multi-use site includes parking allotments based on proposed parcel uses. The plan includes:

- SOV parking at fair market values
- Reserved, conveniently located, and free vanpool spaces
- Reserved, conveniently located, and discounted carpool spaces
- Reserved spaces, if available, for hybrid vehicles and Smart Cars
- Convenient retail parking
- Convenient residential and residential visitor parking

Table 6 shows the proposed parking allocation for each of the proposed parcels. Parking is a function of the type of building use and the square footage associated with that use. Residential and assisted living uses have lower parking ratios as compared to other uses. A total of 5,189 parking spaces are proposed for the Zone A Development,

LAND PARCEL	PROPOSED USE	BUILDING PHASE	HOTEL (SF)	RESIDENTIAL (SF)	OFFICE (SF)	RETAIL (SF)	ASSISTED LIVING (SF)	TOTAL SQUARE FOOTAGE	PARKING SPACES REQUIRED PER PARCEL*	VANPOOLS**	CARPOOLS**	HANDICAPPED ACCESSIBLE**
A/B2	Hotel/Meeting Facility	2	126,391					126,391	178	n/a	n/a	6
B1/B	Transtnl Living/Assisted Living	4/5		25,000			214,000	239,00	186	n/a	n/a	63
C	Office/Retail	2			179,228	60,000		239,228	326	6	18	8
D	Medical Office/Retail	2			290,650	20,145		310,795	906	26	86	18
E	Office	3			408,276			408,276	401	12	41	9
F	Office	3			367,864			367,864	361	11	36	8
H	Residential/Retail	2		346,796		22,863		369,659	405	n/a	n/a	9
I	Residential/Retail	2		329,700		19,645		349,345	380	n/a	n/a	8
K	Residential/Retail	2		253,732		30,240		283,972	330	n/a	n/a	8
L	Retail	2				2,925		2,925	8	n/a	n/a	1
M	Residential/Retail	2		267,920		29,744		297,664	343	n/a	n/a	8
N	Residential	3		286,895				286,895	287	n/a	n/a	7
O	Residential/Retail	2		271,351		16,833		288,184	315	n/a	n/a	8
P	Residential	3		115,207				115,207	116	n/a	n/a	5
Q	Residential	3		138,884				138,884	139	n/a	n/a	5
S	Residential/Office	3		122,911	236,023			358,934	355	14	47	8
T	Residential/Retail	3		122,081		11,691		133,772	153	n/a	n/a	6
	TOTALS		**126,391**	**2,280,477**	**1,482,041**	**214,086**	**214,000**	**4,316,995**	**5,189**	**62**	**204**	**185**

*Parking allocated by land use	
Hotel	1.25 spaces per hotel room and 3.33 spaces/ 1,000 square foot of meeting space
Residential	1.0 space/ unit
Medical Office	2.94 spaces/1,000 square foot
Office	0.98 space/ 1,000 square foot
Assisted Living	0.75 space/1,000 square foot
Retail	2.5 spaces/1,000 square foot

THE NUMBER OF HANDICAPPED ACCESS PARKING SPACES WAS DETERMINED FROM THE FOLLOWING TABLE. (SOURCE: UNIFORM FEDERAL ACCESSIBILITY STANDARDS)

TOTAL NUMBER OF PARKING SPACES IN LOT	REQUIRED MINIMUM NUMBER OF ACCESSIBLE SPACES
1 TO 25	1
26 TO 50	2
51 TO 75	3
76 TO100	4
101 TO 150	5
151 TO 200	6
201 TO 300	7
301 TO 400	8
401 TO 500	9
501 TO 1000	2% OF TOTAL
+1001	20 + 1 FOR EACH 100 OVER 1000

VANPOOL SPACES = 3% TOTAL PARKING SPACES FOR OFFICE
CARPOOL SPACES= 10% OF TOTAL PARKING SPACES FOR OFFICE
NO CARPOOL OR VANPOOLS SPACES ALLOCATED FOR HOTEL, RETAIL, RESIDENTIAL, OR MEDICAL CLINIC
SOURCE: 2000 CENSUS JOURNEY-TO-WORK FOR DC METROPOLITAN AREA)
**These spaces are included in the total number of parking spaces for each land parcel.

TABLE 6: PROPOSED TOTAL PARKING ALLOCATION

Note: The parking spaces per land parcel shown above are for illustrative purposes only and may change from the allocation shown in this table if the proposed land use for a parcel changes during development.

3.5 Shuttle Service to Metrorail Station

The Metrorail stations near the facility are not within walking distance for the average commuter and/or would require crossing of major intersections (for example, Irving Street and North Capitol Street). For these reasons, residents or tenants may not view Metrorail as a reasonable means of commuting. The establishment of an internal shuttle service to/from the facility to a Metro Station would help to generate greater Metro use.

Two shuttle service routes are proposed for the development. One route will run from the Development to the Brookland-CUA Metro Station and the other route will run from the development to the Columbia Heights Metro Station. All stops would be internal to the development. Offsite, the shuttles would run as express services with no stops until reaching the metro stations. The shuttle service will be phased in based on development density. Information on implementation of the service can be found in Table 8.

The Brookland-CUA route (shown in Figure 9)would begin at the 1st and Irving Streets entrance to the development and would encompass a one-loop path through the development, exiting onto Irving Street at 1st Street. The shuttle would continue east along Irving Street Northeast and Michigan Avenue Northeast to the dedicated shuttle area at the metro station. The westbound return route would be along Michigan Avenue Northeast and Irving, reentering the site at 1st Street. The Brookland- CUA Shuttle will run all day from 6:30 am to 8 pm, Mondays through Fridays (except for holidays). The headway will be approximately every 30 minutes all day. No service will be provided on weekends.

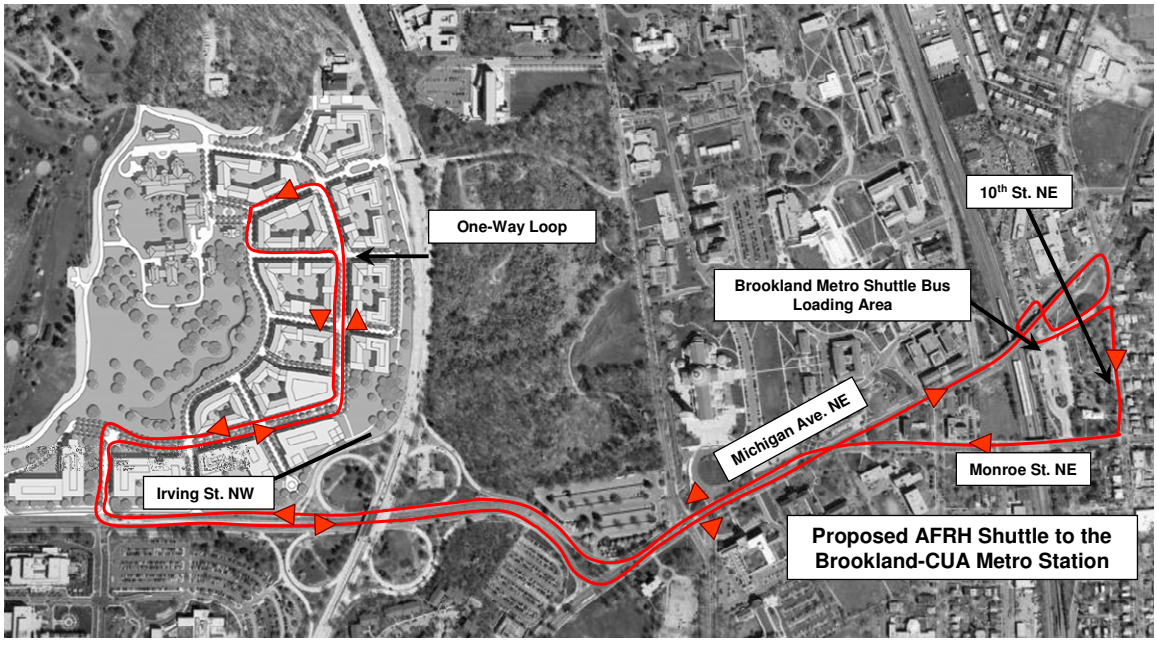


Figure 9: Proposed Onsite Shuttle Route to Brookland-CUA Metrorail Station

The Columbia Heights route (shown in Figure 10) would also begin at the 1st and Irving Streets entrance to the development and would encompass a one-loop path through the development, exiting onto Irving Street at 1st Street. The route would continue west on Irving Street, merging onto Kenyon Street and continuing onto Georgia Avenue. The route would turn onto northbound Georgia Avenue, making a left turn onto New Hampshire Avenue, followed by a left turn onto Quincy Street, and left back onto southbound Georgia Avenue to access the Metro station. The shuttle would then continue south on Georgia Avenue, turning left onto Irving Street, and returning to the site at the 1st and Irving Streets entrance.

The Columbia Heights shuttle will run Mondays through Fridays (except holidays) from 6:30 am to 8: 00 pm. The headways will be approximately every 10 minutes during the morning and evening peak periods (6:30-9 am and 4:30-7 pm), and 30 minutes between the hours of 9am and 4:30 pm and 7 pm and 8 pm. On Saturdays, the service will run between 9 am and 6 pm with headways of 30 minutes.

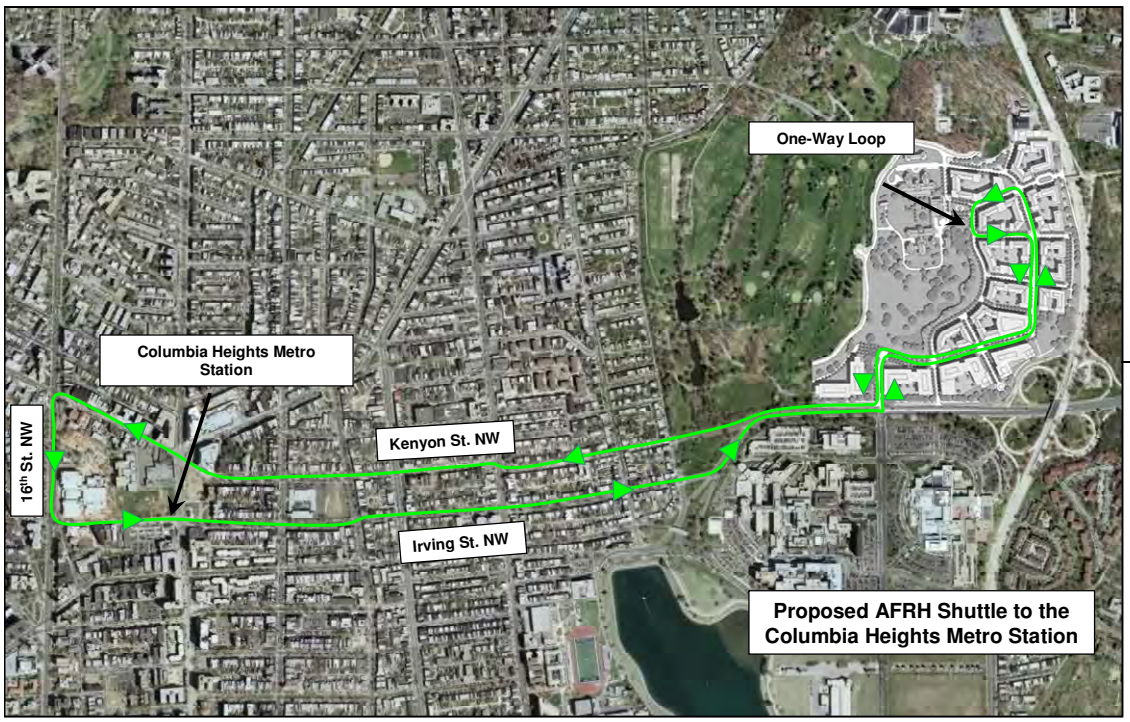


Figure 10: Proposed Onsite Shuttle Route to Columbia Heights Metrorail Station

3.6 Multimedia Displays

An interactive media website will be developed to provide transit, traffic and other useful resources for commuters. The information will be displayed in a central location in all commercial buildings and in common areas for all residential development. The multimedia displays will consist of LCD or plasma displays and literature racks. The televisions will run information regarding the commuter center/transit store (including their website) and other TDM strategies on a loop. The literature racks will contain stocks

of appropriate bus schedules, shuttle schedules, VRE and MARC train schedules, and applications to regional rideshare programs, and other information on cost savings and environmental benefits for the TDM strategies. The exact locations of the displays on the site will be determined during the final site development process. The TMPC will be responsible for ensuring that information shown in the multimedia displays and literature racks is kept current.

3.7 Transit

To encourage and sustain use of available transit services, the current transit service to the facility needs to be significantly improved. Additional buses that stop at or within the facility will likely increase ridership. Currently, the nearest bus stops are on Rock Creek Church Road and on Michigan Avenue near the hospitals. Neither stop is convenient to residents or workers in Zone A. In addition, Irving Street is a dangerous street for pedestrian crossings and requires upgrades to become pedestrian friendly. The TMPC and Master Developer will work with WMATA to establish bus/bay along the north side of Irving Street in the commercial/retail area of the development and also to establish a bus stop in the vicinity of Scale Gate at North Capitol Street. Bus shelters will be provided at both of these locations. The extension of Metro bus service to the development will encourage users to take public transportation.

3.8 Bike/Pedestrian

Pedestrian and bike access can be discussed in two components: within the site and in the surrounding vicinity. Within the site, the development will emphasize the design of bike paths and sidewalks to foster connectivity between residential and commercial areas of the site and also to provide safe access for the Armed Forces veteran residents who wish to access the developed areas in Zone A. The roads within the development will have sidewalks along both sides of the streets and a crosswalk at Scale Gate is also included in the *Armed Forces Retirement Home-Washington, D.C. Master Plan* for this site.

The Master Plan also includes a shared perimeter pedestrian/bike path that will run from the Scale Gate entrance parallel to North Capitol Street towards Irving Street and then run westerly along the north side of Irving Street to the end of the development as shown in Figure 11. In addition, there are shared bike/car lanes and dedicated bike lanes on specific streets within the development. Pedestrian walking and bike paths will also be included in the Historic “Pasture” common area located in the center of the development.

Having pedestrian and bike paths will also encourage people to use bus and or shuttle service if they have a means of accessing the stops safely. To promote bicycle use, bike racks are proposed to be located throughout the commercial and retail areas of the development. Lockers will also be provided for a portion of the bikes. Shower and changing facilities will be included in all commercial buildings for employee use.

Outside of the facility, there are sidewalks for pedestrians throughout the residential community west of the development. There are sidewalks along the west side of Park Place, west of the AFRH-W and sidewalks along Rock Creek Church Road along the northern boundary of the facility to Harewood Road. Sidewalks continue southeasterly

on Harewood to North Capitol Street. There are no pedestrian walkways along North Capitol Street in the project vicinity. Sidewalks are currently located only along the southside of Irving Street adjacent to the hospital center. Sidewalks will be located within the Zone A Development and adjacent to the northside of Irving Street along the boundary of the Zone A Development. This will provide pedestrian traffic with a safer and more accessible way to reach the retail development, open space, and the bus and shuttle stops.

There are existing bike lanes along Park Place and Warder Street to the west of the facility and a bike route on the sidewalk on the southside of Irving Street. The establishment of bike paths within Zone A will primarily benefit the residents by improving their access to the retail/commercial areas. The impact of bicycle commutes to/from the facility is limited because of the limited bike lanes offsite and streets, such as North Capitol Street, designated as poor traffic conditions for bicycling.

3.9 Alternative Work Schedule, Work Place

Alternative work schedules promote working hours outside of the normal 9 am to 5 pm pattern. These can include options such as: flextime, compressed work week, or staggered work hours. The decision to implement an alternative work schedule is left to the discretion of each individual employer. Alternative work place programs include working virtually at home, in telework centers or designated travel destinations.

3.10 Master Association Website

The Master Association will dedicate a page on its website to information on transportation and transit programs and will provide a link to the CCTS. This TMP program brand will have a series of pages that will provide the following information: detailed parking opportunities, transit schedules, shuttle schedules, bicycle paths, and all other TDM strategies. The website will also provide links to regional transportation sites such as MWCOG, DDOT, and other media outlets.

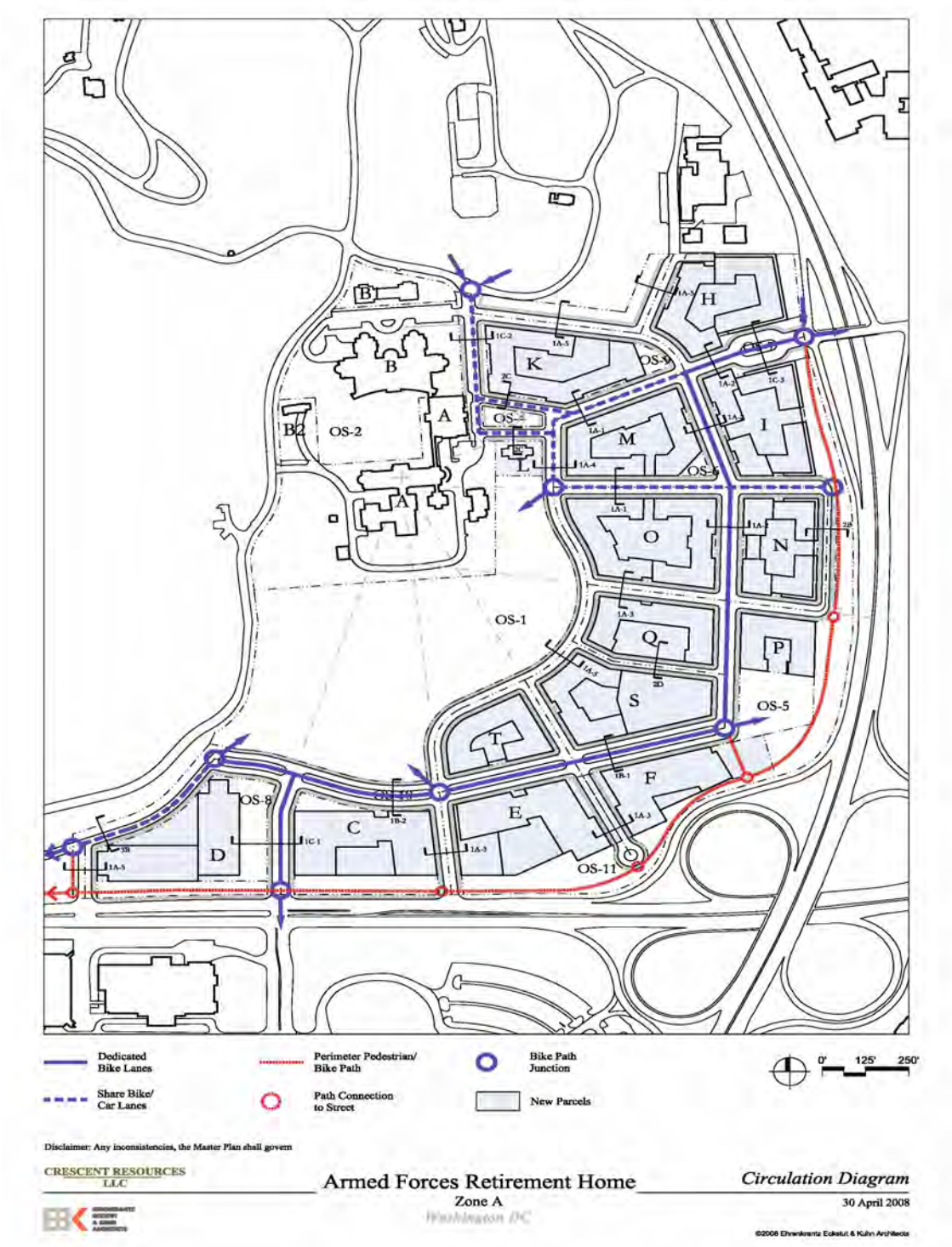


Figure 11: Circulation Diagram for Pedestrian and Bicycle Traffic within Zone A Development (Source: Armed Forces Retirement Home-Washington, D.C. Master Plan)

3.11 Taxi Stand

The Master Developer will work with the District of Columbia Taxicab Commission to establish a taxi stand(s) within the Zone A Development. Locating convenient taxi stands within the development will encourage participation for trip activity that might typically require a personal vehicle. Taxi stands will allow employees, residents, and customers to access transit or other modes of transportation to get to primary destinations (such as work, medical offices, etc.). The presence of taxis onsite provide an alternative form of transportation during the day and non-work days to reach secondary destinations, such as recreation and shopping.

3.12 Existing Local Transportation Services Programs

There are many existing local programs that promote and/or provide transportation services within the District. These programs can vary from car-sharing companies that operate a self-service fleet of vehicles to programs that promote living near to your workplace. The TMPC can provide information to tenants and residents on these programs and provide assistance in joining them.

The following outlines various amenities provided by car-sharing service organizations in the DC area. The TMPC will actively seek the most cost efficient arrangements with one or more of these vendors to provide the best services to commuters at the site.

Flexcar

Flexcar (http://www.flexcar.com) is a car-sharing company that operates a self-service fleet of cars, hybrids, pickup trucks, minivans and utility vehicles and MINI Coopers that members can reserve and use by the hour or by the day. Gas, insurance, up to 150 miles a day, and reserved monthly parking are all included in the usage rates. Flexcar currently operates in Washington DC, as well as several other cities across the U.S. Members share access to hundreds of Flexcar vehicles, often within a five-minute walk of their home or work. Members reserve a vehicle online or by phone, choose from a list of vehicle locations, and then go to the vehicle during their reserved time. After use, members must return to the vehicle's designated parking space. The annual membership fee for individuals is $35. Standard rates for using a vehicle start around $8 an hour or $63 a day. If an employer commits to a 12- month term, the application and membership fees for its employees will be waived.

Zipcar

Zipcar (http://www.zipcar.com) is a car-sharing company that works similar to Flexcar by providing members a self-service fleet located through the city for short-term, round-trip use. Gas, insurance, reserved parking, and up to 125 miles a day are included in the usage rates. For an occasional driving plan, members pay an annual fee of $50, a one-time $25 application fee, and $9 an hour or $65 a day for usage.

NuRide

NuRide (http://www.nuride.com/nuride/main/main.jsp) is the nation's first ride network that rewards people for sharing rides. It's free, flexible and there are no commitments. People can specify their travel criteria on the NuRide website to find the right person

going the same way and then share the ride. Every time a ride is shared, participants earn reward points which can be redeemed for gifts cards, gift certificates, tickets and other special rewards from NuRide sponsors. To join NuRide people must be at least 18 years old, and be affiliated with an organization such as their employer or school.

The following are additional programs that will enhance the TDM program.

SmartBenefits

SmartBenefits is a new web-based program from WMATA that allows employers (or their designated transportation coordinator) to assign dollar values of employees' monthly commuter benefits directly to the individual's SmarTrip card from the employer's computer. An employer who provides the Metrochek benefit can load the value of the benefit onto its employees' SmarTrip card using SmartBenefits. A SmarTrip Card is a permanent, rechargeable fare card that can help commuters to get in and out of Metrorail faregate lots, Metrorail, Metrobuses, and some van pools quickly. The card is purchased at Metro sales offices, retail outlets and commuter centers.

Smart Commute Initiative

The Washington Regional Smart Commute Initiative is designed to expand housing choices and reduce traffic congestion by linking housing and public transportation. It is offered through a partnership of over 30 private and public organizations, including Washington Metropolitan Area Transit Authority (WMATA), the governments of the District of Columbia, Virginia Railway Express, Chevy Chase Bank B.F. Saul Mortgage, and SunTrust Mortgage, Inc. (http://www.mwcog.org/planning/smart_commute/). The Smart Commute Initiative recognizes that homeowners who spend less on commuting expenses can have more disposable income for housing expenses.

The Initiative provides financial incentives for home buyers to purchase properties near public transportation in the Washington region. Buyers who purchase a home either located one-quarter mile from a public bus stop or one-half mile from a public rail station near public transit and use Metro or other local public transit to commute could qualify for the added benefits of a home mortgage through the Initiative. For loan qualification purposes, participating lenders will add a portion of the potential transportation savings to borrowers' qualifying income - an addition of $200 per month for one wage-earner households and $250 per month for two wage-earner households - which could increase the home-buying power of a typical purchaser of a median-priced home by approximately $10,000. Borrowers are required to make a down payment of only 3 percent of purchase price of home.

In addition to mortgage benefit, various transit benefits are available under the Smart Commute Initiative. Borrowers under the Smart Commute Initiative will receive a 50 percent discount for six months on Metrobus or Metrorail service for up to two people per household. Reduced transit fare for a limited time may also be available from other participating transit organizations. Flexcar offers SmartCommute participants lifetime membership and free usage credit. Other transit agencies also provide discount in purchasing transit pass or offer free pass for participants.

Washington Area Bicycle Association (WABA)

The Washington Area Bicyclist Association (WABA) is a non-profit membership organization that advocates bicycling (http://www.waba.org/). The mission of the WABA is to create a healthy, more livable region by promoting bicycling for fun, fitness, and affordable transportation; advocating for better bicycling conditions and transportation choices for a healthier environment, and educating children, adults, and motorists about safe bicycling. WABA members can receive WABA Newsletters, receive discounts on bikes and accessories at over 35 local bike shops, receive discounted tour fees on all WABA sponsored events, and participate in its Commuter Mentor Program. The membership fee is $35 a year for individuals and $25 for Flexcar and Zipcar members.

SmartBike DC

SmartBike DC is a new automated bicycle rental system started in Spring 2008 in Washington, DC. Bicycle are available to rent to members at designated locations in the District. Members pay an annual fee of $40. Hourly rates have not been determined as of the time of the document. Members can use a bicycle for a maximum of three hours and the bicycles must be returned to a SmartBike rack. The TMPC will coordinate with DDOT on adding a SmartBike location as the SmartBike program is expanded in the District. The rack will be located in a centralized location within the Zone A Development.

GoDCgo.com

GdDCgo.com (http://www.godcgo.com/) is a web site with abundant transportation information to help residents, workers and visitors get around greater Downtown DC. The site includes information on parking, transit (rail and bus), bicycling, carsharing, an interactive map of Downtown DC, and other useful links.

The following is an example of one of the vanpool providers that offers program services in the DC area:

VPSI

VPSI (http://www.vanpoolusa.com/Home/index.asp?OID=239) is a third-party vanpool provider that leases vanpool vehicles and coordinates vanpooling. The VPSI website provides a vanpool search engine that matches commuters with vanpools already on the road. Riders share a fee that covers the vanpool fare. Only VPSI approved volunteer vanpool drivers can drive the vanpool vehicle. People who would like to become a VPSI Vanpool Driver or Alternate Driver must submit applications for VPSI to review. In addition to individuals, VPSI also accepts applications from employers who support vanpooling and subsidize monthly vanpool fare.

4.0 Effects of Modal Split Strategies

As discussed in Section 1.0, one of the goals of the TMP is to encourage alternate forms of transportation to reduce SOV use for workers and residents in Zone A, achieving a goal of 30% non-SOV mode split. To reach the 30% goal for non-SOV modal split, a number of technical analysis sources were used including:

- MWCOG Mode Choice Model – regional estimates of transit trips and transit mode shares as calculated from the 2030 model. The model includes programmed transit services as developed through the long-range planning process for the region. This regional model does not account for the inclusion of site specific transit improvements such as transit shuttle service.

- Internal Zone A Development Capture Rate – a number of projects in the Washington region have estimated the impact of multi-purpose development on the production of person trips and how these trips can remain on-site instead of using a vehicle to travel off-site.

- TDM Strategies - reduction in SOV use due to the implementation of TDM strategies as shown in Table 7. These strategies can be analyzed and tested using regional applications (Commuter Model, Federal Highway Administration TDM) and compared to existing strategy performance in the region and in similar cities in the U.S.

Table 7. TDM Strategies for Increased Modal Split

TDM Strategy	Comment
Carpool	Assigned carpool spaces will be available at a discounted parking fee; spaces will be located in preferential locations.
Internal Shuttle Service to Metrorail Station	Service to Brookland-CUA and Columbia Heights Metrorail Stations with multiple internal stops within the Zone A development.
Vanpooling	Reserved spaces will be available for free for registered vanpools; spaces will be located in preferential locations.
Bicycle Access Improvements	Within the development, bike trails will be constructed. Bike racks and lockers will be available throughout the commercial/retail area. Showers will be provided in the commercial buildings.
Telework and Alternative Work Schedules	Employee participation in work from home programs and/or employee participation in compressed work week (such as 9 days, 80 hour work schedule with 1 day off every 2 weeks).
Car Sharing	Reserved spaces on site for short term rentals (such as Zipcars) to encourage use and discourage users from purchasing a vehicle.
TDM for Residents	Marketing efforts geared for residents to use alternate modes of travel for non-work trips
Taxi Stands	Reserved spaces for taxis to encourage participation for trip activity rather than using a personal vehicle. Installation of cab "red phones" that call directly to taxi dispatch.

The cumulative effect of modal split strategies increases as additional services are provided. Strategies that have the greatest impact are those that provide frequent and convenient transit service to move within the Zone A development and throughout the District of Columbia. These strategies have been defined to reach the development goal of a 30% modal split.

5.0 IMPLEMENTATION PLAN FOR TDM STRATEGIES

5.1 Role of the TMPC

The role of the TMPC is to promote the use of transit services, transportation programs including carpooling/vanpooling, shuttle bus service, bicycling, telecommuting, and other components of the TMP with prospective residents, tenants, employers, employees, and visitors during marketing/leasing/new employee orientation. The TMPC responsibilities will include, but not be limited to:

- Administer the ride-sharing program, including assisting in the formation of two person carpools and vanpools of three or more persons
- Display and distribute information on transportation programs and transit service options at the multimedia displays, and ensure that the information on display is current
- Develop and administer the TDM Strategic Plan, the Parking Management Program, TDM Marketing Plan, and Monitoring Plan
- Establish and administer the shuttle service, including selecting the operator
- Work with WMATA to provide additional bus service to the development
- Administer the purchasing, sale and fulfillment of bus and rail fare (discounted) media for employees of businesses at the development and residents
- Establish an electronic newsletter for distribution to all subscribers free of charge informing them of upcoming transit events or any changes to the TDM strategies. Distribute newsletters to all commercial and retail tenants, residential and tenant offices for posting at their facilities.
- Manage and operate the CCTS
- Provide information for uploading to the Master Association website
- Work to establish a car service agreements (either Flexcar or Zipcar), SmartBike service and taxi stands onsite
- Maintain communication with the Master Association, Tenants Association, and ARFH-W
- Coordinate with TMPC at local hospitals, DDOT, and other interested parties to share information on TMP

Table 8 lists examples of the duties for the TMPC for each of the TDM strategies, examples of implementation methods, and the time line, relative to phasing, for implementation of those strategies. The tasks for the TMPC will be a continuous process as construction progresses and as tenants and residents change. The phasing information presented in Figure 11 does not represent the only period where that activity will occur, rather it shows the proposed starting period for that particular strategy.

As the development progresses in Zone A and after construction is completed, the TMPC's primary responsibilities will be to continue to educate tenants and residents by:

- marketing transit services and transportation programs;
- administer available programs and services to the tenant mix;
- provide updated information on all programs and services;
- assist the tenant mix in participating in available programs and services;
- manage and operate the CCTS; and
- monitor and evaluate the successes and/or failures of the TDM strategies with respect to the goals of the TMP.

The TMPC will also be responsible for developing a marketing campaign through the TMP development brand, which draws attention to the advantages of utilizing alternative modes, such as shorter commutes, gasoline savings, annual cost savings, and environmental benefits. As the site matures, it may be necessary for the TMPC, in conjunction with the Master Association, to modify the proposed strategies based on the outcome of the monitoring and evaluation program implementation methods.

Table 8 TMPC Implementation Plan

TDM Strategy	TMPC Responsibilities/Implementation Strategies	Implementation Period
CCTS	• Brand TDM program for development. Create marketing materials on Transportation Options; Develop TDM Strategic Plan, Marketing Plan, Monitoring & Evaluation Plan and Parking Management Plan. Create website for TDM program brand. There will be two separate marketing efforts and materials, one specifically for commercial tenant and the other for residential occupants. Coordinate with developer leasing department/division. • Open Commuter Center/Transit Store • Meet with tenants, residents and employers to provide information and opportunities to sign up for programs • Develop electronic newsletter to provide current information to subscribers and tenant offices and residents • Obtain information on Smart Benefits for distribution to employers. • Implement and operate TDM programs and services	2008 2011-2012 2012 Continuous
Carpooling	• Work with employers to encourage their employees to apply to the Commuter Connections free ridematching service for carpooling and vanpooling. Hold carpool/vanpool formation meetings at their worksite to introduce potential carpoolers/vanpoolers to one another. Invite representatives from vanpool companies to provide information on their program and service offerings. • Enroll tenants/residents in the region-wide guaranteed ride home program • Provide free ridematching services for vanpooling and carpooling to assist tenants/residents to find people to share rides. • Establish ridesharing enrollment drives periodically throughout the year, in addition to organizing a drive when a new tenant signs a lease. • Host "Zip code parties" which the TMPC can facilitate meetings between potential ridesharers. Promote the program on a periodic basis to the residents through the Tenants Association	2011-2014

TDM Strategy	TMPC Responsibilities/Implementation Strategies	Implementation Period
Vanpooling	• Work with employers to establish vanpools by holding both centralized and individual office-based informational events and developing a packet of informational materials to be distributed at the meetings. • Provide information on vanpool services from WMATA's website and Commuter Connection's website • Enroll tenants/residents in region-wide guaranteed ride home program	2011-2014
Guaranteed Ride Home	• Work with employers and residents to informs potential users about the program by holding both centralized and individual informational events • Enroll tenants and residents in program	2011-2014
Telework/Virtual Office	• Provide information to employers and residents by holding both centralized and individual office-based informational events and developing a packet of informational materials to be distributed at the meetings	2011-2014
Live Near Your Work	• Provide information on housing in the Zone A Development to the Commuter Connections online employer program, Employer's Resource Guide • Provide information on housing at the Commuter Center and on the development's website • Provide information on housing to the local hospitals and universities	2012-2014 Continuous Continuous
Clean Air Partners	• Join organization • Provide information to tenants/residents on how to implement an action plan for employers and residents on Air Quality Action Days	2012-2013
TDM and Parking Management Plan	• Inform developers, tenants, and residents on the TDM and parking management plan as part of their lease agreement • Administer Strategic and Parking management plan incentives	2009-2013
Shuttle to Metro	• Implement initial shuttle service upon completion of specified Phase 2 Development density • Expand shuttle service upon completion of specified Phase3 Development density • Inform tenants and residents of shuttle service schedule/operations	Date of implementation is determined when leasing quotas are met
Multimedia Displays	• Ensure information displays are stocked with current information	2012-2014

TDM Strategy	TMPC Responsibilities/Implementation Strategies	Implementation Period
	• Ensure displays are operational	
Transit Use	• Work with WMATA to establish bus stop/bay along north side of Irving Street in commercial/retail area and at Scale Gate • Provide transit information on routes, schedule, and fares to future tenants and residents. • Assist in initial trip planning by identifying routes and schedules for employees/residents • Work with tenants to establish Smart Benefits Transit Program for employees.	2009-2012
Bicycle Access	• Provide information on bike paths, bike racks, and lockers to tenants and residents • In conjunction with the Master Association, maintain bike paths and sidewalks to promote safe non-vehicular travel in the development	2012-2014
Alternate Work Hour/Work Week Schedule	• Provide information to employers and residents by holding both centralized and individual office-based informational events and developing a packet of informational materials to be distributed at the meetings.	2012-2014
Master Association Website	• Develop webpage for transportation information, including link to Commuter Center • Maintain website with current information	2013-2015 Continuous
Taxi Stand	• Work with District of Columbia Taxicab Commission to establish taxi stand(s) in the development • Provide information to tenants on location of taxi stands and operations of taxis	2012-2014 Continuous
Local Programs		
Flexcar	• Provide information to employers and residents by holding informational events and developing a packet of informational materials to be distributed at the meetings • Work with Flexcar to establish space within the development • Assist in enrolling employers and individuals in program	2012-2014 Continuous

TDM Strategy	TMPC Responsibilities/Implementation Strategies	Implementation Period
Zipcar	• Provide information to employers and residents by holding both centralized and individual office-based informational events and developing a packet of informational materials to be distributed at the meetings • Work with Zipcar to establish space within the development • Assist in enrolling employers and individuals in program	2012-2014 Continuous
NuRide	• Provide information to employers and residents by holding both centralized and individual office-based informational events and developing a packet of informational materials to be distributed at the meetings • Assist in enrolling employers and individuals in program	2012-2014 Continuous
SmartBenefits	• Provide information to employers and residents on SmartBenefits program • Apply to WMATA to become sales center for SmarTrip cards • Provide discounted SmarTrip cards (i.e. instead of $30 charge $15) for first time card purchasers. This includes the cost and one-time charge for the actual debit card.	2012-2014 2012-2014 Continuous
Smart Commute Initiative	• Work with real estate developers to provide information to residential home buyers • Provide information on the Master Developer website • Provide information to tenants and employers at informational events	2012-2014 Continuous Continuous
SmartBike DC	• Coordinate with DDOT on locating a SmartBike station within the Zone A Development as the SmartBike program expands in the District • Provide information to tenants and residents on SmartBike via the Commuter Center	 2012-2014 Continuous
Washington Area Bicycle Association	• Join the organization • Promote safe biking with events on site in conjunction with association	 2012-2014
GoDCgo.com	• Add web address to Master Association Website and include in newsletters	2012-2014
Vanpool Providers	• Provide information to tenants, employers, residents at informational events • Assist individuals in locating vanpools	2012-2014 2012-2014

5.2 TDM Strategies

Figure 12 provides a summary outline of the implementation of the TDM strategies, showing the initiation of the strategy and the extent of the implementation period.

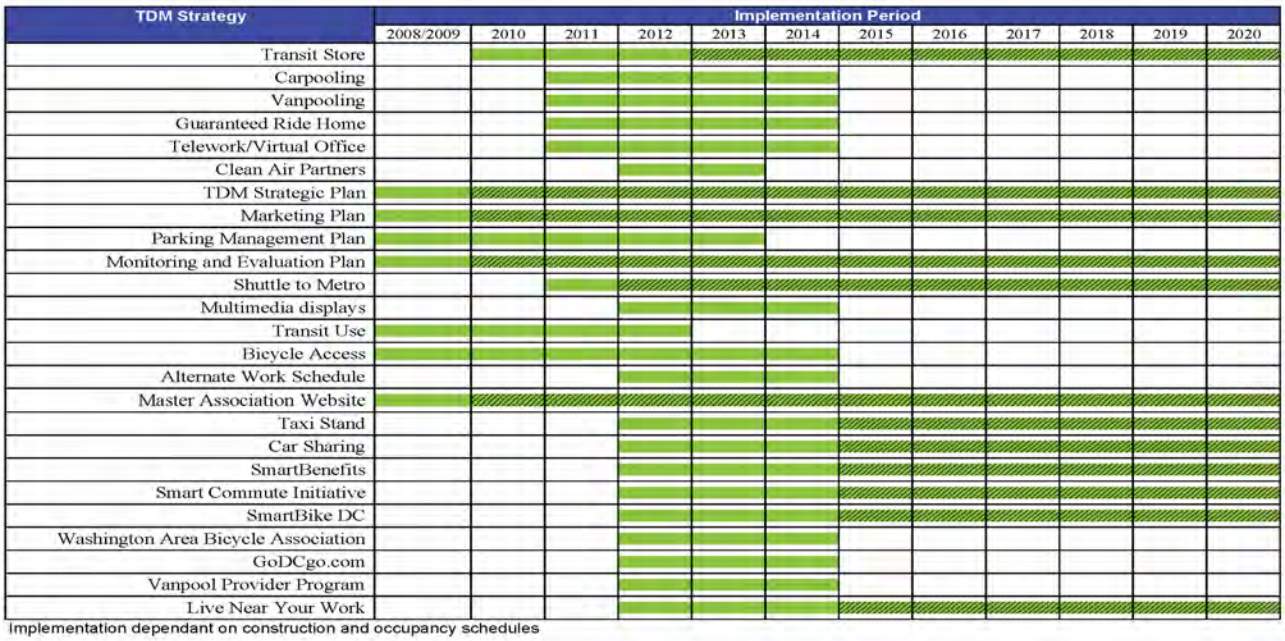


Figure 12: Proposed Implementation Schedule

5.2.1 Parking Management Plan

The Zone A Development will have a parking management plan that is based on the land use and square footage of use as shown in Table 6. For commercial parking areas, the parking plan will provide the following incentives for High Occupancy Vehicle use:

- Reserved carpool/vanpool spaces will be in convenient locations near buildings access points
- As available, reserved parking for hybrid and SmartCar vehicles
- Mandated registration of tenant employees for carpool and vanpool parking
- Registered carpools will receive preferential parking spaces
- Registered vanpools will be provided free parking and preferential parking spaces
- Registered carpools of three or more occupants will receive a parking subsidy

Each building owner/developer will be responsible for enforcing parking at their building and for providing the agreed upon incentives. This may be the responsibility of a third party parking management company.

Parking for retail operations will be allocated as shown in Table 6. Free parking (up to 2 hours) will be provided in the retail parking area. The consumer will receive a parking ticket which can be stamped at any of the retail shops to receive the free parking. This will discourage non-consumers from parking in the 'free' retail spaces. Tenants of the retail area must agree as part of their leasing documents to participate in this program.

For the residential areas, it will be the responsibility of the leasing agent or the Tenants Association to inform residents of the parking plan and to enforce it. Within the residential area, signage and/or residential parking permit tags to prohibit use of residential parking areas for other users will be implemented.

5.3 Facilities and Improvements

Table 9 shows facilities and capital improvements that will be completed as the development is constructed and the implementation phase for each item.

Table 9 Facility and Capital Improvements

Item	Phase	Initial Implementation Period
Construction of pedestrian paths and bike paths	1	2009-2011
Build Commuter Center/Transit Store	2	2010-2012
Begin Metro Shuttle Service	2	Initiated upon completion of specified Phase 2 Development density; projected 2012-2014
Install bike racks, showers, and lockers in office buildings	2 and 3	Projected 2010-2013, prior to occupancy of commercial office space
Install bike racks in retail areas	2 and 3	Projected 2010-2013, prior to occupancy of retail space
Install Multimedia displays	2 and 3	Initiated upon leasing of office or residential parcels Projected 2012-2014 Projected 2015-2016
Expand Metro Shuttle Service	3	Initiated upon completion of specified Phase 3 Development density; projected 2015-2017

5.4 Offsite Roadway Improvements

Offsite roadway improvements (geometric improvements and signalization for areas not in the Zone A Development) will be required to mitigate future traffic from the development as discussed in Section 2.2.2. The design and construction of these improvements will be approved and negotiated between DDOT and the Master Developer. The design and construction of any roadway improvements for the development of Zone A will be paid by the Master Developer or DDOT, as agreed upon by the parties. The following plan will be negotiated with DDOT:

1) The Master Developer will prepare, at their own expense, the design plans for the offsite roadway improvements as shown in Table 10.
2) All design plans will be reviewed and approved by DDOT prior to construction.
3) DDOT will be responsible for all construction engineering and construction costs related to the roadway improvements.
4) The Master Developer will reimburse DDOT for a portion of the construction costs, to be negotiated.
5) Roadway improvements shall be constructed in phases as shown in Table 10.
6) The Master Developer will notify DDOT of the building threshold within a reasonable time frame such that the necessary roadway improvements are completed when needed.

Table 10 Offsite Roadway Improvements

Roadway Improvements	Implementation Phase
Scale Gate Road: Single 150-foot right turn lane on off-ramp from southbound North Capitol Street at Scale Gate Road, or the installation of two signals at the top of the North Capitol Street off-ramps to Scale Gate Road; no roadway improvements required.	Completed during Phase II in conjunction with certificates of occupancy for applicable Parcels
Main Gate (Irving and 1St Streets): Single 400-foot left turn lane along eastbound Irving Street median at intersection of Irving and First Streets	
West Gate: Full movement intersection at the West Gate on Irving Street to include 250-foot southbound left turn lane onto Irving Street and 200-foot eastbound left turn median lane from Irving Street into the development.	
East Gate: Westbound right-in, right-out movement from Irving Street, or to accommodate pedestrian and vehicular activity, a signalized T-intersection with a 200-foot eastbound left turn median lane from Irving Street into the development.	

6.0 TDM BUDGET

The Master Association will fund the TDM strategies as shown in Table 11. Costs shown in Table 12 only include initial capital costs and first year of projected operating costs, with the exception of the costs for the shuttle service which are estimated for a full development build out. Some of the TDM strategies are included in MWCOG's Commuter Connections Program and are provided at no cost. These include: carpool, vanpool, Guaranteed Ride Home program, Live Near Your Work, and the alternate work schedule.

In addition, some of the TDM strategies do not have any costs associated with them. These include: NuRide, Smart Commute Initiative, and GoDCgo.com. Employers at the Zone A Development may incur some or all of the costs of the following TDM strategies, such as:

- Increase Transit Use- cash subsidy and/or tokens
- Telework- capital cost to employer for setting up home office
- Memberships in Clean Air Partners, Flexcar, Zipcar, WABA, SmartBike DC
- Monthly Driver Payment for VPSI

7.0 Marketing the Program

The most common reason for not changing travel behavior is the lack of information. A marketing plan will be developed and implemented to maximize the distribution of information to the commercial tenants and residential community, thereby increasing the effectiveness of the proposed TMP program. The TMPC will be highly knowledgeable on the available transit services and transportation programs and highly qualified to implement and manage them. The TMPC will market the transportation strategies as scheduled in the marketing plan, on an on-going basis. The marketing plan and budget will be developed by the TMPC within the first year of implementing the TMP and will be funded by the Master Association.

The branding process of the TMP will dictate the content of the marketing plan which will include the following components:

- Strategies for informing people on-site (commercial, retail, and residential users) of the programs in place. These strategies may include:
    - Lunch presentations at the offices of tenants and employers
    - Presentations at Tenants Association meetings
    - New resident/tenant TMP informational packages
    - Electronic (email) newsletters
    - Development of website page as part of the Zone A Development website
    - Coordination with developer leasing agents

- Types of marketing media to be utilized and frequency
- Interactive events for tenants and residents to meet with TMPC for information

- Promotional items, such as "free" transit passes for a week or gift cards to retail shop/store on site
- Ride the shuttle periodically to promote the program and to get feedback on the service and program in general
- Sponsor public relations forums seeking comments on how to improve TMP services and products.
- Develop annual surveys to get feedback on why people participate and/or do not participate in the TMP. Survey will be posted on website, in newsletter, and mailed to tenants for distribution to their employees
- Schedule regular meetings (i.e., quarterly) with members of the Master Association and Tenants Association to discuss the TMP
- Joint meetings with organizations who have a vested interest in the property and operations of the programs and services, such as DDOT, WMATA, MWCOG, and DC BID

The marketing plan will be approved on an annual basis by the Master Association as part of the evaluation and monitoring of the TMP as discussed in Section 8 of this report.

Table 11. TDM Budget for Zone A Development

TDM Strategy	Unit	Unit Cost	Quant.	Total Cost
TMPC	Annual	$75,000	1	$75,000
-Public Outreach	Annual	$50,000	1	$50,000
-Consultant	Capital	$100,00	1	$100,000
Commuter Center				
-Initial Build out	Capital	$75/sq ft	400	$30,000
-Rent	Annual	$46.50/sq ft	400	$18,600
Parking Management				
- Enforcement				
-Database & Software for billing and pricing	Capital	$ 14,000	1	$ 14,000
-Database & Software for billing and pricing	Annual	$ 2,000	1	$ 2,000
-Parking Monitoring System	Capital	$ 40,000	1	$ 40,000
Shuttles to Metro				
Annual lease cost for service (full development build out)	Annual	$636,500	1	$636,500
Multimedia Displays				
- LCD Monitor (17”22”)	Capital	$300	16	$4,800
- Plasma Display (42”-50”)	Capital	$2,000	4	$8,000
- Desktop	Capital	$500	20	$10,000
- Interactive Media Website Design	Capital	$10,000	1	$10,000
- Pocket Brochure Holder	Capital	$30	20	$600
- Slatwall Panel	Capital	$500	2	$1,000
- Installation	Capital	$5,000	1	$5,000
- Maintenance	Annual	$10,000	1	$10,000

TDM Strategy	Unit	Unit Cost	Quant.	Total Cost
Transit				
-Discounted $30 SmarTrip Card to $15 for 1st time purchasers (assumed 2600 users)	Per card	$15	2,600	$39,000
Bicycle Access				
-Bike Racks	Capital cost per bicycle rack	$100	436	$43,600
- Storage	Capital cost per bicycle locker	$800	109	$87,200
-SmartBike DC	Capital cost per station (assume 10 bikes)	$27,500	1	$27,500
Memberships				
-Clean Air Partners	Annual	$250	1	$250
- Zipcar	Annual	$50	1	$50
-Flexcar	Annual	$35	1	$35
-WABA	Annual	$25	1	$25

8.0 Monitoring & Evaluation

A successful TMP is a living document that is constantly being updated and adjusted to obtain the maximum desired outcome. An Annual TMP Performance Report will be prepared by the TMPC and presented to the Master Association and AFRH-W at an annual meeting. The report will evaluate each of the TDM strategies and will include:

- The extent to which each program has achieved its objective
- The degree of consistency of the program implementation to the plan
- Detail the relationship of different strategies to the effectiveness of the program
- Amount of square footage leased commercial/retail floor area and/or the number of occupied dwelling units and the number of employees and/or residents occupying such space
- Work program for the following year

The proposed outline of the annual TMP Performance Report includes:

1. Title Page
2. Annual Meeting Agenda and Date
3. Mission Statement
4. Master Association and AFRH Board and members
5. TMP Work Plan
6. TMP Budget (Current and Next Year)
7. TMP Performance/ "State of the Commute" Report Results
    a. Summary
    b. Mode Share by Property site and overall
    c. Parking report by Property site and overall
8. Report on Opportunities and Challenges for the Next Year
9. Appendix- Results of traffic survey and other methodologies used to measure effectiveness

The TMPC will use one or more of the following options to gauge the success of the programs:

- Perform annual survey to determine the number of residents/tenants/employees/ and their place of employment/residence, mode of transportation, arrival and departure times, willingness and ability to use carpooling and public transit. The survey will become the basis for the Annual Report.
- Perform traffic counts annually at all access points to the Zone A Development. This can be easily achieved by setting tubes at each access point and counting the vehicles.
- Track program participation (e.g., application of transit subsidies, preferential parking registration)

The TMPC will submit the annual report to the AFRH-W for review, and if needed, propose modifications to the TMP for the AFRH-W's approval. The Master Association and the Tenants Association will be provided opportunities to provide input on the proposed changes.

APPENDIX A

TRAFFIC IMPACT STUDY

Armed Forces Retirement Homes
Washington, D.C.

Traffic Impact Study

August 2007

Prepared for: Crescent Resources, LLC
Arlington, VA

Prepared by: Michael Baker Jr., Inc.
Linthicum, MD

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EXECUTIVE SUMMARY

Background

The Armed Forces Retirement Homes (AFRH-W) is an existing 272 acre site in northwest Washington, DC. It is home to more than 1,400 retired military veterans and provides amenities such as: health-related facilities, private rooms, banks, chapels, a convenience store, post office, laundry facilities, barber shop and beauty salon, dining rooms, golf course, fishing ponds and 24-hour security and staff. Considering the typical urban context of the District, the AFRH-W is a relatively suburban oasis exhibiting the characteristics of a university campus with considerable open space and view sheds to the District's monument core. A Master Plan is being prepared for the entire AFRH-W site. Revenue from the new development of the site is needed to sustain future funding for the retirement facility, as maintained in the AFRH-W Trust Fund.

Introduction

The Master Plan identifies six unique zones on the site that will be redeveloped over time to generate revenue for the Trust Fund and to provide improved facilities for the Armed Forces retired residents. Zone A is the first zone planned for redevelopment and is located within the southeast corner of the site. The zone is designated for mixed use with a combination of office, residential, hotel, retail, medical clinical and open space uses. The development in Zone A will be phased with an anticipated construction completion date of 2020.

The purpose of a *Traffic Impact Study* (TIS) is to evaluate and determine traffic impacts on the local and regional roadway system associated with a site's future land use. Generally, a TIS is composed of the following steps:

1. Study Area Assessment
2. Existing Conditions Analysis
3. Background Conditions Analysis
4. Trip Generation
5. Trip Distribution
6. Trip Assignment
7. Future Conditions Analysis
8. Mitigation Analysis

Because the field of transportation engineering contains unique terminology, a glossary of terms and concepts for transportation engineering has been provided in Appendix A-9.

The study area is defined by the key intersections that surround the site and provide site access. In the Study Area Assessment, roadway geometry and access to the project site are evaluated. The traffic capacity is analyzed during the morning (a.m.) peak hours and afternoon (p.m.) peak hours for the existing condition and future traffic growth, and with and without the project completed. Analysis of these intersections' operations determines the study area's traffic carrying capacity for existing and future year conditions.

Level of Service (LOS) is a measurement of intersection capacity. LOS rankings are calculated for each intersection during the a.m. and p.m. peak demand periods to analyze and compare intersection operations

LOS	Signalized Intersection Control Delay Per Vehicle	Unsignalized Intersection Control Delay Per Vehicle
A	≤ 10 seconds	≤ 10 seconds
B	> 10 and ≤ 20 seconds	> 10 and ≤ 15 seconds
C	> 20 and ≤ 35 seconds	> 15 and ≤ 25 seconds
D	> 35 and ≤ 55 seconds	> 25 and ≤ 35 seconds
E	> 55 and ≤ 80 seconds	> 35 and ≤ 50 seconds
F	> 80 seconds	> 50 seconds

Source: Highway Capacity Manual (HCM 2000)

and traffic service levels. A letter grade A-F defines an intersection's ability to accommodate traffic through the intersection limits as shown in table above. A LOS A represents excellent free flow conditions and LOS F represents failing conditions. For example, an intersection operating at LOS E implies it is operating at maximum capacity. LOS D is considered to be the worst tolerable ranking which is considered an acceptable condition as stated by the District Department of Transportation.

The Existing Conditions Analysis assesses how the current roadways are performing. The Background Conditions Analysis assesses how the roadways will perform with future 2020 traffic without the project, as compared to the existing observed traffic volumes. The regional travel demand model (TDM) developed and maintained by Metropolitan Washington Council of Governments (MWCOG) was used to assess the background growth of traffic in the vicinity of the site. A quick review was also carried out to determine if there were any other developments in the vicinity of the site that may potentially affect the LOS of the surrounding area and were not included in the regional model. The MWCOG model includes traffic projections for sites surrounding the AFRH-W including: the residential neighborhoods to the west and north; enrollment at Catholic University of America to the east; and the Washington Hospital Center/McMillan complexes to the south.

Traffic impact studies define Trip Generation as a site's generation of vehicle trips for the peak hours onto the adjacent roadways. A trip rate is applied to each site land use to arrive at the number of trips generated from the site. Trip Distribution defines how site generated trips will enter and leave the property, identifying the direction of traffic movement from each internal site location to each major external roadway. Trip Assignment routes the distributed trips between internal sites and external roadways, and adds the routed entering and exiting trips by intersection turning movement within the study area to the background traffic.

Institute of Traffic Engineer's (ITE's) Trip Generation – 6th Edition contains trip generation rates as well as peak hour directional distribution rates by land use. The site development plan includes approximately 4.33 million square feet of mixed use development divided in twenty (20) different land bays across Zone A. The land uses for these buildings include a combination of office, residential, hotel, retail and medical clinical. These trips were then divided into trips coming "In" and going "Out" of the site and are considered full-build conditions. Table 1 summarizes the total daily projected site trip generation.

Table 1: AFRH-W Trip Generation

Trip Generation	Square Footage	Total Trips AM			Total Trips PM		
		In	Out	Total	In	Out	Total
Zone A	4,337,369	2,923	1,566	4,489	1,955	3,183	5,138

The future conditions LOS analysis assesses how the roadways will perform in year 2020 with the site traffic added to the projected background growth in traffic. The LOS analysis performed for the study area shows that overall the proposed expansion will have an impact on the local roadways. By producing a new traffic signal plan for the surrounding area and modifying the lane geometry at the proposed access point intersections to the site, traffic impacts are reduced. The study area's intersections operate at acceptable levels with the addition of site generated traffic to the analysis year forecast when mitigation steps are applied.

Table 2 and Table 3 summarize the year 2006 existing, 2020 background without the project, 2020 future with project and mitigated 2020 future with the project, LOS traffic results for the a.m. and p.m. peak hours.

In general all signalized intersections operate at acceptable LOS at present and for future conditions with traffic mitigation under both alternatives. Note that a major difference from the site access configuration between this traffic impact study and the DEIS is the addition of a new entrance to the AFRH-W at Scale Gate Road and North Capitol Street. This effectively splits the AFRH-W development traffic between South Capitol Street and Irving Street. The p.m. peak LOS summary shows that with the future conditions without site traffic in year 2020, all intersections will operate at the same LOS as existing conditions. This is a function of the relatively slow growth projected by the MWCOG regional traffic model. With the addition of site traffic, the operations at two (2) intersections will degrade to a LOS F and one (1) intersection will degrade from a LOS B to a C in the a.m. peak hour. In the p.m. peak hour two (2) intersections will degrade from a LOS B to a C and one (1) intersection will degrade from a LOS C to a D.

Even though the overall operation of most intersections in the study area are at an acceptable LOS D or better, there are some approaches that operate below LOS D levels as follows:

- The eastbound approach at North Capitol Street and Harewood Road in the a.m. and p.m. peak hour under Full-Build with no mitigation conditions.
- The eastbound approach at Irving Street and 1st Street in the p.m. peak hour under existing, future no-build and future build without mitigation conditions.
- The northbound approach at Irving Street and 1st Street in the p.m. peak hour under future build with mitigation conditions.
- The eastbound approach at Rock Creek Church Road and Upshur Street in the p.m. peak hour under existing and future no-build conditions.
- The eastbound approach at North Capitol Street and Harewood Road in the p.m. peak hour under future build without mitigation conditions.
- The southbound approach at North Capitol Street and Michigan Avenue in the a.m. peak hour under future build without mitigation conditions.

The optimization of signal timing at the intersection of Rock Creek Church Road and Upshur Street is also recommended as it shows an improvement in operations from the existing conditions.

The signalized intersection of Irving Street and 1st Street and the southbound approach at the unsignalized intersection of Scale Gate Road and North Capitol Street off-ramp operate at a LOS F under the future build conditions. To mitigate the impacts associated with the project at these two locations, a recommendation of retiming the signal phasing and two alternatives for proposed change in lane configuration at the intersections are described in this report. With the implementation of either of these mitigations, the above intersections will operate at an acceptable LOS D or better under the future 2020 build conditions. Out of the two mitigation alternatives described in this report, the second alternative is the preferred alternative from a design stand point.

Table 2: A.M. Peak Hour Intersection Level-of-Service Results

Intersection	Existing	Back-ground	Full-Build	Full-Build With Alt-1	Full-Build with Alt-2
SIGNALIZED Intersections:					
Irving Street & 1st Street NW	B	B	**F**	D	D[3]
Irving Street & West Gate Entrance					D[4]
Irving Street & Columbia Road	C	C	C		
Irving Street & Park Place	B	B	B		
Kenyon Street & Park Place	C	C	C		
Rock Creek Church Rd & Upshur Street	B	B	C		
Rock Creek Church Rd & Harewood Rd	A	A	A		
North Capitol St & Harewood Rd	B	B	C[1]		
North Capitol St & Michigan Avenue	C	D	D[2]		
UNSIGNALIZED Intersections:					
Rock Creek Church Rd & Illinois Avenue (EB Right Turn)	A	A	A		
Rock Creek Church Rd & Randolph Street (EB Left Turn)	B	B	B		
Scale Gate Road & North Capitol St SB-Off Ramp (SB Approach)	A	A	**F**	C	C

[1]Eastbound approach, AM= Delay (66.9) LOS E, [2]Southbound approach, AM= Delay(71.8) LOS E
[3]Westbound approach, AM= Delay(56.1) LOS E, Northbound approach, AM=Delay(74.4) LOS E
[4]Westbound approach, AM= Delay(69.5) LOS E

Table 3: P.M. Peak Hour Intersection Level-of-Service Results

Intersection	Existing	Back-ground	Full-Build	Full-Build With Alt-1	Full-Build with Alt-2
SIGNALIZED Intersections:					
Irving Street & 1st Street NW	D[1]	D[3]	**F**	D[6]	D[7]
Irving Street & West Gate Entrance					D[8]
Irving Street & Columbia Road	B	B	C		
Irving Street & Park Place	B	B	A		
Kenyon Street & Park Place	B	B	B		
Rock Creek Church Rd & Upshur Street	D[2]	D[4]	B		
Rock Creek Church Rd & Harewood Rd	A	A	A		
North Capitol St & Harewood Rd	C	C	D[5]		
North Capitol St & Michigan Avenue	C	C	C		
UNSIGNALIZED Intersections:					
Rock Creek Church Rd & Illinois Avenue (EB Right Turn)	A	A	A		
Rock Creek Church Rd & Randolph Street (EB Left Turn)	B	B	B		
Scale Gate Road & North Capitol St SB-Off Ramp (SB Approach)	A	A	D	C	C

[1]Eastbound approach, PM= Delay (74.4) LOS E, [2]Eastbound approach, PM= Delay(84.6) LOS F,
[3]Eastbound approach, PM= Delay(82.3) LOS F, [4]Eastbound approach, PM= Delay(104.0) LOS F
[5]Eastbound approach, PM= Delay(100.1) LOS F, [6]Northbound approach, PM= Delay(68.5) LOS E
[7]Northbound approach, PM= Delay(87.2) LOS F
[8]Westbound approach, PM= Delay(67.3) LOS E, Southbound approach, PM=Delay(70.5) LOS E

INTRODUCTION

The Armed Forces Retirement Homes (AFRH-W) is an existing 272 acre site in northwest Washington, DC. The site is located between North Capitol Street on the east, Harewood Road to the northeast, Rock Creek Church Road to the northwest, Park Place to the west and Irving Street to the south as shown in Figure 1.

It is home to more than 1,400 retired military veterans and provides such features as: health-related facilities, private rooms, banks, chapels, a convenience store, post office, laundry facilities, barber shop and beauty salon, dining rooms, golf course, fishing ponds and 24-hour security and staff. The overall site can be divided into four functional areas: 1) the northern part of the facility with residential and administration areas; 2) the southeastern part with support and utility areas; 3) the King Health Center in the central part of the southern end, and 4) the recreational areas.

A Master Plan is being prepared for the entire AFRH-W site. Revenue from the development of the site is needed to sustain the primary source of funding for the facility, the AFRH-W Trust Fund. The Master Plan identifies six unique zones on the site as shown in Figure 2 that will be redeveloped over time to generate revenue for the Trust Fund and to provide improved facilities for the Armed Forces retired residents.

Zone A (shown in Figure 2) is the first zone planned for redevelopment and is located within the southeast corner of the site. The zone is designated for mixed use with a combination of office, residential, hotel, retail, medical clinical and open space uses. The development in Zone A will be phased with an anticipated construction completion date of 2020. Table 4 shows the proposed use and construction phase for each building shown in Figure 3. Phase 1 of construction will only include the roads and infrastructure.

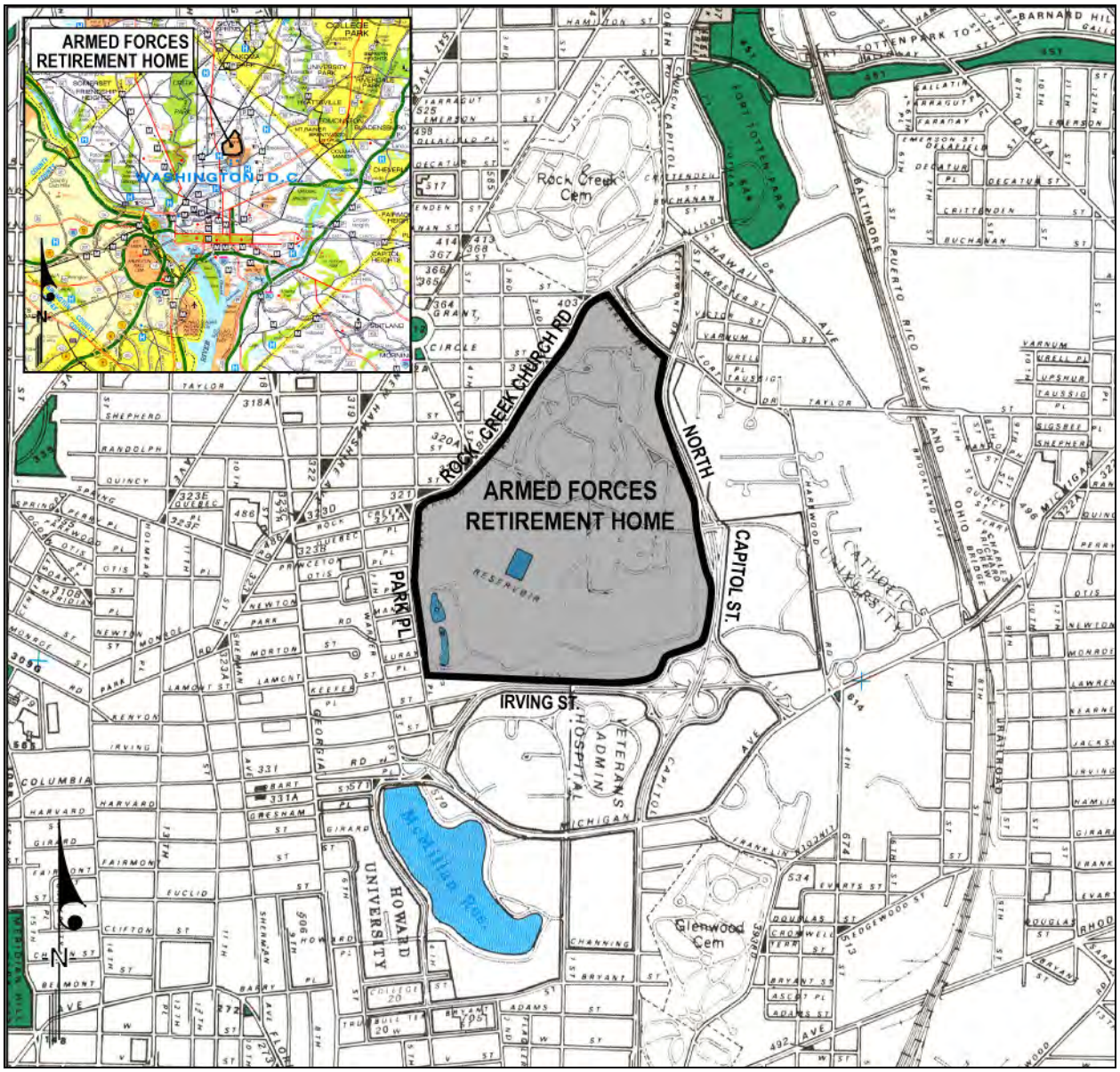


Figure 1: Location Map (source: Draft Environmental Impact Statement, May 2005)

Figure 2: Zone Layout for the AFRH-W (Zone A formerly Zones 3 & 4)

Table 4: Zone A Redevelopment Plan

Building	Use	Construction Phase/ Construction Start
A	Hotel	Phase 2/ 2009
B	Assisted Living/Hotel/Medical Clinical	Phase 3/ 2012
C	Office/Retail	Phase 2/ 2009
D	Office/Retail	Phase 2/ 2009
E	Office	Phase 2/ 2010
F	Office	Phase 3/ 2013
G	Residential	Phase 2/ 2010
H	Residential/Retail	Phase 2/ 2010
I	Residential/Retail	Phase 3/ 2011
J	Residential	Phase 3/ 2012
K	Residential/Retail/Office	Phase 3/ 2013
L	Residential/Office	Phase 4/ 2014
M	Residential	Phase 3/ 2013
N	Residential	Phase 4/ 2014
O	Residential	Phase 2/ 2010
P	Residential	Phase 4/ 2014
Q	Residential/Retail	Phase 3/ 2011
R	Residential	Phase 4/ 2015
S	Office	Phase 3/ 2012
T	Office	Phase 3/ 2013

Note: Phase 1 includes construction of roads and infrastructure.

TRAFFIC IMPACT STUDY

The proposed development at the AFRH-W would have a defined impact on the traffic on the surrounding roadways. This study includes a traffic impact study (TIS) that reflects the current traffic patterns, proposed development of the site and expected future traffic growth in the region. The TIS was developed in such a way that the information can be incorporated into the *Master Plan Environmental Impact Statement (EIS)*.

DATA COLLECTION/FIELD VISIT

Data collection efforts for this TIS included field visits to assess the existing conditions of the roadways network at the AFRH-W and in the vicinity of the site. The lane geometry, traffic volumes and signal timing data were also collected for the roadways in the vicinity.

Public Roadways

AFRH-W is accessed by an extensive network of local streets as shown in Figure 1. Key roadways include North Capitol Street, Irving Street and Rock Creek Church Road. A brief description of these streets follows:

North Capitol Street is a major north-south arterial roadway, which connects Washington, D.C. with its northern suburbs. In the vicinity of the site, North Capitol Street is a six-lane roadway which runs from Louisiana Avenue in the south and ends at New Hampshire Avenue to the north. There is an exit for Scale Gate Road, an access point to the AFRH-W, along North Capitol Street. Currently, this gate is closed and the site cannot be accessed from North Capitol Street. The intersections with Harewood Road and Michigan Avenue are signal controlled. Left turns from North Capitol Street are prohibited at the Michigan Avenue intersection. There is full cloverleaf interchange at Irving Street and North Capitol Street. Sidewalks are located along North Capitol Street north and south of the AFRH-W. There are no sidewalks on the portion of the road that parallels the site. The speed limit on North Capitol Street is 35 miles per hour (mph). The Average Annual Weekday Volume[1] in 2002 was 30,000 vehicles. The gate on Scale Gate Road will be the north entrance to the proposed site.

Irving Street is a minor east-west arterial roadway with a posted speed limit of 30 mph. It runs from Michigan Avenue in the east to the Harvard Street-Columbia Road one-way street system in the west. Irving Street, Michigan Avenue, Harvard Street, and Columbia Road intersect each other via ramps, which in some instances are grade separated and/or yield controlled. The intersection of eastbound Irving Street & Michigan Avenue is signalized. In most of the sections near the AFRH-W, Irving Street has a three-lane cross section where the third lane serves as shared right/left turns where it intersects other roadways. There are sidewalks on the south side of Irving Street in the vicinity of the AFRH-W. The intersection with 1st Street NW is signal controlled and functions as the north entrance to the Washington Hospital Center located to the south of the site. It is also signal controlled at the intersection with Columbia Road and Park Place located to

[1] Source: District Department of Transportation, Traffic Services Administration

the southwest of the site. The Average Annual Weekday Volume[2] in 2002 was 25,100 vehicles.

Rock Creek Church Road is a two-lane collector roadway that borders on the northwest end of the AFRH-W site with a posted speed limit of 30 mph. It stretches in a north-south direction between Park Place and North Capitol Street. Its' intersection with Upshur Street NW is signal controlled and is currently the only access gate open to the AFRH-W. Its' intersection with Harewood Road is also signal controlled, and its intersection with Randolph Road & Illinois Avenue is stop controlled. The Average Annual Weekday Volume[2] in 2002 north of Upshur Street was 7,800 and south of Upshur Street was approximately 3,500 vehicles. There are sidewalks on both sides of Rock Creek Church Road in the vicinity of AFRH-W.

Harewood Road is a two-lane, east-west roadway, which extends between Rock Creek Church Road and extends past North Capitol Street, eventually connecting to Michigan Avenue. A majority of the traffic along this roadway appears to be cut through traffic from Taylor Street, which provides access to Catholic University of America. Its' intersections with North Capitol Street, Rock Creek Church Road, and Michigan Avenue are signalized. There are sidewalks along both sides of Harewood Road in the vicinity of the AFRH-W. The speed limit on Harewood Road is 25 mph. The Average Annual Weekday Volume[2] in 2002 was estimated to be 10,800 vehicles between Rock Creek Church Road and North Capitol Street.

New Hampshire Avenue is a major north-south corridor in the study area. It runs from Washington, D.C. to Maryland and connects to the I-95/I-495 capital beltway. It intersects North Capitol Street approximately 3.5 miles north of the site at a signalized intersection. The Average Annual Weekday Volume[2] of traffic was estimated to range between 14,000 and 16,000 vehicles. There are sidewalks on both sides of New Hampshire Avenue in the vicinity of the AFRH-W. The speed limit on New Hampshire Avenue is 35 mph.

Michigan Avenue – This is an east-west, three-lane, roadway which loops around the southern part of the Washington Hospital Center and continues past Dakota Avenue to the east. This roadway is part of the major east-west route in the vicinity of the site. Its' intersections with North Capitol Street and Harewood Road are signal controlled and its' intersection with Columbia Road-Harvard Street is grade separated. The Average Annual Weekday Volume[2] of traffic was estimated to be 19,500 vehicles west of North Capitol Street and 31,800 vehicles east of North Capitol Street. There are sidewalks on both sides of Michigan Avenue in the vicinity of the AFRH-W. The speed limit on Michigan Avenue is 35 mph.

Local Site Conditions

The approved development in Zone A and the proposed roadway network for the site is shown in Figure 3. Entry and exit to this site will be from the Scale Gate Road gate to North Capitol Street and from the south gate at the intersection of Irving Street at 1st Street. Additionally two right-in/right-out intersections along Irving Street will be constructed, one each on the east and west sides of the Irving Street/1st Street intersection, onto westbound Irving Street. The internal street system at this site consists of a two-way main loop road consisting of Scale Gate Road on the north and Pershing Drive on the South that provides access to the parking areas and the individual

[2] Source: District Department of Transportation, Traffic Services Administration

building sites. There will be no restriction on access to Zone A of the AFRH-W. Access from this zone to the remaining AFRH-W site will be restricted.

Mass Transit Services

The public transportation system in the vicinity of the site consists of Metro bus and Metro rail service. There is also commuter rail service to Union Station. Commuters to Union Station then must use Metro and bus service to access the site. Figure 4 shows the Metro services within the study area.

There are several Metro Rail stations in the vicinity of the AFRH-W although none are within easy walking distance of the site. The three closest stations are: Georgia Avenue-Petworth, Brookland-CUA, and Fort Totten. The Georgia Avenue-Petworth Station is located on Georgia Avenue and serves the Metro Green Line. It is approximately 1.4 miles northwest of the AFRH-W as measured from the intersection of Irving and 1st Streets. The Brookland-CUA Station is located on Metro's Red Line at Michigan Avenue and Bunker Hill Road. As measured from the intersection of Irving and 1st Streets, it is approximately 1.1 miles from the AFRH-W. The Fort Totten Station is located on Galloway Street, NE, and serves both the Green and Red Metro Lines. This station is approximately 3 miles from the AFRH-W as measured from the intersection of Irving and 1st Streets.

DATA COLLECTION/TRAFFIC COUNTS

The lane geometry of the nearby roadway system is shown in Appendix A-6 and the existing traffic volumes for the a.m. and p.m. peak hours are shown in Appendix A-1. The existing 2006 traffic volumes, intersection geometry and signal timing data were provided at the following locations from the data developed for the *Draft Environmental Impact Statement for the Armed Forces Retirement Home Master Plan (DEIS).*

- Rock Creek Church Road & Harewood Road
- Rock Creek Church Road & Upshur Street
- Rock Creek Church Road & Randolph Road and Illinois Avenue
- Park Place & Kenyon Street
- Park Place & Irving Street
- Columbia Road & Irving Street
- Kenyon Street & Irving Street
- First Street & Irving Street
- Scale Gate at North Capitol Street
- Harewood Road & North Capitol Street
- Michigan Avenue & North Capitol Street

The regional travel demand model (TDM) developed and maintained by Metropolitan Washington Council of Governments (MWCOG) was used to assess the background growth of traffic in the vicinity of the site and to develop origin and destination trip distribution for the site traffic. The *Traffic Impact Analysis – Children's National Medical Center* report was referred to estimate the site traffic generated due to the development. The approved site development plans were assessed to develop site traffic and entry/exit volumes at the gates. The roadway network from the approved site development plans were also used to develop internal traffic movement.

Figure 3: Proposed Zone A Redevelopment (formerly Zones 3 & 4)

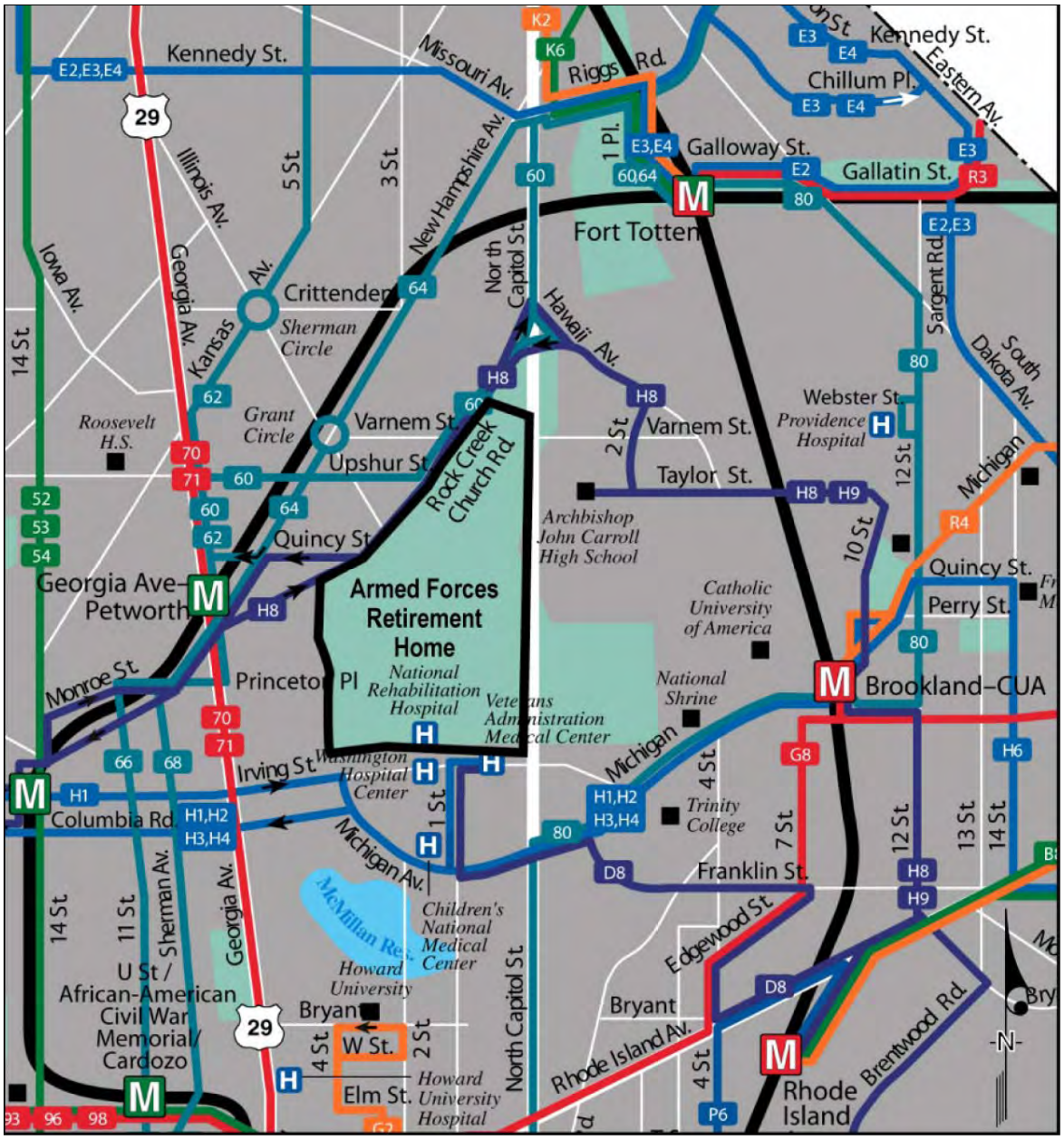


Figure 4: Metro Services in vicinity of the AFRH-W (Source: WMATA)

IMPACT ANALYSIS

For the purpose of the AFRH-W study, traffic simulation and animation programs were used to replicate and evaluate existing traffic conditions. Synchro V7.0, a traffic signal analysis software package, serves as the intersection analysis tool. Synchro implements the methods of the 2000 Highway Capacity Manual (HCM). With coordinated intersections, Synchro explicitly calculates how traffic will proceed from one intersection to the next, known as the progression factor. With the Highway Capacity Software (HCS), the intersection is assumed to be isolated from its neighbors, requiring the analyst to make assumptions regarding the effects of signal coordination. Synchro's timing plans optimizes networks offsets and cycle splits to reduce stops and delays. Because Synchro gives the user the opportunity to examine the network, rather than each intersection individually, the user can evaluate how changes to one intersection will affect local network traffic. This results in a better representation of how traffic actually flows within the roadway network in comparison to HCS. For this study, Synchro was used to determine the intersection Level of Service (LOS) and intersection delays for the project area.

In order to simulate traffic conditions, these methodologies require accurate input data. These data, collected through field observations and turning movement counts, include:

- Intersection and lane geometry
- Intersection turning movement counts
- AM & PM traffic volumes
- Speed of traffic flow
- Intersection traffic control
- Signal timing and phasing

Levels of Service (LOS): One of the best means of interpreting the performance of an entire arterial, as well as each of its intersections, is to analyze LOS. LOS is a standardized measure of traffic engineering programs and the operability of an intersection based upon the delay encountered by a vehicle using that intersection. LOS rankings are calculated for each intersection during the a.m. and p.m. peak hour demand periods to analyze and compare intersection operations and traffic service levels. A letter grade A-F, defines an intersection's ability to pass traffic through the intersection. A LOS A represents excellent free flow conditions and LOS F represents failing conditions. Generally, LOS D is considered to be the worst tolerable ranking which is considered an acceptable condition, as determined by the District Department of Transportation. In comparison, an intersection at LOS F represents a situation in which drivers experience significant delays, having to wait through multiple signal cycles before passing through.

LOS	Signalized Intersection Control Delay Per Vehicle	Unsignalized Intersection Control Delay Per Vehicle
A	≤ 10 seconds	≤ 10 seconds
B	> 10 and ≤ 20 seconds	> 10 and ≤ 15 seconds
C	> 20 and ≤ 35 seconds	> 15 and ≤ 25 seconds
D	> 35 and ≤ 55 seconds	> 25 and ≤ 35 seconds
E	> 55 and ≤ 80 seconds	> 35 and ≤ 50 seconds
F	> 80 seconds	> 50 seconds

In the HCM approach, capacity at intersections is defined as the maximum rate of flow that may pass through under prevailing conditions. Capacity analysis involves the computation of volume-to-capacity (V/C) ratios for each directional lane groups of movement, from which an overall

intersection V/C ratio may be derived. Thus, it is possible to have an overall intersection V/C of less than 1.00 (under capacity), but still have individual movements be over capacity.

Existing Conditions Analysis

An existing LOS analysis was performed using Synchro\SimTraffic simulation software that implements HCM 2000. The analysis shows that all signalized intersections within the study area operate at LOS D or better for the overall intersection (the minimum acceptable operations = LOS D) for both peak hours. The overall intersection LOS results are summarized in Table 5. Although the overall intersection at Rock Creek Church Rd & Upshur St operates at a LOS D in the PM, the eastbound approach leg of the intersection operates at a LOS F.

In addition to LOS, the tables include the HCM control delay per vehicle in seconds at the intersection and the intersection traffic volume demand to carrying capacity ratio (V\C). Intersection LOS is a twofold measurement because it measures the operability of the whole intersection and each of its approach legs. At various locations, the overall intersection LOS may be better than that of its approach legs' LOS. That is, although one or several of the streets of an intersection are congested, the intersection as a whole may perform at an acceptable level.

The two-way stop controlled HCM analysis was carried out for the unsignalized intersection and key turning movement approaches were analyzed as shown in Table 5. All unsignalized intersections within the study area operate at an acceptable LOS. Detailed Synchro analysis reports for all intersections are included in Appendix A-7.

Table 5: Overall Intersection LOS: 2006 Existing Conditions Analysis and Results

Intersection	AM			PM		
	LOS	Delay	V/C	LOS	Delay	V/C
SIGNALIZED Intersections:						
Irving St & 1st St NW	B	17.4	0.50	D[1]	46.2	0.65
Irving St & Columbia Rd	C	20.2	0.40	B	12.1	0.28
Irving St & Park Place	B	10.2	0.33	B	11.7	0.26
Kenyon St & Park Place	C	20.1	0.51	B	13.7	0.38
Rock Creek Church Rd & Upshur St	B	16.5	0.61	D[2]	37.9	0.58
Rock Creek Church Rd & Harewood Rd	A	0.4	0.36	A	0.3	0.26
North Capitol St & Harewood Rd	B	18.3	0.74	C	26.6	0.81
North Capitol St & Michigan Avenue	C	30.4	0.93	C	25.6	0.83
UNSIGNALIZED Intersections:						
Rock Creek Church Rd & Illinois Ave (EB Right Turn)	A	9.5	0.04	A	9.0	0.02
Rock Creek Church Rd & Randolph St (EB Left Turn)	B	10.5	0.03	B	10.8	0.07
Scale Gate Rd & N. Capitol St SB-Off Ramp (SB Approach)	A	8.6	0.01	A	8.6	0.01

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Eastbound approach, PM= Delay(74.4) LOS E, [2]Eastbound approach, PM= Delay(84.6) LOS F

Background Traffic Forecast and Analysis

Based on the project development phasing for the approved buildings in Zone A, a future year 2020 was established for this analysis when the site would be fully developed (built-out) and operational. The background traffic forecast projects future traffic without any development at the site in order to assess potential short and long-term needs to the transportation network. As a result, the future traffic forecasts assume that no capacity, system or roadway improvements are made to the roadway system.

The regional TDM was used to assess the background growth of traffic in the vicinity of the site. A 2000 year model run was conducted along with a 2030 year model run to assess the growth in traffic volumes on the roadway network surrounding the site. The TDM takes into consideration future approved developments in the region, including new transit services and its impact on mode choice in the region. Overall growth rates were developed based on these model runs for the roadway volumes surrounding the site. The future traffic volumes as shown in Appendix A-2 for 2020 background traffic were developed using these growth rates.

A quick review was also carried out to determine if there were any other developments in the vicinity of the site that may potentially affect the LOS of the surrounding area and were not included in the regional TDM. The MWCOG model includes traffic projections for sites surrounding the AFRH-W including: the residential neighborhoods to the west and north; enrollment at Catholic University of America to the east; and the Washington Hospital Center/McMillan complexes to the south. The Children's National Medical Center plans to construct additional improvements to its facilities situated north of Michigan Avenue and west of First Street. The traffic generated[3] by this site was considered, to estimate the background traffic projections.

Following the same methodology used in the existing LOS analysis, the results for the 2020 background analysis show that all signalized intersections within the study area operate at LOS D or better for the overall intersection for both peak hours. For 2020 background, the analysis shows very similar results as that for the existing conditions analysis. The reason would be the growth of traffic volume from 2006 to 2020 as reflected by the regional TDM. The increase of mode share for transit and non-motorized trips as well as traffic being diverted to nearby facilities due to future developments is also considered by the regional model. Similarly, the forecasted 2020 unsignalized analysis shows that all the unsignalized intersections and key turning movement approaches operate at an acceptable LOS.

The overall intersection LOS results are summarized in Table 6. The results show that the intersection of North Capitol Street and Michigan Avenue degrades from a LOS C to a D and the eastbound approach at the intersection of Irving Street and 1st Street NW degrades to a LOS F as compared with the existing conditions analysis. Detailed Synchro analysis reports for all intersections are included in Appendix A-7.

[3] *Traffic Impact Analysis – Children's National Medical Center* report

Table 6: Overall Intersection LOS: 2020 Background Conditions Analysis and Results

Intersection	AM			PM		
	LOS	Delay	V/C	LOS	Delay	V/C
SIGNALIZED Intersections:						
Irving St & 1st St NW	B	17.7	0.52	D[1]	50.2	0.67
Irving St & Columbia Rd	C	20.5	0.41	B	12.1	0.29
Irving St & Park Place	B	10.3	0.34	B	11.8	0.28
Kenyon St & Park Place	C	20.4	0.53	B	13.8	0.39
Rock Creek Church Rd & Upshur St	B	17.7	0.63	D[2]	45.3	0.61
Rock Creek Church Rd & Harewood Rd	A	0.4	0.37	A	0.3	0.27
North Capitol St & Harewood Rd	B	19.0	0.77	C	28.0	0.83
North Capitol St & Michigan Avenue	D	36.2	0.98	C	25.7	0.85
UNSIGNALIZED Intersections:						
Rock Creek Church Rd & Illinois Ave (EB Right Turn)	A	9.5	0.04	A	9.0	0.02
Rock Creek Church Rd & Randolph St (EB Left Turn)	B	10.6	0.03	B	10.9	0.07
Scale Gate Rd & N. Capitol St SB-Off Ramp (SB Approach)	A	8.6	0.01	A	8.6	0.01

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Eastbound approach, PM= Delay(82.3) LOS F, [2]Eastbound approach, PM= Delay(104.0) LOS F

Trip Generation

In a TIS, trip generation refers to the study site's generation of trips which are typically the number of vehicle trips. Trip generation calculations typically come from the *Institute of Transportation Engineers' (ITE) Trip Generation* manuals that contain trip generation rates for numerous land uses. For this study all trip generation rates as well as peak hour directional distribution rates were obtained from the *ITE's Trip Generation - 6th Edition* for all land uses. For detailed land use and trip generation calculations refer to Appendix A-8.

The site development plan includes approximately 4.33 million square feet of mixed use development divided in twenty (20) different land bays across Zone A. The land use for these buildings ranges from a combination of office, residential, hotel, retail and medical clinical. The trips rates used to generate traffic from each of the land bays are for auto trips. These trips were then divided into trips coming "In" and going "Out" of the site based on the directional distribution from the *ITE's Trip Generation* manual. Table 7 shows the summary of the site trip generation.

Table 7: Site Trip Generation

Trip Generation	Square Footage	Total Trips AM			Total Trips PM		
		In	Out	Total	In	Out	Total
Proposed Site	4,337,369	2,923	1,566	4,489	1,955	3,183	5,138

Trip Distribution and Assignment

The trip distribution for the site was based upon the results taken from the MWCOG regional TDM. The output from the model runs were used to develop a detailed origin-destination (O-D) distribution for the site. In all five (5) origin-destination locations were established where the traffic was distributed. The O-D results from the model are shown in Table 8 and the locations are shown in Appendix A-5.

Table 8: Origin-Destination from Regional TDM

Location	Origin/Destination	Inbound		Outbound	
		AM	PM	AM	PM
#1	From/To North on North Capitol Street	23%	15%	15%	20%
#2	From/To South on North Capitol Street	18%	25%	22%	25%
#3	From/To East on Irving Street	22%	18%	15%	13%
#4	From/To West on Irving Street	36%	40%	46%	40%
#5	From/To South on 1st Street	1%	2%	2%	2%

Future traffic was distributed using the O-D percentages shown in Table 8. Internal trip reductions were not considered for this study to develop a conservative estimate. The distributions were then assigned to local streets based on the existing traffic flow patterns in the vicinity of the site. The internal trip distribution was developed based on the location of the buildings (land-bays) on the site plan. These trips were then assigned to the internal roadway system of the site as well as the two gates they would use to access the site. The assignment of the trips to the gates and internal roadways was based on a review of the site plans and the most likely route that can be taken from the origin to the destination. The site traffic volumes for the a.m. and p.m. peak hours are shown in Appendix A-5.

The future site generated inbound and outbound traffic volumes as shown in Appendix A-5 will be added to the background 2020 traffic. The resulting volumes which represent the future traffic growth along with the site traffic generated once it is built and operational is shown in Appendix A-3 as full-build traffic volumes.

Future Traffic Forecast and Analysis

For the 2020 full-build traffic analysis the lane geometry for the three new access points on Irving Street was assumed for the full-build conditions. The access point for the approach at the intersection of Irving Street and 1st Street was assumed to have a single left-turn lane and a shared through and right-turn lane. The other two access gates on Irving Street will be right-in-right-out movements only. Both secondary access roads will be a single right-turn lane into the site and a single right-turn lane coming out of the gate with a stop sign control for the approach. The approach for the site access at the Scale Gate Road would remain the same as a shared through and right-turn lane. The signal timing was optimized in Synchro for all the signalized intersections in the study area. New phasing was assumed for the southbound approach at the intersection of Irving Street and 1st Street. Appendix A-10 contains the signal timing and phasing assumed for all signalized intersections.

The 2020 future traffic analysis shows that the signalized intersection at Irving Street and 1st Street will operate at a LOS F in both the a.m. and p.m. peak hours. The analysis also shows that the southbound approach at the unsignalized intersection at Scale Gate Road and the southbound off-ramp from North Capitol Street will operate at a LOS F in the a.m. peak hour. All other signalized and unsignalized intersections within the study area will operate at an acceptable LOS D or better for both peak hours. The results are summarized in Table 9 below.

Table 9: Overall Intersection LOS: 2020 Full-Build Analysis and Results

Intersection	AM			PM		
	LOS	Delay	V/C	LOS	Delay	V/C
SIGNALIZED Intersections:						
Irving Street & 1st Street NW	**F**	**204.4**	**1.57**	**F**	**249.7**	**1.59**
Irving Street & Columbia Road	C	24.2	0.67	C	20.6	0.47
Irving Street & Park Place	B	11.5	0.61	A	9.3	0.47
Kenyon Street & Park Place	C	21.0	0.70	B	17.9	0.69
Rock Creek Church Road & Upshur Street	C	20.9	0.62	B	19.8	0.58
Rock Creek Church Road & Harewood Road	A	0.4	0.37	A	0.3	0.27
North Capitol Street & Harewood Road	C[1]	26.8	0.99	D[2]	44.7	1.04
North Capitol St & Michigan Avenue	D[3]	51.8	1.05	C	34.5	0.97
UNSIGNALIZED Intersections:						
Rock Creek Church Road & Illinois Avenue (EB Right Turn)	A	9.5	0.04	A	9.0	0.02
Rock Creek Church Road & Randolph Street (EB Left Turn)	B	10.6	0.03	B	10.9	0.07
Scale Gate Road & North Capitol Street SB-Off Ramp (SB Approach)	**F**	**75.8**	**1.03**	D	27.2	0.63

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Eastbound approach, AM= Delay(66.9) LOS E, [2]Eastbound approach, PM= Delay(100.1) LOS F
[3]Southbound approach, AM= Delay(71.8) LOS E

In general the operations at all intersections either degraded or remained the same as compared with the No-Build analysis except for the intersections at Irving Street and Park Place and Rock Creek Church Road and Upshur Street which operate at an improved LOS. This is mainly because the traffic volumes at the intersection do not get greatly affected due to the site generated traffic and since the signal timing was optimized for the intersection, it now operates at an improved LOS.

Some individual intersection approach legs operate at an unacceptable LOS due to additional traffic added by the project. The eastbound approach at the intersection of North Capitol Street and Harewood Road operates at a LOS E in the a.m. and at a LOS F in the p.m. peak hour and the southbound approach at the intersection of North Capitol Street and Michigan Avenue operates at a LOS E in the a.m.

Mitigation and Analysis

To mitigate for the degradation of LOS for the failing LOS intersections in the Full-Build, two alternatives with new signal plans along with improved lane geometry were developed. Under both alternatives the proposed new signal plans at the signalized intersection of Irving Street and 1st Street, includes converting the controller from a pre-timed to an actuated controller, with the main street phases having maximum recall and will always show to their maximum green time. The side street phases may be actuated and can be skipped. The signal phasing was optimized to allocate more green time to degraded approaches within the optimal cycle length. Appendix A-10 contains the signal timing and phasing assumed for all signalized intersections.

Alternative-1:

Under Alternative-1 new proposed lane geometry was considered at the intersections of Irving Street and 1st Street as well as at Scale Gate Road and the off-ramp for southbound North Capitol Street as shown in Figure 5 and Figure 6, respectively. The results of the proposed mitigation are shown in Table 10.

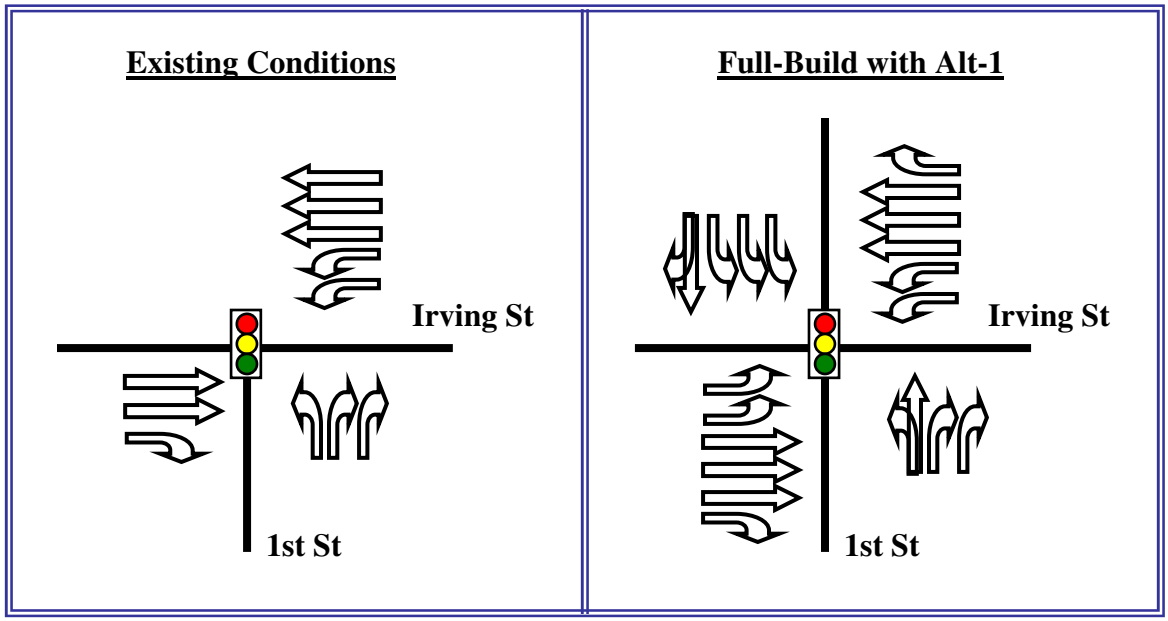


Figure 5: Alt-1 – Proposed Lane Geometry for Irving Street & 1st Street

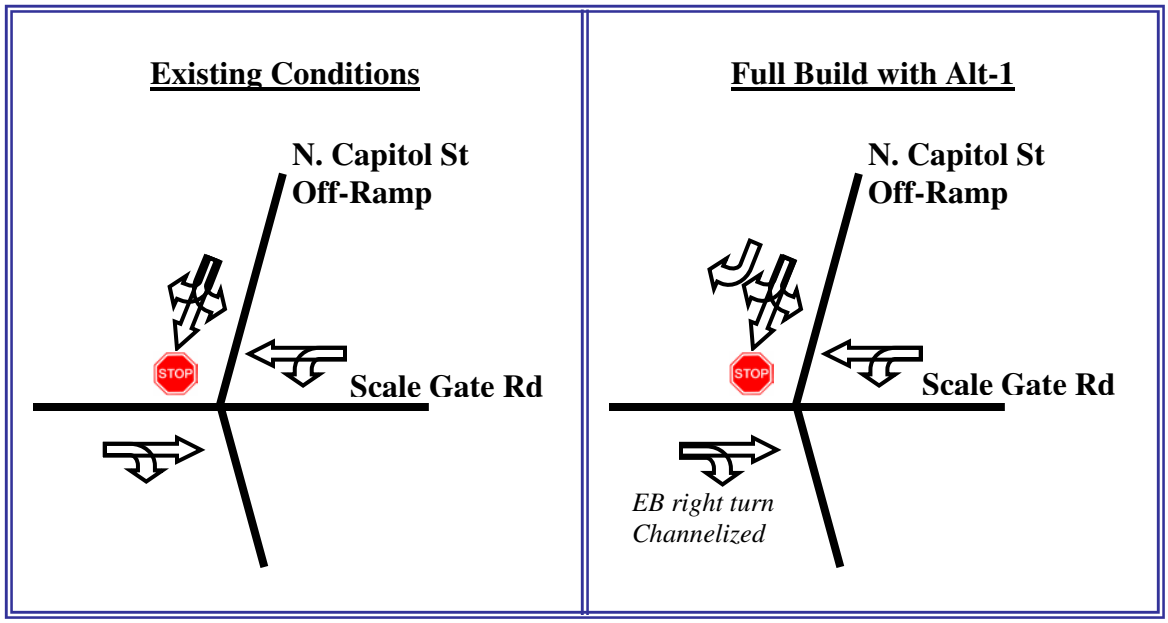


Figure 6: Alt-1 – Proposed Lane Geometry for Scale Gate Rd & North Capitol St Off-Ramp

Table 10: Overall Intersection LOS: 2020 Full-Build With Alternative-1 Analysis and Results

Intersection	AM			PM		
	LOS	Delay	V/C	LOS	Delay	V/C
SIGNALIZED Intersections:						
Irving Street & 1st Street NW	D	48.2	0.92	D[1]	48.5	0.99
UNSIGNALIZED Intersections:						
Scale Gate Road & North Capitol Street SB-Off Ramp (SB Approach)	C	21.7	0.67	C	17.8	0.37

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Northbound approach, PM= Delay(68.5) LOS E

The intersection capacity analysis results for all other signalized and unsignalized intersections will remain the same as no improvements are proposed for any other locations. The above results indicate that if the proposed mitigations are implemented, the two locations which operated at a LOS F with the development of the site, will now operate at an acceptable LOS D or better.

Alternative-2:

Alternative-2 converts the right-in-right-out gate on the west of 1st Street into a full movement signalized intersection with minor geometric changes at the intersection of Irving Street and 1st Street. This alternative is also the preferred alternative from a design stand point. Under this alternative, new proposed lane geometry was considered at the intersections of Irving Street and 1st Street and the intersection of Irving Street and West Gate Entrance Road as shown in Figure 7 and Figure 8, respectively. The resulting volumes are shown in Appendix A-4 as full-build with Alternative-2 traffic volumes. The proposed lane geometry at Scale Gate Road and the off-ramp for southbound North Capitol Street will remain as shown in Figure 6, under Alternative-1. The results of the proposed mitigation are shown in Table 12.

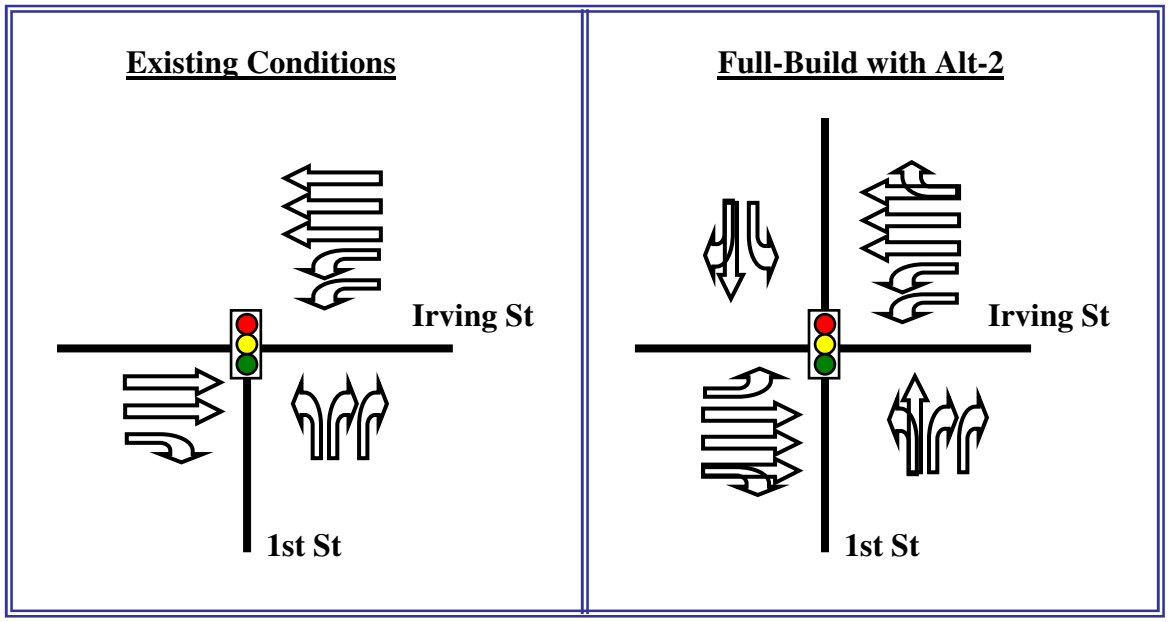


Figure 7: Alt-2 – Proposed Lane Geometry for Irving Street & 1st Street

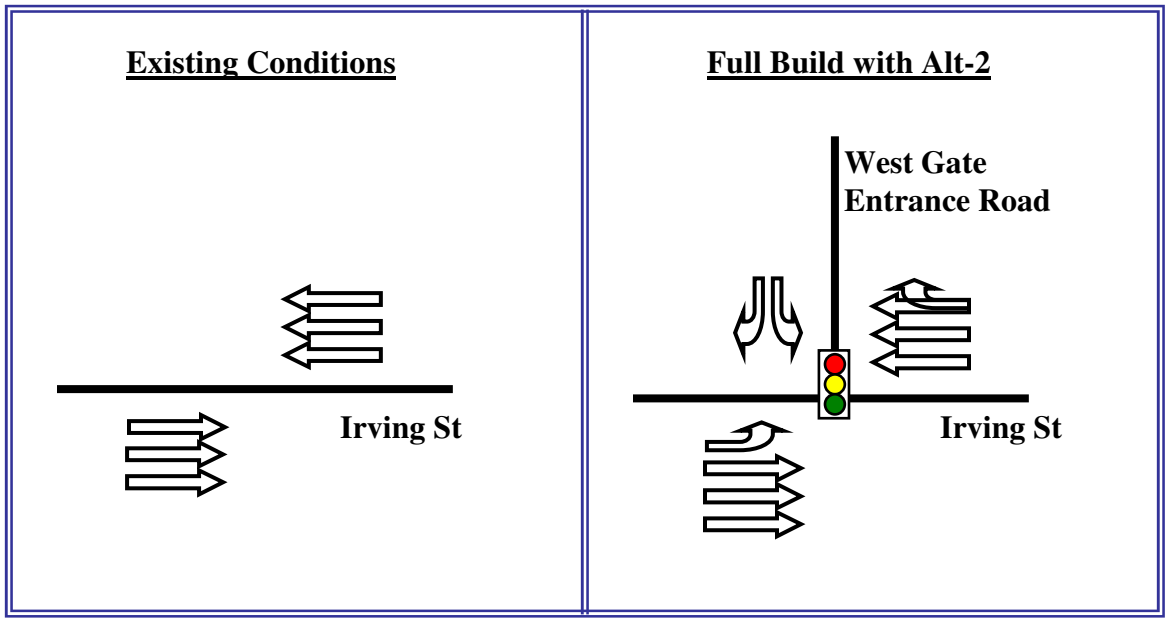


Figure 8: Alt-2 – Proposed Lane Geometry for Irving Street & West Gate Entrance Rd

The intersection of Irving Street and West Gate Entrance Road will be a full movement signalized intersection. The controller would be actuated, with the main street phases having maximum recall and will always show to their maximum green time. The side street phases may be actuated and can be skipped. The cycle length will be equal to that of the signalized intersection of Irving Street and 1st Street to allow for coordination of the signals. Appendix A-10 contains the signal timing and phasing assumed for this intersection.

Table 11: Overall Intersection LOS: 2020 Full-Build With Alternative-2 Analysis and Results

Intersection	AM			PM		
	LOS	Delay	V/C	LOS	Delay	V/C
SIGNALIZED Intersections:						
Irving Street & 1st Street NW	D[1]	54.0	0.91	D[2]	54.6	0.99
Irving Street & West Gate Entrance	D[3]	50.7	0.98	D[4]	53.7	1.01
UNSIGNALIZED Intersections:						
Scale Gate Road & North Capitol Street SB-Off Ramp (SB Approach)	C	21.7	0.67	C	17.8	0.37

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Westbound approach, AM= Delay(56.1) LOS E, Northbound approach, AM=Delay(74.4) LOS E
[2]Northbound approach, PM= Delay(87.2) LOS F
[3]Westbound approach, AM= Delay(69.5) LOS E
[4]Westbound approach, PM= Delay(67.3) LOS E, Southbound approach, PM=Delay(70.5) LOS E

The intersection capacity analysis results for all other signalized and unsignalized intersections will remain the same as no improvements are proposed for any other locations. The above results indicate that if the proposed mitigations are implemented, the two locations which operated at a LOS F with the development of the site, will now operate at an acceptable LOS D or better.

CONCLUSION

The LOS analysis performed for the study area shows that overall the proposed expansion will have an impact on the local traffic. By producing a new traffic signal plan for the surrounding area and modifying the lane geometry at the proposed access point intersections to the site, traffic impacts will be mitigated. The study area's intersections operate at acceptable levels with the addition of site generated traffic to the analysis year forecast when mitigation steps are applied. Table 12 and Table 13 summarize the year 2006 existing, 2020 background without the project, 2020 future with project, and mitigated 2020 future with project LOS traffic results for the a.m. and p.m. peak hours.

In general all signalized intersections operate at acceptable LOS at present and for future conditions with traffic mitigation. The p.m. peak LOS summary shows that with the future conditions without site traffic in year 2020, all intersections will operate at the same LOS as existing conditions. With the addition of site traffic, the operations at two (2) intersections will degrade to a LOS F and one (1) intersection will degrade from a LOS B to a C in the a.m. peak hour. In the p.m. peak hour two (2) intersections will degrade from a LOS B to a C and one (1) intersection will degrade from a LOS C to a D.

Even though the overall operation of most intersections in the study area is at an acceptable LOS D or better, there are some approaches that operate at below LOS D levels as follows:

- The eastbound approach at North Capitol Street and Harewood Road in the a.m. and p.m. peak hour under Full-Build with no mitigation conditions.
- The eastbound approach at Irving Street and 1st Street in the p.m. peak hour under existing, future no-build and future build without mitigation conditions.
- The northbound approach at Irving Street and 1st Street in the p.m. peak hour under future build with mitigation conditions.
- The eastbound approach at Rock Creek Church Road and Upshur Street in the p.m. peak hour under existing and future no-build conditions.
- The eastbound approach at North Capitol Street and Harewood Road in the p.m. peak hour under future build without mitigation conditions.
- The southbound approach at North Capitol Street and Michigan Avenue in the a.m. peak hour under future build without mitigation conditions.

The optimization of signal timing at the intersection of Rock Creek Church Road and Upshur Street is also recommended as it shows an improvement in operations from the existing conditions.

The signalized intersection of Irving Street and 1st Street and the southbound approach at the unsignalized intersection of Scale Gate Road and North Capitol Street Off-ramp operate at a LOS F under the future build conditions. To mitigate the impacts associated with the project, a recommendation of retiming the signal phasing and two alternatives for proposed change in lane configuration at the intersections were previously described in this report. With the implementation of either of these mitigations, the above intersections will operate at an acceptable LOS D or better under the future 2020 build conditions. Out of the two mitigation alternatives analyzed above, the second alternative is the preferred alternative from a design stand point.

Table 12: Overall Intersection LOS: 2020 AM Peak LOS Summary

Intersection	Existing	Back-ground	Full-Build	Full-Build With Alt-1	Full-Build with Alt-2
SIGNALIZED Intersections:					
Irving Street & 1st Street NW	B	B	**F**	D	D[3]
Irving Street & West Gate Entrance					D[4]
Irving Street & Columbia Road	C	C	C		
Irving Street & Park Place	B	B	B		
Kenyon Street & Park Place	C	C	C		
Rock Creek Church Rd & Upshur Street	B	B	C		
Rock Creek Church Rd & Harewood Rd	A	A	A		
North Capitol St & Harewood Rd	B	B	C[1]		
North Capitol St & Michigan Avenue	C	D	D[2]		
UNSIGNALIZED Intersections:					
Rock Creek Church Rd & Illinois Avenue (EB Right Turn)	A	A	A		
Rock Creek Church Rd & Randolph Street (EB Left Turn)	B	B	B		
Scale Gate Road & North Capitol St SB-Off Ramp (SB Approach)	A	A	**F**	C	C

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Eastbound approach, AM= Delay (66.9) LOS E, [2]Southbound approach, AM= Delay(71.8) LOS E
[3]Westbound approach, AM= Delay(56.1) LOS E, Northbound approach, AM=Delay(74.4) LOS E
[4]Westbound approach, AM= Delay(69.5) LOS E

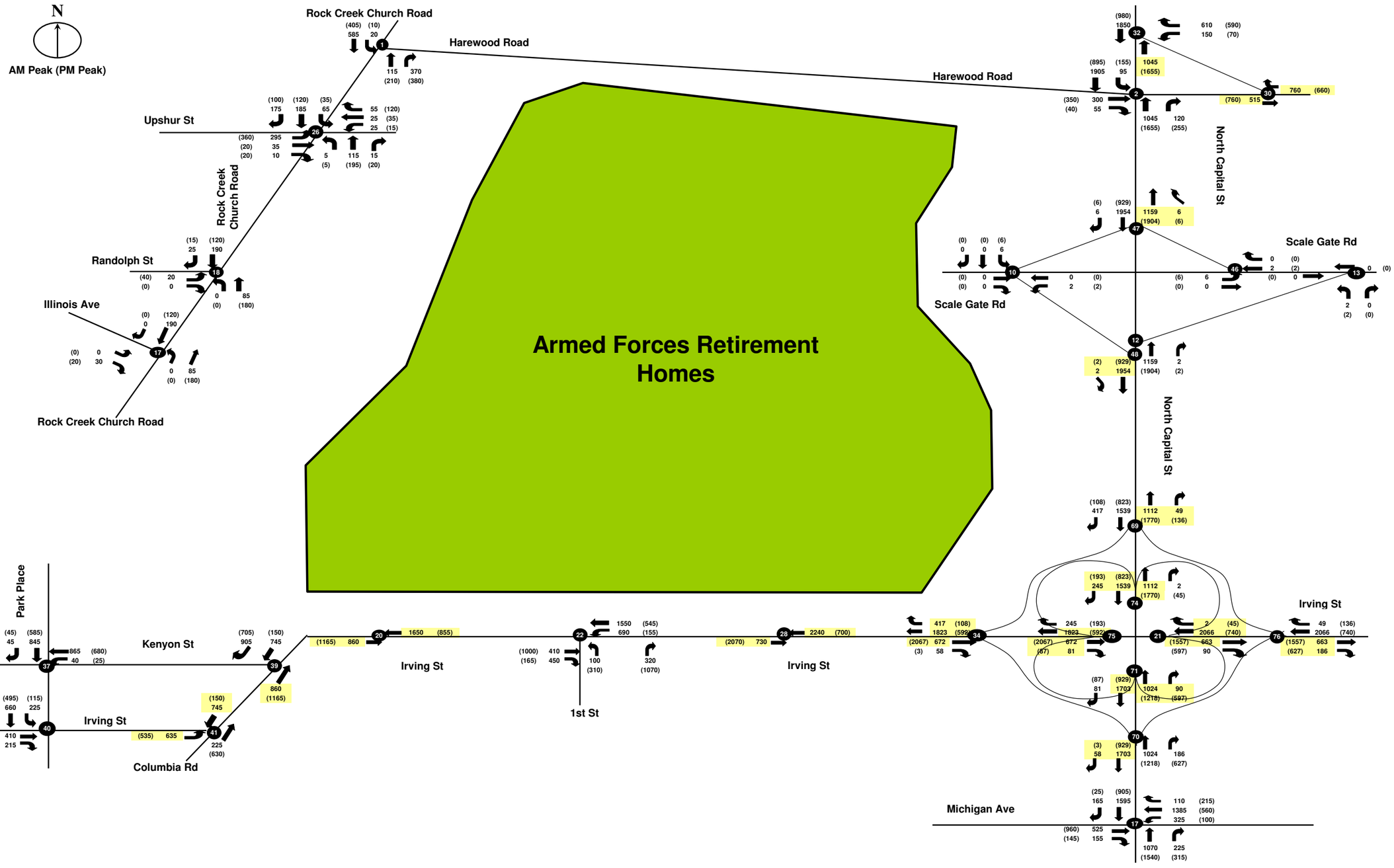
Table 13: Overall Intersection LOS: 2020 PM Peak LOS Summary

Intersection	Existing	Back-ground	Full-Build	Full-Build With Alt-1	Full-Build with Alt-2
SIGNALIZED Intersections:					
Irving Street & 1st Street NW	D[1]	D[3]	**F**	D[6]	D[7]
Irving Street & West Gate Entrance					D[8]
Irving Street & Columbia Road	B	B	C		
Irving Street & Park Place	B	B	A		
Kenyon Street & Park Place	B	B	B		
Rock Creek Church Rd & Upshur Street	D[2]	D[4]	B		
Rock Creek Church Rd & Harewood Rd	A	A	A		
North Capitol St & Harewood Rd	C	C	D[5]		
North Capitol St & Michigan Avenue	C	C	C		
UNSIGNALIZED Intersections:					
Rock Creek Church Rd & Illinois Avenue (EB Right Turn)	A	A	A		
Rock Creek Church Rd & Randolph Street (EB Left Turn)	B	B	B		
Scale Gate Road & North Capitol St SB-Off Ramp (SB Approach)	A	A	D	C	C

Notes: LOS=HCM Level of Service, V/C=Volume/Capacity, Delay=Control Delay in seconds,
[1]Eastbound approach, PM= Delay (74.4) LOS E, [2]Eastbound approach, PM= Delay(84.6) LOS F,
[3]Eastbound approach, PM= Delay(82.3) LOS F, [4]Eastbound approach, PM= Delay(104.0) LOS F
[5]Eastbound approach, PM= Delay(100.1) LOS F, [6]Northbound approach, PM= Delay(68.5) LOS E
[7]Northbound approach, PM= Delay(87.2) LOS F
[8]Westbound approach, PM= Delay(67.3) LOS E, Southbound approach, PM=Delay(70.5) LOS E

Appendix A-1:

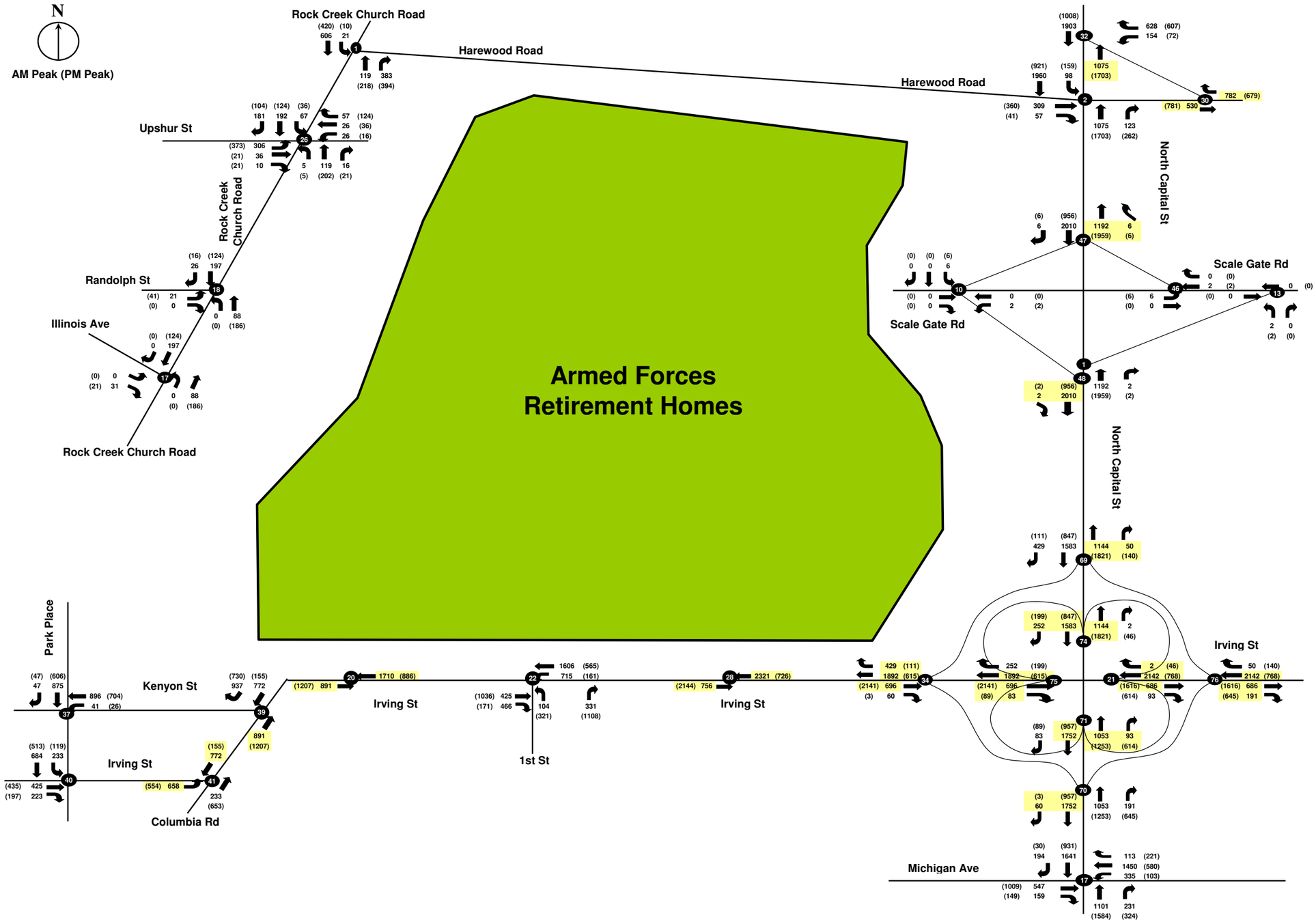
Existing Peak Hour Traffic Volumes (2006)



Appendix-A1: Existing Peak Hour Traffic Volumes (2006)

Appendix A-2:

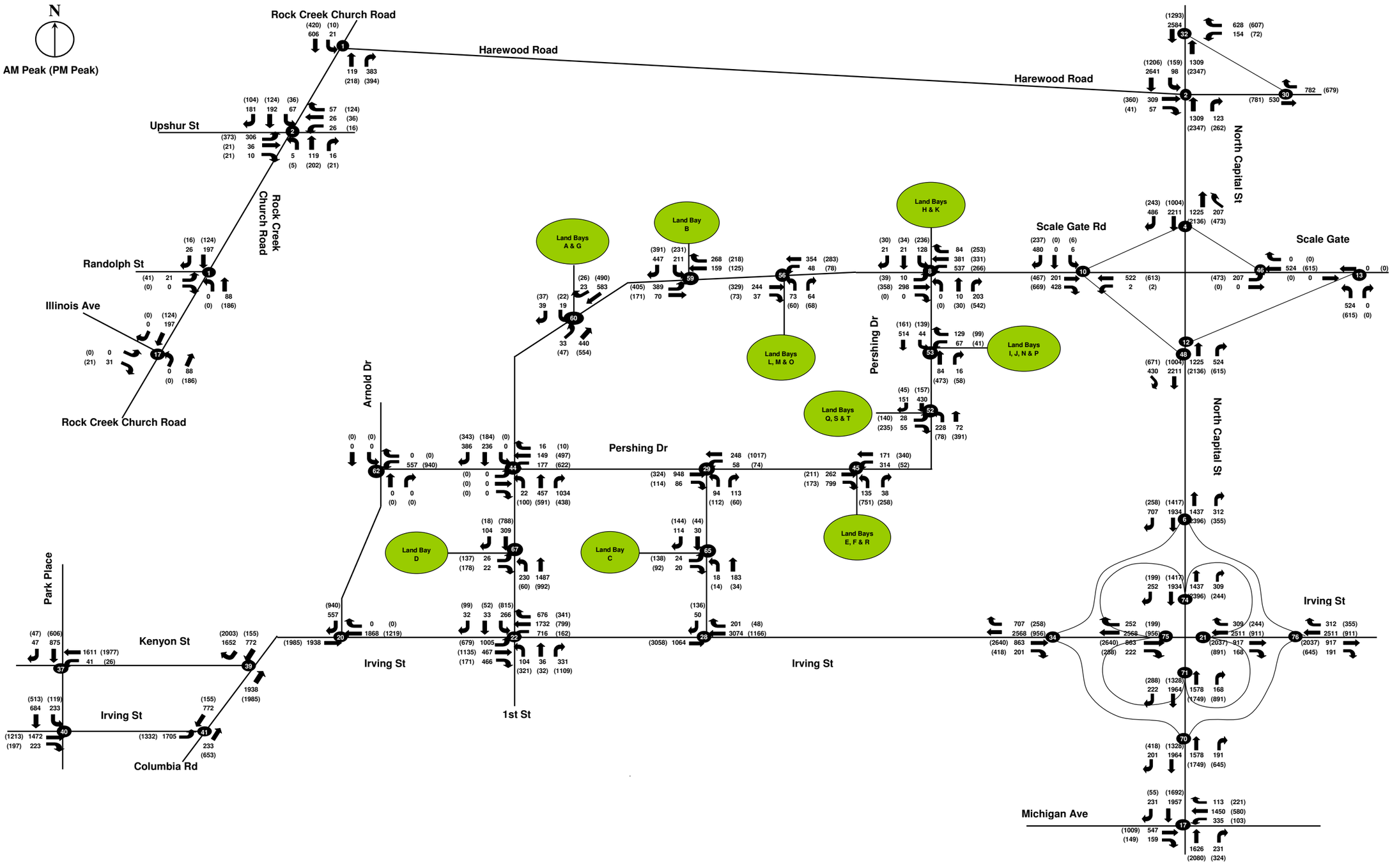
Background (No-Build) Peak Hour Traffic Volumes (2020)



Appendix-A2: Background (No-Build) Peak Hour Traffic Volumes (2020)

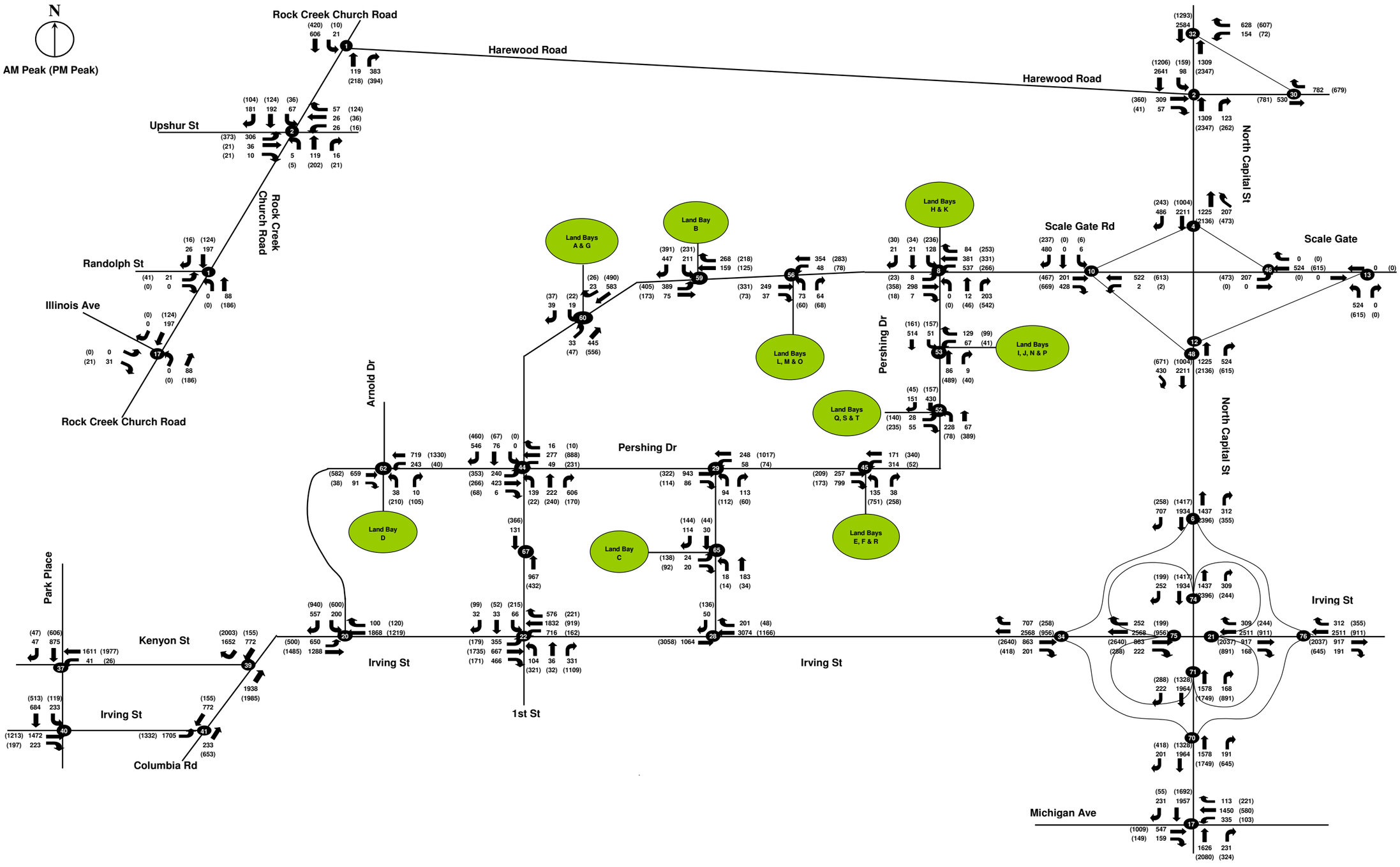
Appendix A-3:

Full-Build Peak Hour Traffic Volumes (2020)



Appendix-A3: Full-Build Peak Hour Traffic Volumes (2020)

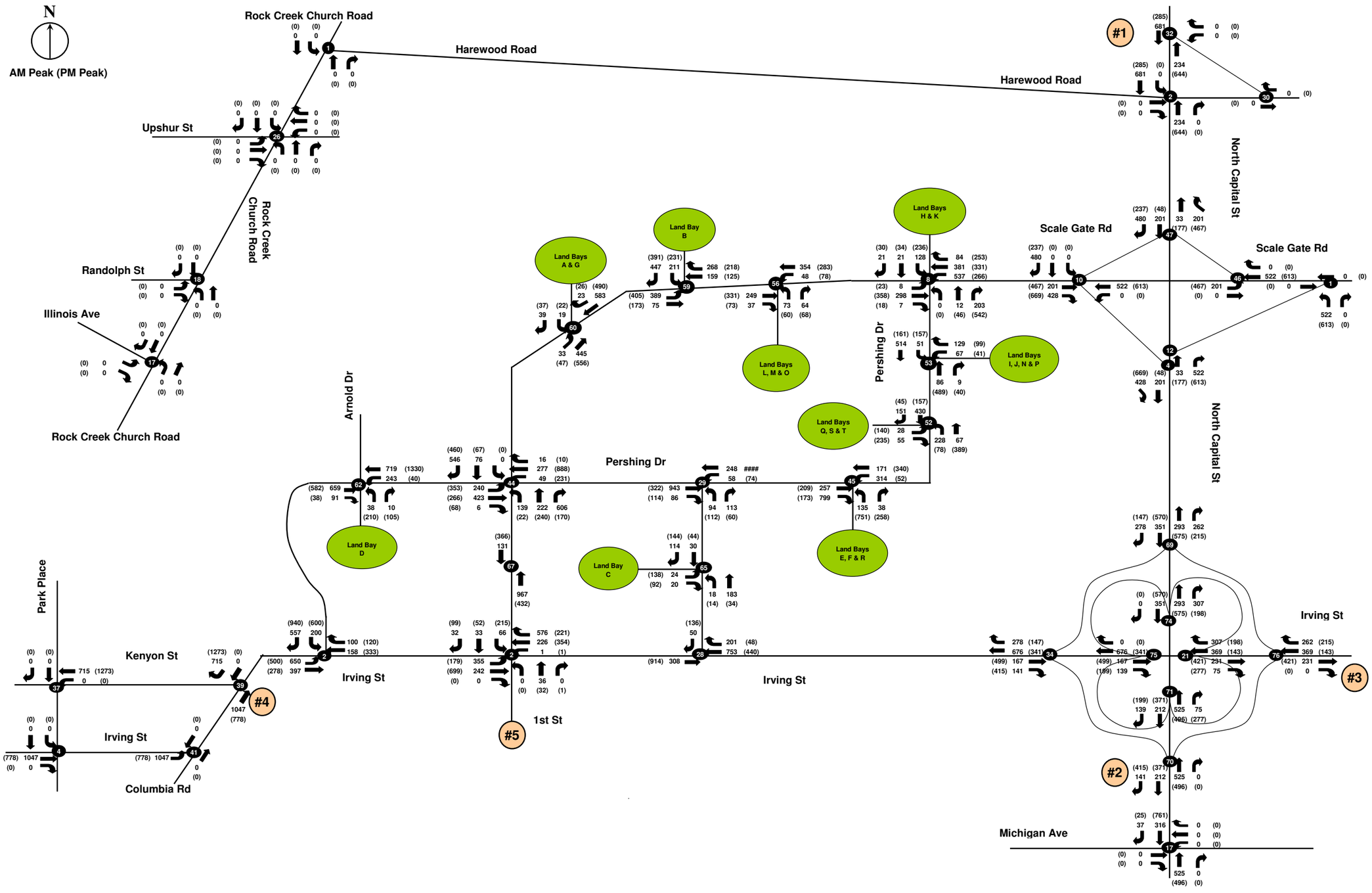
Appendix A-4:
Full-Build with Alternative-2
Peak Hour Traffic Volumes (2020)



Appendix-A4: Full-Build With Mitigation (Alt-2) Peak Hour Traffic Volumes (2020)

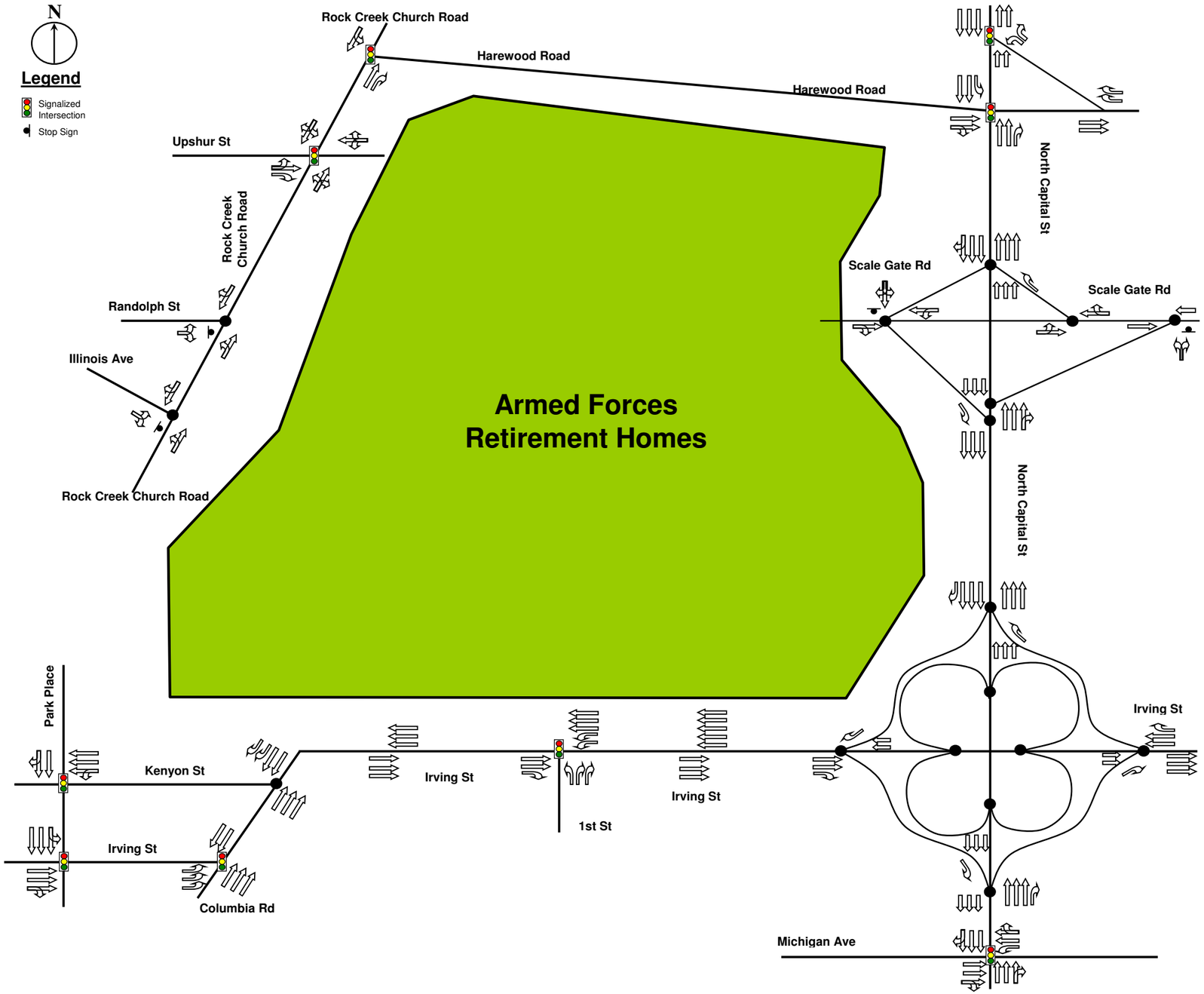
Appendix A-5:

Site Peak Hour Traffic Volumes (2020)



Appendix-A5: Site Peak Hour Traffic Volumes (2020)

Appendix A-6:
Existing Roadways
Lane Geometry



Appendix-A6: Existing Roadways Lane Geometry

Appendix A-7:
Synchro Results

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	410	450	690	1550	100	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.91	1.00	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	5085	1770	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	5085	1770	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	446	489	750	1685	109	348
RTOR Reduction (vph)	0	265	0	0	0	286
Lane Group Flow (vph)	446	224	750	1685	109	62
Turn Type		Perm	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	33.0	33.0	29.0	66.0	16.0	16.0
Effective Green, g (s)	33.0	33.0	29.0	66.0	16.0	16.0
Actuated g/C Ratio	0.37	0.37	0.32	0.73	0.18	0.18
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	1298	580	1106	3729	315	495
v/s Ratio Prot	0.13		c0.22	c0.33	c0.06	
v/s Ratio Perm		0.14				0.02
v/c Ratio	0.34	0.39	0.68	0.45	0.35	0.12
Uniform Delay, d1	20.7	21.0	26.5	4.8	32.4	31.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	1.9	3.4	0.4	3.0	0.5
Delay (s)	21.4	23.0	29.8	5.2	35.4	31.6
Level of Service	C	C	C	A	D	C
Approach Delay (s)	22.2			12.8	32.5	
Approach LOS	C			B	C	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	635	0	0	225	745	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.94			0.91	0.95	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	4990			5085	3539	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	4990			5085	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	690	0	0	245	810	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	690	0	0	245	810	0
Turn Type						
Protected Phases	4				6	
Permitted Phases				2		
Actuated Green, G (s)	28.0			64.0	64.0	
Effective Green, g (s)	28.0			64.0	64.0	
Actuated g/C Ratio	0.28			0.64	0.64	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	1397			3254	2265	
v/s Ratio Prot	c0.14				c0.23	
v/s Ratio Perm				0.05		
v/c Ratio	0.49			0.08	0.36	
Uniform Delay, d1	30.1			6.8	8.4	
Progression Factor	1.23			1.00	1.00	
Incremental Delay, d2	1.2			0.0	0.4	
Delay (s)	38.3			6.9	8.8	
Level of Service	D			A	A	
Approach Delay (s)	38.3			6.9	8.8	
Approach LOS	D			A	A	

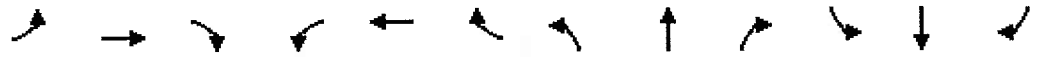
Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	410	215	0	0	0	0	0	0	225	660	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0									4.0	
Lane Util. Factor		0.91									0.91	
Frt		0.95									1.00	
Flt Protected		1.00									0.99	
Satd. Flow (prot)		4823									5021	
Flt Permitted		1.00									0.99	
Satd. Flow (perm)		4823									5021	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	446	234	0	0	0	0	0	0	245	717	0
RTOR Reduction (vph)	0	91	0	0	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	0	589	0	0	0	0	0	0	0	0	900	0
Turn Type										Perm		
Protected Phases		4									6	
Permitted Phases										6		
Actuated Green, G (s)		43.0									49.0	
Effective Green, g (s)		43.0									49.0	
Actuated g/C Ratio		0.43									0.49	
Clearance Time (s)		4.0									4.0	
Lane Grp Cap (vph)		2074									2460	
v/s Ratio Prot		c0.12										
v/s Ratio Perm											0.18	
v/c Ratio		0.28									0.37	
Uniform Delay, d1		18.5									15.8	
Progression Factor		1.00									0.24	
Incremental Delay, d2		0.3									0.4	
Delay (s)		18.9									4.1	
Level of Service		B									A	
Approach Delay (s)		18.9			0.0			0.0			4.1	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

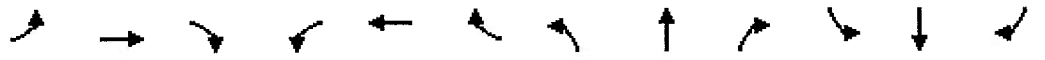
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	40	865	0	0	0	0	0	845	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.91						0.95	
Frt					1.00						0.99	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					5074						3512	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					5074						3512	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	43	940	0	0	0	0	0	918	49
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	0	0	978	0	0	0	0	0	963	0
Turn Type				Perm								
Protected Phases					8						6	
Permitted Phases				8								
Actuated Green, G (s)					40.0						52.0	
Effective Green, g (s)					40.0						52.0	
Actuated g/C Ratio					0.40						0.52	
Clearance Time (s)					4.0						4.0	
Lane Grp Cap (vph)					2030						1826	
v/s Ratio Prot											c0.27	
v/s Ratio Perm					0.19							
v/c Ratio					0.48						0.53	
Uniform Delay, d1					22.3						15.9	
Progression Factor					1.00						1.00	
Incremental Delay, d2					0.8						1.1	
Delay (s)					23.1						17.0	
Level of Service					C						B	
Approach Delay (s)		0.0			23.1			0.0			17.0	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	295	35	10	25	25	55	5	115	15	65	185	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.93			0.99			0.94	
Flt Protected		0.96	1.00		0.99			1.00			0.99	
Satd. Flow (prot)		1783	1583		1710			1832			1746	
Flt Permitted		0.74	1.00		0.88			0.99			0.94	
Satd. Flow (perm)		1375	1583		1525			1813			1650	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	38	11	27	27	60	5	125	16	71	201	190
RTOR Reduction (vph)	0	0	7	0	41	0	0	8	0	0	50	0
Lane Group Flow (vph)	0	359	4	0	73	0	0	138	0	0	412	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		16.0	16.0		16.0			26.0			26.0	
Effective Green, g (s)		16.0	16.0		16.0			26.0			26.0	
Actuated g/C Ratio		0.32	0.32		0.32			0.52			0.52	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		440	507		488			943			858	
v/s Ratio Prot												
v/s Ratio Perm		c0.26	0.00		0.05			0.08			c0.25	
v/c Ratio		0.82	0.01		0.15			0.15			0.48	
Uniform Delay, d1		15.6	11.6		12.1			6.2			7.7	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		15.3	0.0		0.6			0.3			1.8	
Delay (s)		30.9	11.6		12.8			6.6			9.5	
Level of Service		C	B		B			A			A	
Approach Delay (s)		30.4			12.8			6.6			9.5	
Approach LOS		C			B			A			A	

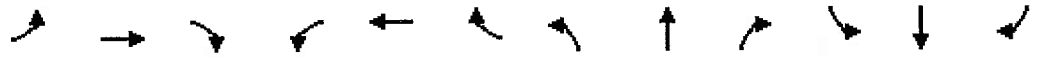
Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑	↱		↰↑
Volume (vph)	0	0	115	370	20	585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0		4.0
Lane Util. Factor			1.00	1.00		1.00
Frt			1.00	0.85		1.00
Flt Protected			1.00	1.00		1.00
Satd. Flow (prot)			1863	1583		1860
Flt Permitted			1.00	1.00		0.99
Satd. Flow (perm)			1863	1583		1848
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	125	402	22	636
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	125	402	0	658
Turn Type				Perm	Perm	
Protected Phases			4			8
Permitted Phases				4	8	
Actuated Green, G (s)			50.0	50.0		50.0
Effective Green, g (s)			50.0	50.0		50.0
Actuated g/C Ratio			1.00	1.00		1.00
Clearance Time (s)			4.0	4.0		4.0
Lane Grp Cap (vph)			1863	1583		1848
v/s Ratio Prot			0.07			
v/s Ratio Perm				0.25		c0.36
v/c Ratio			0.07	0.25		0.36
Uniform Delay, d1			0.0	0.0		0.0
Progression Factor			1.00	1.00		1.00
Incremental Delay, d2			0.1	0.3		0.5
Delay (s)			0.1	0.3		0.5
Level of Service			A	A		A
Approach Delay (s)	0.0		0.3			0.5
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	0.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		

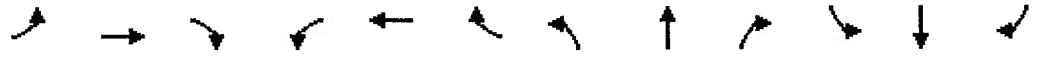
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	300	55	0	0	0	0	1045	120	95	1905	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95						0.95	1.00	1.00	0.95	
Frt		0.98						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3457						3539	1583	1770	3539	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3457						3539	1583	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	326	60	0	0	0	0	1136	130	103	2071	0
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	55	0	0	0
Lane Group Flow (vph)	0	373	0	0	0	0	0	1136	75	103	2071	0
Turn Type									Perm	Prot		
Protected Phases		4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.0						66.0	66.0	11.0	81.0	
Effective Green, g (s)		26.0						66.0	66.0	11.0	81.0	
Actuated g/C Ratio		0.23						0.57	0.57	0.10	0.70	
Clearance Time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)		782						2031	909	169	2493	
v/s Ratio Prot		c0.11						0.32		0.06	c0.59	
v/s Ratio Perm									0.05			
v/c Ratio		0.48						0.56	0.08	0.61	0.83	
Uniform Delay, d1		38.6						15.4	11.0	49.9	12.1	
Progression Factor		1.00						1.00	1.00	1.41	0.86	
Incremental Delay, d2		2.1						1.1	0.2	9.5	2.1	
Delay (s)		40.7						16.5	11.1	79.9	12.5	
Level of Service		D						B	B	E	B	
Approach Delay (s)		40.7			0.0			15.9			15.7	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	18.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	525	155	325	1385	110	0	1070	225	0	1595	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		0.91		1.00	0.95			0.91			0.91	
Frt		0.97		1.00	0.99			0.97			0.99	
Flt Protected		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		4912		1770	3500			4953			5014	
Flt Permitted		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (perm)		4912		1770	3500			4953			5014	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	571	168	353	1505	120	0	1163	245	0	1734	179
RTOR Reduction (vph)	0	57	0	0	6	0	0	36	0	0	12	0
Lane Group Flow (vph)	0	682	0	353	1619	0	0	1372	0	0	1901	0
Turn Type				Prot								
Protected Phases		4		3	8			2			6	
Permitted Phases												
Actuated Green, G (s)		17.7		23.0	44.7			36.0			36.0	
Effective Green, g (s)		17.7		23.0	44.7			36.0			36.0	
Actuated g/C Ratio		0.20		0.26	0.50			0.41			0.41	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		980		459	1764			2010			2035	
v/s Ratio Prot		0.14		0.20	c0.46			0.28			c0.38	
v/s Ratio Perm												
v/c Ratio		0.70		0.77	0.92			0.68			0.93	
Uniform Delay, d1		33.0		30.4	20.3			21.7			25.2	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		2.2		11.7	8.0			1.0			8.6	
Delay (s)		35.2		42.1	28.3			22.6			33.9	
Level of Service		D		D	C			C			C	
Approach Delay (s)		35.2			30.8			22.6			33.9	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	30	0	85	190	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	0	92	207	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	299	207	207			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	299	207	207			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	692	834	1365			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	33	92	207
Volume Left	0	0	0
Volume Right	33	0	0
cSH	834	1365	1700
Volume to Capacity	0.04	0.00	0.12
Queue Length 95th (ft)	3	0	0
Control Delay (s)	9.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.5	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	0	0	85	190	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	0	0	92	207	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	312	220	234			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	312	220	234			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	100			
cM capacity (veh/h)	680	820	1334			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	92	234
Volume Left	22	0	0
Volume Right	0	0	27
cSH	680	1334	1700
Volume to Capacity	0.03	0.00	0.14
Queue Length 95th (ft)	2	0	0
Control Delay (s)	10.5	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.5	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	21.5%	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 (veh/h)	0	0	0	2	0	0	0	0	0	6	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	2	0	0	0	0	0	7	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	0			0			4	4	0	4	4	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			4	4	0	4	4	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1623			1623			1016	890	1085	1016	890	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	2	7
Volume Left	0	2	7
Volume Right	0	0	0
cSH	1700	1623	1016
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	7.2	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	7.2	8.6
Approach LOS			A

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1000	165	155	545	310	1070
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.91	1.00	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	5085	1770	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	5085	1770	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1087	179	168	592	337	1163
RTOR Reduction (vph)	0	125	0	0	0	826
Lane Group Flow (vph)	1087	54	168	592	337	337
Turn Type		Perm	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	27.0	27.0	32.0	63.0	19.0	19.0
Effective Green, g (s)	27.0	27.0	32.0	63.0	19.0	19.0
Actuated g/C Ratio	0.30	0.30	0.36	0.70	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	1062	475	1221	3560	374	588
v/s Ratio Prot	c0.31		0.05	c0.12	c0.19	
v/s Ratio Perm		0.03				0.12
v/c Ratio	1.02	0.11	0.14	0.17	0.90	0.57
Uniform Delay, d1	31.5	22.8	19.7	4.6	34.6	31.9
Progression Factor	1.30	3.30	1.00	1.00	1.00	1.00
Incremental Delay, d2	33.3	0.5	0.2	0.1	27.2	4.0
Delay (s)	74.1	75.9	19.9	4.7	61.8	35.9
Level of Service	E	E	B	A	E	D
Approach Delay (s)	74.4			8.0	41.7	
Approach LOS	E			A	D	

Intersection Summary			
HCM Average Control Delay	46.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	535	0	0	630	150	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.94			0.91	0.95	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	4990			5085	3539	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	4990			5085	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	582	0	0	685	163	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	582	0	0	685	163	0
Turn Type						
Protected Phases	4				6	
Permitted Phases				2		
Actuated Green, G (s)	26.0			56.0	56.0	
Effective Green, g (s)	26.0			56.0	56.0	
Actuated g/C Ratio	0.29			0.62	0.62	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	1442			3164	2202	
v/s Ratio Prot	c0.12				0.05	
v/s Ratio Perm				c0.13		
v/c Ratio	0.40			0.22	0.07	
Uniform Delay, d1	25.8			7.4	6.7	
Progression Factor	0.68			1.00	1.32	
Incremental Delay, d2	0.8			0.2	0.1	
Delay (s)	18.3			7.6	9.0	
Level of Service	B			A	A	
Approach Delay (s)	18.3			7.6	9.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	420	190	0	0	0	0	0	0	115	495	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0									4.0	
Lane Util. Factor		0.91									0.91	
Frt		0.95									1.00	
Flt Protected		1.00									0.99	
Satd. Flow (prot)		4847									5038	
Flt Permitted		1.00									0.99	
Satd. Flow (perm)		4847									5038	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	457	207	0	0	0	0	0	0	125	538	0
RTOR Reduction (vph)	0	91	0	0	0	0	0	0	0	0	43	0
Lane Group Flow (vph)	0	573	0	0	0	0	0	0	0	0	620	0
Turn Type										Perm		
Protected Phases		4									6	
Permitted Phases										6		
Actuated Green, G (s)		36.0									46.0	
Effective Green, g (s)		36.0									46.0	
Actuated g/C Ratio		0.40									0.51	
Clearance Time (s)		4.0									4.0	
Lane Grp Cap (vph)		1939									2575	
v/s Ratio Prot		c0.12										
v/s Ratio Perm											0.12	
v/c Ratio		0.30									0.24	
Uniform Delay, d1		18.4									12.3	
Progression Factor		1.00									0.36	
Incremental Delay, d2		0.4									0.2	
Delay (s)		18.8									4.6	
Level of Service		B									A	
Approach Delay (s)		18.8			0.0			0.0			4.6	
Approach LOS		B			A			A			A	

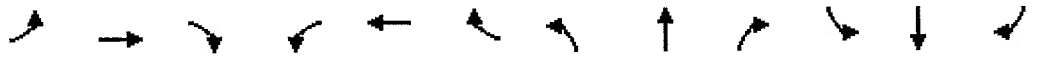
Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	30.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	680	0	0	0	0	0	585	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.91						0.95	
Frt					1.00						0.99	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					5076						3501	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					5076						3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	27	739	0	0	0	0	0	636	49
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	0	0	762	0	0	0	0	0	679	0
Turn Type				Perm								
Protected Phases					8						6	
Permitted Phases				8								
Actuated Green, G (s)					34.0						48.0	
Effective Green, g (s)					34.0						48.0	
Actuated g/C Ratio					0.38						0.53	
Clearance Time (s)					4.0						4.0	
Lane Grp Cap (vph)					1918						1867	
v/s Ratio Prot											c0.19	
v/s Ratio Perm					0.15							
v/c Ratio					0.40						0.36	
Uniform Delay, d1					20.5						12.2	
Progression Factor					0.68						1.00	
Incremental Delay, d2					0.6						0.5	
Delay (s)					14.5						12.7	
Level of Service					B						B	
Approach Delay (s)		0.0			14.5			0.0			12.7	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	360	20	20	15	35	120	5	195	20	35	120	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.90			0.99			0.95	
Flt Protected		0.95	1.00		1.00			1.00			0.99	
Satd. Flow (prot)		1779	1583		1678			1838			1752	
Flt Permitted		0.64	1.00		0.95			0.99			0.94	
Satd. Flow (perm)		1186	1583		1606			1830			1664	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	391	22	22	16	38	130	5	212	22	38	130	109
RTOR Reduction (vph)	0	0	15	0	88	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	413	7	0	96	0	0	232	0	0	230	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		16.0	16.0		16.0			26.0			26.0	
Effective Green, g (s)		16.0	16.0		16.0			26.0			26.0	
Actuated g/C Ratio		0.32	0.32		0.32			0.52			0.52	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		380	507		514			952			865	
v/s Ratio Prot												
v/s Ratio Perm		c0.35	0.00		0.06			0.13			c0.14	
v/c Ratio		1.09	0.01		0.19			0.24			0.27	
Uniform Delay, d1		17.0	11.6		12.3			6.6			6.7	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		71.5	0.0		0.8			0.6			0.7	
Delay (s)		88.5	11.7		13.1			7.2			7.4	
Level of Service		F	B		B			A			A	
Approach Delay (s)		84.6			13.1			7.2			7.4	
Approach LOS		F			B			A			A	

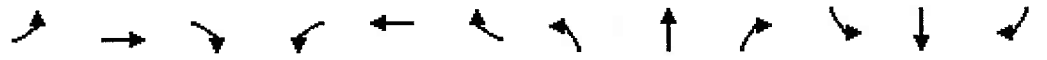
Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	210	380	10	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0		4.0
Lane Util. Factor			1.00	1.00		1.00
Frt			1.00	0.85		1.00
Flt Protected			1.00	1.00		1.00
Satd. Flow (prot)			1863	1583		1860
Flt Permitted			1.00	1.00		0.99
Satd. Flow (perm)			1863	1583		1852
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	228	413	11	440
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	228	413	0	451
Turn Type				Perm	Perm	
Protected Phases			4			8
Permitted Phases				4	8	
Actuated Green, G (s)			50.0	50.0		50.0
Effective Green, g (s)			50.0	50.0		50.0
Actuated g/C Ratio			1.00	1.00		1.00
Clearance Time (s)			4.0	4.0		4.0
Lane Grp Cap (vph)			1863	1583		1852
v/s Ratio Prot			0.12			
v/s Ratio Perm				c0.26		0.24
v/c Ratio			0.12	0.26		0.24
Uniform Delay, d1			0.0	0.0		0.0
Progression Factor			1.00	1.00		1.00
Incremental Delay, d2			0.1	0.3		0.3
Delay (s)			0.1	0.3		0.3
Level of Service			A	A		A
Approach Delay (s)	0.0		0.2			0.3
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	0.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱						↑↑	↱	↰	↑↑	
Volume (vph)	0	350	40	0	0	0	0	1655	255	155	895	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95						0.95	1.00	1.00	0.95	
Frt		0.98						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3485						3539	1583	1770	3539	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3485						3539	1583	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	380	43	0	0	0	0	1799	277	168	973	0
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	49	0	0	0
Lane Group Flow (vph)	0	415	0	0	0	0	0	1799	228	168	973	0
Turn Type									Perm	Prot		
Protected Phases		4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.0						66.0	66.0	11.0	81.0	
Effective Green, g (s)		26.0						66.0	66.0	11.0	81.0	
Actuated g/C Ratio		0.23						0.57	0.57	0.10	0.70	
Clearance Time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)		788						2031	909	169	2493	
v/s Ratio Prot		c0.12						c0.51		c0.09	0.27	
v/s Ratio Perm									0.14			
v/c Ratio		0.53						0.89	0.25	0.99	0.39	
Uniform Delay, d1		39.1						21.2	12.2	52.0	6.9	
Progression Factor		1.00						1.00	1.00	1.58	0.19	
Incremental Delay, d2		2.5						6.1	0.7	65.7	0.4	
Delay (s)		41.6						27.4	12.9	147.7	1.8	
Level of Service		D						C	B	F	A	
Approach Delay (s)		41.6			0.0			25.4			23.3	
Approach LOS		D			A			C			C	

Intersection Summary			
HCM Average Control Delay	26.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
17: Michigan Ave & North Capitol St

6/27/2007

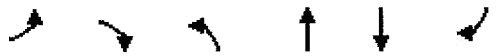
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↖	↑↑			↑↑↑			↑↑↑	
Volume (vph)	0	960	145	100	560	215	0	1540	315	0	905	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		0.91		1.00	0.95			0.91			0.91	
Frt		0.98		1.00	0.96			0.97			1.00	
Flt Protected		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		4985		1770	3392			4956			5065	
Flt Permitted		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (perm)		4985		1770	3392			4956			5065	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1043	158	109	609	234	0	1674	342	0	984	27
RTOR Reduction (vph)	0	22	0	0	4	0	0	34	0	0	3	0
Lane Group Flow (vph)	0	1179	0	109	839	0	0	1982	0	0	1008	0
Turn Type				Prot								
Protected Phases		4		3	8			2			6	
Permitted Phases												
Actuated Green, G (s)		24.4		12.0	40.4			40.3			40.3	
Effective Green, g (s)		24.4		12.0	40.4			40.3			40.3	
Actuated g/C Ratio		0.28		0.14	0.46			0.45			0.45	
Clearance Time (s)		4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1371		239	1545			2252			2301	
v/s Ratio Prot		c0.24		0.06	c0.25			c0.40			0.20	
v/s Ratio Perm												
v/c Ratio		0.86		0.46	0.54			0.88			0.44	
Uniform Delay, d1		30.5		35.3	17.5			22.0			16.5	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.6		6.2	0.4			4.3			0.1	
Delay (s)		36.1		41.5	17.9			26.3			16.6	
Level of Service		D		D	B			C			B	
Approach Delay (s)		36.1			20.6			26.3			16.6	
Approach LOS		D			C			C			B	

Intersection Summary			
HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	20	0	180	120	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	22	0	196	130	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	326	130	130			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	326	130	130			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	668	919	1455			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	22	196	130
Volume Left	0	0	0
Volume Right	22	0	0
cSH	919	1455	1700
Volume to Capacity	0.02	0.00	0.08
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.0	0.0	0.0
Approach LOS	A		

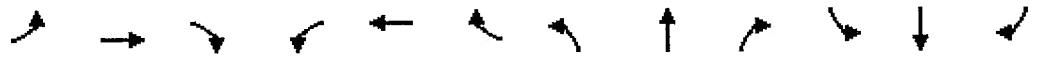
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	19.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	40	0	0	180	120	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	0	0	196	130	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	334	139	147			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	334	139	147			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	100	100			
cM capacity (veh/h)	661	910	1435			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	43	196	147
Volume Left	43	0	0
Volume Right	0	0	16
cSH	661	1435	1700
Volume to Capacity	0.07	0.00	0.09
Queue Length 95th (ft)	5	0	0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	19.5%	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 (veh/h)	0	0	0	2	0	0	0	0	0	6	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	2	0	0	0	0	0	7	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	0			0			4	4	0	4	4	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			4	4	0	4	4	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1623			1623			1016	890	1085	1016	890	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	2	7
Volume Left	0	2	7
Volume Right	0	0	0
cSH	1700	1623	1016
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	7.2	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	7.2	8.6
Approach LOS			A

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰↰	↑↑↑	↰	↱↱
Volume (vph)	425	466	715	1606	104	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.91	1.00	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	5085	1770	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	5085	1770	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	462	507	777	1746	113	360
RTOR Reduction (vph)	0	263	0	0	0	296
Lane Group Flow (vph)	462	244	777	1746	113	64
Turn Type		Perm	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	33.0	33.0	29.0	66.0	16.0	16.0
Effective Green, g (s)	33.0	33.0	29.0	66.0	16.0	16.0
Actuated g/C Ratio	0.37	0.37	0.32	0.73	0.18	0.18
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	1298	580	1106	3729	315	495
v/s Ratio Prot	0.13		c0.23	c0.34	c0.06	
v/s Ratio Perm		0.15				0.02
v/c Ratio	0.36	0.42	0.70	0.47	0.36	0.13
Uniform Delay, d1	20.8	21.3	26.7	4.9	32.5	31.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	2.2	3.7	0.4	3.2	0.5
Delay (s)	21.5	23.6	30.5	5.3	35.7	31.7
Level of Service	C	C	C	A	D	C
Approach Delay (s)	22.6			13.0	32.6	
Approach LOS	C			B	C	

Intersection Summary				
HCM Average Control Delay	17.7	HCM Level of Service	B	
HCM Volume to Capacity ratio	0.52			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0	
Intersection Capacity Utilization	55.9%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	658	0	0	233	772	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.94			0.91	0.95	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	4990			5085	3539	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	4990			5085	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	715	0	0	253	839	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	715	0	0	253	839	0
Turn Type						
Protected Phases	4				6	
Permitted Phases				2		
Actuated Green, G (s)	28.0			64.0	64.0	
Effective Green, g (s)	28.0			64.0	64.0	
Actuated g/C Ratio	0.28			0.64	0.64	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	1397			3254	2265	
v/s Ratio Prot	c0.14				c0.24	
v/s Ratio Perm				0.05		
v/c Ratio	0.51			0.08	0.37	
Uniform Delay, d1	30.3			6.8	8.5	
Progression Factor	1.24			1.00	1.00	
Incremental Delay, d2	1.3			0.0	0.5	
Delay (s)	38.8			6.9	9.0	
Level of Service	D			A	A	
Approach Delay (s)	38.8			6.9	9.0	
Approach LOS	D			A	A	

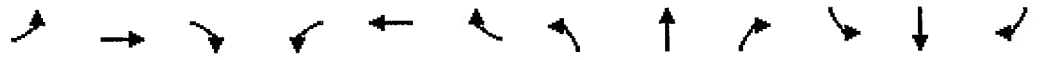
Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	425	223	0	0	0	0	0	0	233	684	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0									4.0	
Lane Util. Factor		0.91									0.91	
Frt		0.95									1.00	
Flt Protected		1.00									0.99	
Satd. Flow (prot)		4823									5022	
Flt Permitted		1.00									0.99	
Satd. Flow (perm)		4823									5022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	462	242	0	0	0	0	0	0	253	743	0
RTOR Reduction (vph)	0	84	0	0	0	0	0	0	0	0	62	0
Lane Group Flow (vph)	0	620	0	0	0	0	0	0	0	0	934	0
Turn Type										Perm		
Protected Phases		4									6	
Permitted Phases										6		
Actuated Green, G (s)		43.0									49.0	
Effective Green, g (s)		43.0									49.0	
Actuated g/C Ratio		0.43									0.49	
Clearance Time (s)		4.0									4.0	
Lane Grp Cap (vph)		2074									2461	
v/s Ratio Prot		c0.13										
v/s Ratio Perm											0.19	
v/c Ratio		0.30									0.38	
Uniform Delay, d1		18.6									16.0	
Progression Factor		1.00									0.24	
Incremental Delay, d2		0.4									0.4	
Delay (s)		19.0									4.2	
Level of Service		B									A	
Approach Delay (s)		19.0			0.0			0.0			4.2	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	41	896	0	0	0	0	0	876	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.91						0.95	
Frt					1.00						0.99	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					5074						3512	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					5074						3512	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	45	974	0	0	0	0	0	952	51
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	0	0	1014	0	0	0	0	0	999	0
Turn Type				Perm								
Protected Phases					8						6	
Permitted Phases				8								
Actuated Green, G (s)					40.0						52.0	
Effective Green, g (s)					40.0						52.0	
Actuated g/C Ratio					0.40						0.52	
Clearance Time (s)					4.0						4.0	
Lane Grp Cap (vph)					2030						1826	
v/s Ratio Prot											c0.28	
v/s Ratio Perm					0.20							
v/c Ratio					0.50						0.55	
Uniform Delay, d1					22.5						16.1	
Progression Factor					1.00						1.00	
Incremental Delay, d2					0.9						1.2	
Delay (s)					23.4						17.3	
Level of Service					C						B	
Approach Delay (s)		0.0			23.4			0.0			17.3	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	306	36	10	26	26	57	5	119	16	67	192	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.93			0.98			0.94	
Flt Protected		0.96	1.00		0.99			1.00			0.99	
Satd. Flow (prot)		1783	1583		1710			1831			1746	
Flt Permitted		0.73	1.00		0.88			0.99			0.94	
Satd. Flow (perm)		1369	1583		1518			1812			1649	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	333	39	11	28	28	62	5	129	17	73	209	197
RTOR Reduction (vph)	0	0	7	0	42	0	0	8	0	0	50	0
Lane Group Flow (vph)	0	372	4	0	76	0	0	143	0	0	429	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		16.0	16.0		16.0			26.0			26.0	
Effective Green, g (s)		16.0	16.0		16.0			26.0			26.0	
Actuated g/C Ratio		0.32	0.32		0.32			0.52			0.52	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		438	507		486			942			857	
v/s Ratio Prot												
v/s Ratio Perm		c0.27	0.00		0.05			0.08			c0.26	
v/c Ratio		0.85	0.01		0.16			0.15			0.50	
Uniform Delay, d1		15.9	11.6		12.2			6.3			7.8	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		18.3	0.0		0.7			0.3			2.0	
Delay (s)		34.1	11.6		12.9			6.6			9.8	
Level of Service		C	B		B			A			A	
Approach Delay (s)		33.5			12.9			6.6			9.8	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

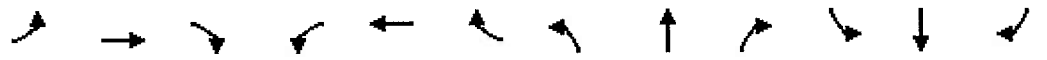
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑	↱		↰↑
Volume (vph)	0	0	119	383	21	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0		4.0
Lane Util. Factor			1.00	1.00		1.00
Frt			1.00	0.85		1.00
Flt Protected			1.00	1.00		1.00
Satd. Flow (prot)			1863	1583		1860
Flt Permitted			1.00	1.00		0.99
Satd. Flow (perm)			1863	1583		1848
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	129	416	23	659
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	129	416	0	682
Turn Type				Perm	Perm	
Protected Phases			4			8
Permitted Phases				4	8	
Actuated Green, G (s)			50.0	50.0		50.0
Effective Green, g (s)			50.0	50.0		50.0
Actuated g/C Ratio			1.00	1.00		1.00
Clearance Time (s)			4.0	4.0		4.0
Lane Grp Cap (vph)			1863	1583		1848
v/s Ratio Prot			0.07			
v/s Ratio Perm				0.26		c0.37
v/c Ratio			0.07	0.26		0.37
Uniform Delay, d1			0.0	0.0		0.0
Progression Factor			1.00	1.00		1.00
Incremental Delay, d2			0.1	0.3		0.6
Delay (s)			0.1	0.3		0.6
Level of Service			A	A		A
Approach Delay (s)	0.0		0.3			0.6
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	0.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Harewood Rd & North Capitol St

6/28/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	309	57	0	0	0	0	1075	123	98	1960	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95						0.95	1.00	1.00	0.95	
Frt		0.98						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3457						3539	1583	1770	3539	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3457						3539	1583	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	62	0	0	0	0	1168	134	107	2130	0
RTOR Reduction (vph)	0	13	0	0	0	0	0	0	57	0	0	0
Lane Group Flow (vph)	0	385	0	0	0	0	0	1168	77	107	2130	0
Turn Type									Perm	Prot		
Protected Phases		4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.0						66.0	66.0	11.0	81.0	
Effective Green, g (s)		26.0						66.0	66.0	11.0	81.0	
Actuated g/C Ratio		0.23						0.57	0.57	0.10	0.70	
Clearance Time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)		782						2031	909	169	2493	
v/s Ratio Prot		c0.11						0.33		0.06	c0.60	
v/s Ratio Perm									0.05			
v/c Ratio		0.49						0.58	0.08	0.63	0.85	
Uniform Delay, d1		38.8						15.6	11.0	50.1	12.6	
Progression Factor		1.00						1.00	1.00	1.40	0.89	
Incremental Delay, d2		2.2						1.2	0.2	9.9	2.3	
Delay (s)		41.0						16.8	11.2	79.9	13.6	
Level of Service		D						B	B	E	B	
Approach Delay (s)		41.0			0.0			16.2			16.7	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	19.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	547	159	335	1450	113	0	1101	231	0	1641	194
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			5.0			5.0	
Lane Util. Factor		0.91		1.00	0.95			0.91			0.91	
Frt		0.97		1.00	0.99			0.97			0.98	
Flt Protected		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		4913		1770	3501			4953			5005	
Flt Permitted		1.00		0.17	1.00			1.00			1.00	
Satd. Flow (perm)		4913		316	3501			4953			5005	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	595	173	364	1576	123	0	1197	251	0	1784	211
RTOR Reduction (vph)	0	59	0	0	6	0	0	36	0	0	10	0
Lane Group Flow (vph)	0	709	0	364	1693	0	0	1412	0	0	1985	0
Turn Type				pm+pt								
Protected Phases		4		3	8			2			6	
Permitted Phases				8								
Actuated Green, G (s)		19.6		45.6	45.6			35.0			35.0	
Effective Green, g (s)		19.6		45.6	45.6			35.0			35.0	
Actuated g/C Ratio		0.22		0.51	0.51			0.39			0.39	
Clearance Time (s)		4.0		4.0	4.0			5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1075		518	1782			1935			1955	
v/s Ratio Prot		0.14		0.17	c0.48			0.29			c0.40	
v/s Ratio Perm				0.19								
v/c Ratio		0.66		0.70	0.95			0.73			1.02	
Uniform Delay, d1		32.0		17.4	20.9			23.3			27.3	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		1.5		4.3	11.5			1.4			24.3	
Delay (s)		33.4		21.7	32.4			24.7			51.6	
Level of Service		C		C	C			C			D	
Approach Delay (s)		33.4			30.5			24.7			51.6	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM Average Control Delay	36.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	89.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	31	0	88	197	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	34	0	96	214	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	310	214	214			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	310	214	214			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	683	826	1356			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	34	96	214
Volume Left	0	0	0
Volume Right	34	0	0
cSH	826	1356	1700
Volume to Capacity	0.04	0.00	0.13
Queue Length 95th (ft)	3	0	0
Control Delay (s)	9.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.5	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	21	0	0	88	197	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	0	0	96	214	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	324	228	242			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	324	228	242			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	100			
cM capacity (veh/h)	670	811	1324			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	23	96	242
Volume Left	23	0	0
Volume Right	0	0	28
cSH	670	1324	1700
Volume to Capacity	0.03	0.00	0.14
Queue Length 95th (ft)	3	0	0
Control Delay (s)	10.6	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.6	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	21.9%	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 (veh/h)	0	0	0	2	0	0	0	0	0	6	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	2	0	0	0	0	0	7	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	0			0			4	4	0	4	4	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			4	4	0	4	4	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1623			1623			1016	890	1085	1016	890	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	2	7
Volume Left	0	2	7
Volume Right	0	0	0
cSH	1700	1623	1016
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	7.2	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	7.2	8.6
Approach LOS			A

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1036	171	161	565	321	1108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	0.97	0.91	1.00	0.88
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3539	1583	3433	5085	1770	2787
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3539	1583	3433	5085	1770	2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1126	186	175	614	349	1204
RTOR Reduction (vph)	0	130	0	0	0	825
Lane Group Flow (vph)	1126	56	175	614	349	379
Turn Type		Perm	Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases		4				2
Actuated Green, G (s)	27.0	27.0	32.0	63.0	19.0	19.0
Effective Green, g (s)	27.0	27.0	32.0	63.0	19.0	19.0
Actuated g/C Ratio	0.30	0.30	0.36	0.70	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	1062	475	1221	3560	374	588
v/s Ratio Prot	c0.32		0.05	c0.12	c0.20	
v/s Ratio Perm		0.04				0.14
v/c Ratio	1.06	0.12	0.14	0.17	0.93	0.64
Uniform Delay, d1	31.5	22.9	19.7	4.6	34.9	32.4
Progression Factor	1.25	3.12	1.00	1.00	1.00	1.00
Incremental Delay, d2	44.6	0.5	0.2	0.1	32.4	5.4
Delay (s)	84.0	71.8	19.9	4.7	67.2	37.8
Level of Service	F	E	B	A	E	D
Approach Delay (s)	82.3			8.1	44.4	
Approach LOS	F			A	D	

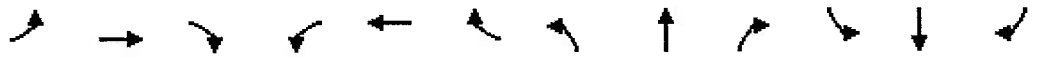
Intersection Summary			
HCM Average Control Delay	50.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	554	0	0	653	155	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.94			0.91	0.95	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	4990			5085	3539	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	4990			5085	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	602	0	0	710	168	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	602	0	0	710	168	0
Turn Type						
Protected Phases	4				6	
Permitted Phases				2		
Actuated Green, G (s)	26.0			56.0	56.0	
Effective Green, g (s)	26.0			56.0	56.0	
Actuated g/C Ratio	0.29			0.62	0.62	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	1442			3164	2202	
v/s Ratio Prot	c0.12				0.05	
v/s Ratio Perm				c0.14		
v/c Ratio	0.42			0.22	0.08	
Uniform Delay, d1	25.9			7.5	6.7	
Progression Factor	0.67			1.00	1.32	
Incremental Delay, d2	0.9			0.2	0.1	
Delay (s)	18.3			7.6	9.0	
Level of Service	B			A	A	
Approach Delay (s)	18.3			7.6	9.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑									↕↑↑	
Volume (vph)	0	435	197	0	0	0	0	0	0	119	513	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0									4.0	
Lane Util. Factor		0.91									0.91	
Frt		0.95									1.00	
Flt Protected		1.00									0.99	
Satd. Flow (prot)		4848									5038	
Flt Permitted		1.00									0.99	
Satd. Flow (perm)		4848									5038	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	473	214	0	0	0	0	0	0	129	558	0
RTOR Reduction (vph)	0	91	0	0	0	0	0	0	0	0	42	0
Lane Group Flow (vph)	0	596	0	0	0	0	0	0	0	0	645	0
Turn Type										Perm		
Protected Phases		4									6	
Permitted Phases										6		
Actuated Green, G (s)		36.0									46.0	
Effective Green, g (s)		36.0									46.0	
Actuated g/C Ratio		0.40									0.51	
Clearance Time (s)		4.0									4.0	
Lane Grp Cap (vph)		1939									2575	
v/s Ratio Prot		c0.12										
v/s Ratio Perm											0.13	
v/c Ratio		0.31									0.25	
Uniform Delay, d1		18.5									12.3	
Progression Factor		1.00									0.36	
Incremental Delay, d2		0.4									0.2	
Delay (s)		18.9									4.6	
Level of Service		B									A	
Approach Delay (s)		18.9			0.0			0.0			4.6	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	26	704	0	0	0	0	0	606	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.91						0.95	
Frt					1.00						0.99	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					5076						3501	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					5076						3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	28	765	0	0	0	0	0	659	51
RTOR Reduction (vph)	0	0	0	0	4	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	0	0	789	0	0	0	0	0	703	0
Turn Type				Perm								
Protected Phases					8						6	
Permitted Phases				8								
Actuated Green, G (s)					34.0						48.0	
Effective Green, g (s)					34.0						48.0	
Actuated g/C Ratio					0.38						0.53	
Clearance Time (s)					4.0						4.0	
Lane Grp Cap (vph)					1918						1867	
v/s Ratio Prot											c0.20	
v/s Ratio Perm					0.16							
v/c Ratio					0.41						0.38	
Uniform Delay, d1					20.6						12.3	
Progression Factor					0.68						1.00	
Incremental Delay, d2					0.6						0.6	
Delay (s)					14.6						12.8	
Level of Service					B						B	
Approach Delay (s)		0.0			14.6			0.0			12.8	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	373	21	21	16	36	124	5	202	21	36	124	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.90			0.99			0.95	
Flt Protected		0.95	1.00		1.00			1.00			0.99	
Satd. Flow (prot)		1779	1583		1678			1838			1752	
Flt Permitted		0.63	1.00		0.95			0.99			0.94	
Satd. Flow (perm)		1168	1583		1601			1830			1662	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	405	23	23	17	39	135	5	220	23	39	135	113
RTOR Reduction (vph)	0	0	16	0	92	0	0	7	0	0	47	0
Lane Group Flow (vph)	0	428	7	0	99	0	0	241	0	0	240	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		16.0	16.0		16.0			26.0			26.0	
Effective Green, g (s)		16.0	16.0		16.0			26.0			26.0	
Actuated g/C Ratio		0.32	0.32		0.32			0.52			0.52	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		374	507		512			952			864	
v/s Ratio Prot												
v/s Ratio Perm		c0.37	0.00		0.06			0.13			c0.14	
v/c Ratio		1.14	0.01		0.19			0.25			0.28	
Uniform Delay, d1		17.0	11.6		12.3			6.6			6.7	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		91.9	0.1		0.8			0.6			0.8	
Delay (s)		108.9	11.7		13.2			7.3			7.5	
Level of Service		F	B		B			A			A	
Approach Delay (s)		104.0			13.2			7.3			7.5	
Approach LOS		F			B			A			A	

Intersection Summary			
HCM Average Control Delay	45.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

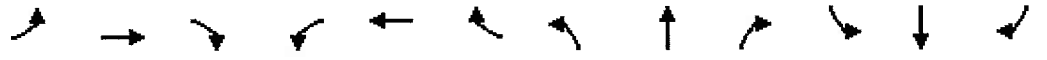
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑	↱		↰
Volume (vph)	0	0	218	394	10	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0		4.0
Lane Util. Factor			1.00	1.00		1.00
Frt			1.00	0.85		1.00
Flt Protected			1.00	1.00		1.00
Satd. Flow (prot)			1863	1583		1861
Flt Permitted			1.00	1.00		0.99
Satd. Flow (perm)			1863	1583		1852
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	237	428	11	457
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	237	428	0	468
Turn Type				Perm	Perm	
Protected Phases			4			8
Permitted Phases				4	8	
Actuated Green, G (s)			50.0	50.0		50.0
Effective Green, g (s)			50.0	50.0		50.0
Actuated g/C Ratio			1.00	1.00		1.00
Clearance Time (s)			4.0	4.0		4.0
Lane Grp Cap (vph)			1863	1583		1852
v/s Ratio Prot			0.13			
v/s Ratio Perm				c0.27		0.25
v/c Ratio			0.13	0.27		0.25
Uniform Delay, d1			0.0	0.0		0.0
Progression Factor			1.00	1.00		1.00
Incremental Delay, d2			0.1	0.3		0.3
Delay (s)			0.1	0.3		0.3
Level of Service			A	A		A
Approach Delay (s)	0.0		0.2			0.3
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	0.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Harewood Rd & North Capitol St

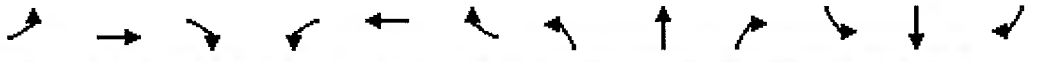
6/28/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱						↑↑	↱	↰	↑↑	
Volume (vph)	0	360	41	0	0	0	0	1703	262	159	921	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95						0.95	1.00	1.00	0.95	
Frt		0.98						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3484						3539	1583	1770	3539	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3484						3539	1583	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	391	45	0	0	0	0	1851	285	173	1001	0
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	46	0	0	0
Lane Group Flow (vph)	0	428	0	0	0	0	0	1851	239	173	1001	0
Turn Type									Perm	Prot		
Protected Phases		4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		26.0						66.0	66.0	11.0	81.0	
Effective Green, g (s)		26.0						66.0	66.0	11.0	81.0	
Actuated g/C Ratio		0.23						0.57	0.57	0.10	0.70	
Clearance Time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)		788						2031	909	169	2493	
v/s Ratio Prot		c0.12						c0.52		c0.10	0.28	
v/s Ratio Perm									0.15			
v/c Ratio		0.54						0.91	0.26	1.02	0.40	
Uniform Delay, d1		39.3						21.9	12.3	52.0	7.0	
Progression Factor		1.00						1.00	1.00	1.53	0.20	
Incremental Delay, d2		2.7						7.6	0.7	73.4	0.5	
Delay (s)		41.9						29.5	13.0	153.2	1.9	
Level of Service		D						C	B	F	A	
Approach Delay (s)		41.9			0.0			27.3			24.2	
Approach LOS		D			A			C			C	

Intersection Summary			
HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰	↑↑↱			↑↑↑↱			↑↑↑↱	
Volume (vph)	0	1009	149	103	580	221	0	1584	324	0	931	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		4.0	4.0			5.0			5.0	
Lane Util. Factor		0.91		1.00	0.95			0.91			0.91	
Frt		0.98		1.00	0.96			0.97			1.00	
Flt Protected		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		4987		1770	3393			4956			5061	
Flt Permitted		1.00		0.14	1.00			1.00			1.00	
Satd. Flow (perm)		4987		254	3393			4956			5061	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1097	162	112	630	240	0	1722	352	0	1012	33
RTOR Reduction (vph)	0	22	0	0	3	0	0	34	0	0	4	0
Lane Group Flow (vph)	0	1237	0	112	867	0	0	2040	0	0	1041	0
Turn Type				pm+pt								
Protected Phases		4		3	8			2			6	
Permitted Phases				8								
Actuated Green, G (s)		25.8		39.3	39.3			40.6			40.6	
Effective Green, g (s)		25.8		39.3	39.3			40.6			40.6	
Actuated g/C Ratio		0.29		0.44	0.44			0.46			0.46	
Clearance Time (s)		3.5		4.0	4.0			5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1447		283	1500			2263			2311	
v/s Ratio Prot		c0.25		0.04	c0.26			c0.41			0.21	
v/s Ratio Perm				0.13								
v/c Ratio		0.85		0.40	0.58			0.90			0.45	
Uniform Delay, d1		29.8		17.9	18.6			22.3			16.5	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.2		0.9	0.5			5.4			0.1	
Delay (s)		34.9		18.8	19.1			27.7			16.7	
Level of Service		C		B	B			C			B	
Approach Delay (s)		34.9			19.1			27.7			16.7	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM Average Control Delay	25.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	88.9	Sum of lost time (s)	12.5
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	21	0	186	124	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	0	202	135	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	337	135	135			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	337	135	135			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	659	914	1450			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	23	202	135
Volume Left	0	0	0
Volume Right	23	0	0
cSH	914	1450	1700
Volume to Capacity	0.02	0.00	0.08
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	41	0	0	186	124	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	0	0	202	135	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	345	143	151			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	345	143	151			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	100	100			
cM capacity (veh/h)	651	905	1430			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	45	202	151
Volume Left	45	0	0
Volume Right	0	0	16
cSH	651	1430	1700
Volume to Capacity	0.07	0.00	0.09
Queue Length 95th (ft)	5	0	0
Control Delay (s)	10.9	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.9	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	19.8%	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 (veh/h)	0	0	0	2	0	0	0	0	0	6	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	2	0	0	0	0	0	7	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	0			0			4	4	0	4	4	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			4	4	0	4	4	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1623			1623			1016	890	1085	1016	890	1085

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	0	2	7
Volume Left	0	2	7
Volume Right	0	0	0
cSH	1700	1623	1016
Volume to Capacity	0.00	0.00	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	7.2	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	7.2	8.6
Approach LOS			A

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
22: Irving St & Main Irving Gate

6/27/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1005	467	466	716	1732	676	104	36	331	266	33	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0		3.0	4.0			3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		0.97	0.91			1.00	0.88	1.00	1.00	
Frt	1.00	0.93		1.00	0.96			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3274		3433	4871			1796	2787	1770	1725	
Flt Permitted	0.07	1.00		0.95	1.00			0.74	1.00	0.95	1.00	
Satd. Flow (perm)	131	3274		3433	4871			1370	2787	1770	1725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1092	508	507	778	1883	735	113	39	360	289	36	35
RTOR Reduction (vph)	0	116	0	0	47	0	0	0	189	0	23	0
Lane Group Flow (vph)	1092	899	0	778	2571	0	0	152	171	289	48	0
Turn Type	pm+pt			Prot			Perm		pm+ov	Prot		
Protected Phases	7	4		3	8			2	3	1	6	
Permitted Phases	4						2		2			
Actuated Green, G (s)	107.0	63.3		39.7	53.0			16.0	55.7	14.0	34.0	
Effective Green, g (s)	108.0	64.3		40.7	54.0			17.0	57.7	15.0	35.0	
Actuated g/C Ratio	0.72	0.43		0.27	0.36			0.11	0.38	0.10	0.23	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	652	1403		931	1754			155	1128	177	403	
v/s Ratio Prot	c0.57	0.27		0.23	0.53				0.04	c0.16	0.03	
v/s Ratio Perm	c0.64							c0.11	0.02			
v/c Ratio	1.67	0.64		0.84	1.47			0.98	0.15	1.63	0.12	
Uniform Delay, d1	51.7	33.8		51.5	48.0			66.3	30.2	67.5	45.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	310.4	2.3		6.6	212.9			66.2	0.1	308.9	0.1	
Delay (s)	362.1	36.0		58.1	260.9			132.5	30.2	376.4	45.5	
Level of Service	F	D		E	F			F	C	F	D	
Approach Delay (s)		205.0			214.4			60.6			311.2	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM Average Control Delay	204.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.57		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	135.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	1705	0	0	233	772	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.94			0.91	0.95	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	4990			5085	3539	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	4990			5085	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1853	0	0	253	839	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1853	0	0	253	839	0
Turn Type						
Protected Phases	4				6	
Permitted Phases				2		
Actuated Green, G (s)	48.0			34.0	34.0	
Effective Green, g (s)	48.0			34.0	34.0	
Actuated g/C Ratio	0.53			0.38	0.38	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	2661			1921	1337	
v/s Ratio Prot	c0.37				c0.24	
v/s Ratio Perm				0.05		
v/c Ratio	0.70			0.13	0.63	
Uniform Delay, d1	15.6			18.3	22.8	
Progression Factor	1.50			1.00	1.00	
Incremental Delay, d2	1.2			0.1	2.2	
Delay (s)	24.7			18.5	25.1	
Level of Service	C			B	C	
Approach Delay (s)	24.7			18.5	25.1	
Approach LOS	C			B	C	

Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	109.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

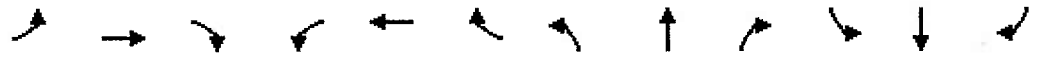
HCM Signalized Intersection Capacity Analysis
40: Irving St & Park Place

6/27/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1472	223	0	0	0	0	0	0	233	684	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0									4.0	
Lane Util. Factor		0.91									0.91	
Frt		0.98									1.00	
Flt Protected		1.00									0.99	
Satd. Flow (prot)		4985									5022	
Flt Permitted		1.00									0.99	
Satd. Flow (perm)		4985									5022	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1600	242	0	0	0	0	0	0	253	743	0
RTOR Reduction (vph)	0	22	0	0	0	0	0	0	0	0	17	0
Lane Group Flow (vph)	0	1820	0	0	0	0	0	0	0	0	979	0
Turn Type										Perm		
Protected Phases		4									6	
Permitted Phases										6		
Actuated Green, G (s)		52.0									30.0	
Effective Green, g (s)		52.0									30.0	
Actuated g/C Ratio		0.58									0.33	
Clearance Time (s)		4.0									4.0	
Lane Grp Cap (vph)		2880									1674	
v/s Ratio Prot		c0.37										
v/s Ratio Perm											0.19	
v/c Ratio		0.63									0.58	
Uniform Delay, d1		12.6									24.8	
Progression Factor		1.00									0.25	
Incremental Delay, d2		1.1									1.1	
Delay (s)		13.7									7.3	
Level of Service		B									A	
Approach Delay (s)		13.7			0.0			0.0			7.3	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	41	1612	0	0	0	0	0	876	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.91						0.95	
Frt					1.00						0.99	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					5079						3512	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					5079						3512	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	45	1752	0	0	0	0	0	952	51
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	0	0	1794	0	0	0	0	0	999	0
Turn Type				Perm								
Protected Phases					8						6	
Permitted Phases				8								
Actuated Green, G (s)					45.0						37.0	
Effective Green, g (s)					45.0						37.0	
Actuated g/C Ratio					0.50						0.41	
Clearance Time (s)					4.0						4.0	
Lane Grp Cap (vph)					2540						1444	
v/s Ratio Prot											c0.28	
v/s Ratio Perm					0.35							
v/c Ratio					0.71						0.69	
Uniform Delay, d1					17.4						21.8	
Progression Factor					1.00						1.00	
Incremental Delay, d2					1.7						2.7	
Delay (s)					19.1						24.6	
Level of Service					B						C	
Approach Delay (s)		0.0			19.1			0.0			24.6	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	306	36	10	26	26	57	5	119	16	67	192	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.93			0.98			0.94	
Flt Protected		0.96	1.00		0.99			1.00			0.99	
Satd. Flow (prot)		1783	1583		1710			1831			1746	
Flt Permitted		0.68	1.00		0.88			0.99			0.93	
Satd. Flow (perm)		1275	1583		1530			1812			1637	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	333	39	11	28	28	62	5	129	17	73	209	197
RTOR Reduction (vph)	0	0	6	0	33	0	0	5	0	0	28	0
Lane Group Flow (vph)	0	372	5	0	85	0	0	146	0	0	451	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		42.0	42.0		42.0			40.0			40.0	
Effective Green, g (s)		42.0	42.0		42.0			40.0			40.0	
Actuated g/C Ratio		0.47	0.47		0.47			0.44			0.44	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		595	739		714			805			728	
v/s Ratio Prot												
v/s Ratio Perm		c0.29	0.00		0.06			0.08			c0.28	
v/c Ratio		0.63	0.01		0.12			0.18			0.62	
Uniform Delay, d1		18.1	12.8		13.6			15.1			19.2	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		4.9	0.0		0.3			0.5			3.7	
Delay (s)		23.0	12.9		13.9			15.6			22.9	
Level of Service		C	B		B			B			C	
Approach Delay (s)		22.7			13.9			15.6			22.9	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑	↱		↰↑
Volume (vph)	0	0	119	383	21	606
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0		4.0
Lane Util. Factor			1.00	1.00		1.00
Frt			1.00	0.85		1.00
Flt Protected			1.00	1.00		1.00
Satd. Flow (prot)			1863	1583		1860
Flt Permitted			1.00	1.00		0.99
Satd. Flow (perm)			1863	1583		1845
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	129	416	23	659
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	129	416	0	682
Turn Type				Perm	Perm	
Protected Phases			4			8
Permitted Phases				4	8	
Actuated Green, G (s)			90.0	90.0		90.0
Effective Green, g (s)			90.0	90.0		90.0
Actuated g/C Ratio			1.00	1.00		1.00
Clearance Time (s)			4.0	4.0		4.0
Lane Grp Cap (vph)			1863	1583		1845
v/s Ratio Prot			0.07			
v/s Ratio Perm				0.26		c0.37
v/c Ratio			0.07	0.26		0.37
Uniform Delay, d1			0.0	0.0		0.0
Progression Factor			1.00	1.00		1.00
Incremental Delay, d2			0.1	0.4		0.6
Delay (s)			0.1	0.4		0.6
Level of Service			A	A		A
Approach Delay (s)	0.0		0.3			0.6
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	0.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↱						↑↑	↱	↰	↑↑	
Volume (vph)	0	309	57	0	0	0	0	1309	123	98	2641	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95						0.95	1.00	1.00	0.95	
Frt		0.98						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3457						3539	1583	1770	3539	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3457						3539	1583	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	62	0	0	0	0	1423	134	107	2871	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	47	0	0	0
Lane Group Flow (vph)	0	391	0	0	0	0	0	1423	87	107	2871	0
Turn Type									Perm	Prot		
Protected Phases		4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		15.7						78.3	78.3	14.0	96.3	
Effective Green, g (s)		15.7						78.3	78.3	14.0	96.3	
Actuated g/C Ratio		0.13						0.65	0.65	0.12	0.80	
Clearance Time (s)		4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		452						2309	1033	207	2840	
v/s Ratio Prot		c0.11						0.40		0.06	c0.81	
v/s Ratio Perm									0.06			
v/c Ratio		0.87						0.62	0.08	0.52	1.01	
Uniform Delay, d1		51.1						12.1	7.7	49.8	11.9	
Progression Factor		1.00						1.00	1.00	0.76	1.41	
Incremental Delay, d2		15.7						1.2	0.2	0.6	11.7	
Delay (s)		66.9						13.4	7.8	38.6	28.4	
Level of Service		E						B	A	D	C	
Approach Delay (s)		66.9			0.0			12.9			28.7	
Approach LOS		E			A			B			C	

Intersection Summary			
HCM Average Control Delay	26.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
17: Michigan Ave & North Capitol St

6/29/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰	↑↑↱			↑↑↑↱			↑↑↑↱	
Volume (vph)	0	547	159	335	1450	113	0	1626	231	0	1957	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0			5.0			5.0	
Lane Util. Factor		0.91		1.00	0.95			0.91			0.91	
Frt		0.97		1.00	0.99			0.98			0.98	
Flt Protected		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		4913		1770	3501			4990			5005	
Flt Permitted		1.00		0.17	1.00			1.00			1.00	
Satd. Flow (perm)		4913		310	3501			4990			5005	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	595	173	364	1576	123	0	1767	251	0	2127	251
RTOR Reduction (vph)	0	52	0	0	2	0	0	18	0	0	6	0
Lane Group Flow (vph)	0	716	0	364	1697	0	0	2000	0	0	2372	0
Turn Type				pm+pt								
Protected Phases		4		3	8			2			6	
Permitted Phases				8								
Actuated Green, G (s)		20.0		47.0	47.0			44.0			44.0	
Effective Green, g (s)		20.0		47.0	47.0			44.0			44.0	
Actuated g/C Ratio		0.20		0.47	0.47			0.44			0.44	
Clearance Time (s)		4.0		4.0	4.0			5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		983		482	1645			2196			2202	
v/s Ratio Prot		0.15		0.17	c0.48			0.40			c0.47	
v/s Ratio Perm				0.18								
v/c Ratio		0.73		0.76	1.03			0.91			1.08	
Uniform Delay, d1		37.5		22.0	26.5			26.2			28.0	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		2.7		6.6	30.7			6.2			43.8	
Delay (s)		40.2		28.6	57.2			32.3			71.8	
Level of Service		D		C	E			C			E	
Approach Delay (s)		40.2			52.2			32.3			71.8	
Approach LOS		D			D			C			E	

Intersection Summary			
HCM Average Control Delay	51.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	31	0	88	197	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	34	0	96	214	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	310	214	214			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	310	214	214			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	683	826	1356			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	34	96	214
Volume Left	0	0	0
Volume Right	34	0	0
cSH	826	1356	1700
Volume to Capacity	0.04	0.00	0.13
Queue Length 95th (ft)	3	0	0
Control Delay (s)	9.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.5	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	21	0	0	88	197	26
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	0	0	96	214	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	324	228	242			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	324	228	242			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	100			
cM capacity (veh/h)	670	811	1324			

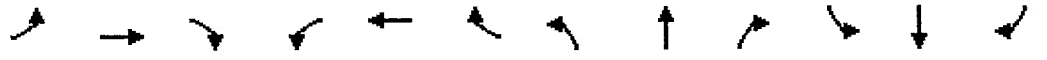
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	23	96	242
Volume Left	23	0	0
Volume Right	0	0	28
cSH	670	1324	1700
Volume to Capacity	0.03	0.00	0.14
Queue Length 95th (ft)	3	0	0
Control Delay (s)	10.6	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.6	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	21.9%	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 (veh/h)	0	201	428	2	522	0	0	0	0	6	0	480
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	218	465	2	567	0	0	0	0	7	0	522
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	567			218			1023	1023	451	1023	790	567
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	567			218			1023	1023	451	1023	790	567
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	97	100	0
cM capacity (veh/h)	1005			1351			0	235	608	214	322	523

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	684	570	528
Volume Left	0	2	7
Volume Right	465	0	522
cSH	1700	1351	514
Volume to Capacity	0.40	0.00	1.03
Queue Length 95th (ft)	0	0	376
Control Delay (s)	0.0	0.0	75.8
Lane LOS		A	F
Approach Delay (s)	0.0	0.0	75.8
Approach LOS			F

Intersection Summary			
Average Delay	22.5		
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	679	1135	171	162	799	341	321	32	1109	815	52	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0		3.0	4.0			3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.95		0.97	0.91			1.00	0.88	1.00	1.00	
Frt	1.00	0.98		1.00	0.96			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3470		3433	4857			1782	2787	1770	1680	
Flt Permitted	0.27	1.00		0.95	1.00			0.63	1.00	0.95	1.00	
Satd. Flow (perm)	497	3470		3433	4857			1179	2787	1770	1680	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	738	1234	186	176	868	371	349	35	1205	886	57	108
RTOR Reduction (vph)	0	8	0	0	52	0	0	0	12	0	45	0
Lane Group Flow (vph)	738	1412	0	176	1187	0	0	384	1193	886	120	0
Turn Type	pm+pt			Prot			Perm		pm+ov	Prot		
Protected Phases	7	4		3	8			2	3	1	6	
Permitted Phases	4						2		2			
Actuated Green, G (s)	46.0	46.0		13.0	28.0			32.0	45.0	42.0	78.0	
Effective Green, g (s)	47.0	47.0		14.0	29.0			33.0	47.0	43.0	79.0	
Actuated g/C Ratio	0.31	0.31		0.09	0.19			0.22	0.31	0.29	0.53	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	427	1087		320	939			259	873	507	885	
v/s Ratio Prot	c0.37	0.41		0.05	c0.24				0.13	c0.50	0.07	
v/s Ratio Perm	c0.17							c0.33	0.30			
v/c Ratio	1.73	1.30		0.55	1.26			1.48	1.37	1.75	0.14	
Uniform Delay, d1	61.2	51.5		65.0	60.5			58.5	51.5	53.5	18.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	337.5	141.3		2.0	127.6			236.8	172.1	344.5	0.1	
Delay (s)	398.6	192.8		67.0	188.1			295.3	223.6	398.0	18.2	
Level of Service	F	F		E	F			F	F	F	B	
Approach Delay (s)		263.2			173.0			240.9			338.4	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	249.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.59		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	138.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	1332	0	0	653	155	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	0.94			0.91	0.95	
Frt	1.00			1.00	1.00	
Flt Protected	0.95			1.00	1.00	
Satd. Flow (prot)	4990			5085	3539	
Flt Permitted	0.95			1.00	1.00	
Satd. Flow (perm)	4990			5085	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1448	0	0	710	168	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1448	0	0	710	168	0
Turn Type						
Protected Phases	4				6	
Permitted Phases				2		
Actuated Green, G (s)	52.0			30.0	30.0	
Effective Green, g (s)	52.0			30.0	30.0	
Actuated g/C Ratio	0.58			0.33	0.33	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	2883			1695	1180	
v/s Ratio Prot	c0.29				0.05	
v/s Ratio Perm				c0.14		
v/c Ratio	0.50			0.42	0.14	
Uniform Delay, d1	11.3			23.2	21.0	
Progression Factor	1.62			1.00	1.00	
Incremental Delay, d2	0.6			0.8	0.3	
Delay (s)	18.9			24.0	21.2	
Level of Service	B			C	C	
Approach Delay (s)	18.9			24.0	21.2	
Approach LOS	B			C	C	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	118.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1213	197	0	0	0	0	0	0	119	513	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0									4.0	
Lane Util. Factor		0.91									0.91	
Frt		0.98									1.00	
Flt Protected		1.00									0.99	
Satd. Flow (prot)		4979									5038	
Flt Permitted		1.00									0.99	
Satd. Flow (perm)		4979									5038	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1318	214	0	0	0	0	0	0	129	558	0
RTOR Reduction (vph)	0	25	0	0	0	0	0	0	0	0	42	0
Lane Group Flow (vph)	0	1508	0	0	0	0	0	0	0	0	645	0
Turn Type										Perm		
Protected Phases		4									6	
Permitted Phases										6		
Actuated Green, G (s)		55.0									27.0	
Effective Green, g (s)		55.0									27.0	
Actuated g/C Ratio		0.61									0.30	
Clearance Time (s)		4.0									4.0	
Lane Grp Cap (vph)		3043									1511	
v/s Ratio Prot		c0.30										
v/s Ratio Perm											0.13	
v/c Ratio		0.50									0.43	
Uniform Delay, d1		9.8									25.3	
Progression Factor		1.00									0.24	
Incremental Delay, d2		0.6									0.7	
Delay (s)		10.3									6.8	
Level of Service		B									A	
Approach Delay (s)		10.3			0.0			0.0			6.8	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	26	1977	0	0	0	0	0	606	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.91						0.95	
Frt					1.00						0.99	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					5082						3501	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					5082						3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	28	2149	0	0	0	0	0	659	51
RTOR Reduction (vph)	0	0	0	0	2	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	0	0	2175	0	0	0	0	0	704	0
Turn Type				Perm								
Protected Phases					8						6	
Permitted Phases				8								
Actuated Green, G (s)					54.0						28.0	
Effective Green, g (s)					54.0						28.0	
Actuated g/C Ratio					0.60						0.31	
Clearance Time (s)					4.0						4.0	
Lane Grp Cap (vph)					3049						1089	
v/s Ratio Prot											c0.20	
v/s Ratio Perm					0.43							
v/c Ratio					0.71						0.65	
Uniform Delay, d1					12.6						26.7	
Progression Factor					1.00						1.00	
Incremental Delay, d2					1.5						3.0	
Delay (s)					14.0						29.7	
Level of Service					B						C	
Approach Delay (s)		0.0			14.0			0.0			29.7	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	373	21	21	16	36	124	5	202	21	36	124	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.90			0.99			0.95	
Flt Protected		0.95	1.00		1.00			1.00			0.99	
Satd. Flow (prot)		1779	1583		1678			1838			1752	
Flt Permitted		0.62	1.00		0.96			0.99			0.94	
Satd. Flow (perm)		1153	1583		1612			1829			1652	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	405	23	23	17	39	135	5	220	23	39	135	113
RTOR Reduction (vph)	0	0	9	0	56	0	0	4	0	0	26	0
Lane Group Flow (vph)	0	428	14	0	136	0	0	244	0	0	261	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		53.0	53.0		53.0			29.0			29.0	
Effective Green, g (s)		53.0	53.0		53.0			29.0			29.0	
Actuated g/C Ratio		0.59	0.59		0.59			0.32			0.32	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		679	932		949			589			532	
v/s Ratio Prot												
v/s Ratio Perm		c0.37	0.01		0.08			0.13			c0.16	
v/c Ratio		0.63	0.01		0.14			0.41			0.49	
Uniform Delay, d1		12.1	7.7		8.3			23.9			24.6	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		4.4	0.0		0.3			2.1			3.2	
Delay (s)		16.5	7.7		8.6			26.0			27.7	
Level of Service		B	A		A			C			C	
Approach Delay (s)		16.1			8.6			26.0			27.7	
Approach LOS		B			A			C			C	

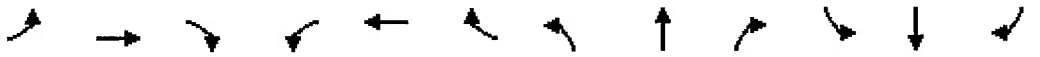
Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			↑	↱		↰
Volume (vph)	0	0	218	394	10	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0	4.0		4.0
Lane Util. Factor			1.00	1.00		1.00
Frt			1.00	0.85		1.00
Flt Protected			1.00	1.00		1.00
Satd. Flow (prot)			1863	1583		1861
Flt Permitted			1.00	1.00		0.99
Satd. Flow (perm)			1863	1583		1851
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	237	428	11	457
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	237	428	0	468
Turn Type				Perm	Perm	
Protected Phases			4			8
Permitted Phases				4	8	
Actuated Green, G (s)			90.0	90.0		90.0
Effective Green, g (s)			90.0	90.0		90.0
Actuated g/C Ratio			1.00	1.00		1.00
Clearance Time (s)			4.0	4.0		4.0
Lane Grp Cap (vph)			1863	1583		1851
v/s Ratio Prot			0.13			
v/s Ratio Perm				c0.27		0.25
v/c Ratio			0.13	0.27		0.25
Uniform Delay, d1			0.0	0.0		0.0
Progression Factor			1.00	1.00		1.00
Incremental Delay, d2			0.1	0.4		0.3
Delay (s)			0.1	0.4		0.3
Level of Service			A	A		A
Approach Delay (s)	0.0		0.3			0.3
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	0.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	360	41	0	0	0	0	2347	262	159	1206	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95						0.95	1.00	1.00	0.95	
Frt		0.98						1.00	0.85	1.00	1.00	
Flt Protected		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3484						3539	1583	1770	3539	
Flt Permitted		1.00						1.00	1.00	0.95	1.00	
Satd. Flow (perm)		3484						3539	1583	1770	3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	391	45	0	0	0	0	2551	285	173	1311	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	18	0	0	0
Lane Group Flow (vph)	0	429	0	0	0	0	0	2551	267	173	1311	0
Turn Type									Perm	Prot		
Protected Phases		4						2		1	6	
Permitted Phases									2			
Actuated Green, G (s)		16.0						89.0	89.0	13.0	106.0	
Effective Green, g (s)		16.0						89.0	89.0	13.0	106.0	
Actuated g/C Ratio		0.12						0.68	0.68	0.10	0.82	
Clearance Time (s)		4.0						4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0						3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		429						2423	1084	177	2886	
v/s Ratio Prot		c0.12						c0.72		c0.10	0.37	
v/s Ratio Perm									0.17			
v/c Ratio		1.00						1.05	0.25	0.98	0.45	
Uniform Delay, d1		57.0						20.5	7.8	58.4	3.5	
Progression Factor		1.00						1.00	1.00	1.33	0.70	
Incremental Delay, d2		43.1						34.1	0.5	59.1	0.5	
Delay (s)		100.1						54.6	8.3	136.6	3.0	
Level of Service		F						D	A	F	A	
Approach Delay (s)		100.1			0.0			49.9			18.5	
Approach LOS		F			A			D			B	

Intersection Summary			
HCM Average Control Delay	44.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱		↰	↑↑↱			↑↑↑↱			↑↑↑↱	
Volume (vph)	0	1009	149	103	580	221	0	2080	324	0	1692	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.5		4.0	4.0			5.0			5.0	
Lane Util. Factor		0.91		1.00	0.95			0.91			0.91	
Frt		0.98		1.00	0.96			0.98			1.00	
Flt Protected		1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)		4987		1770	3393			4983			5061	
Flt Permitted		1.00		0.15	1.00			1.00			1.00	
Satd. Flow (perm)		4987		276	3393			4983			5061	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1097	162	112	630	240	0	2261	352	0	1839	60
RTOR Reduction (vph)	0	21	0	0	1	0	0	23	0	0	4	0
Lane Group Flow (vph)	0	1238	0	112	869	0	0	2590	0	0	1895	0
Turn Type				pm+pt								
Protected Phases		4		3	8			2			6	
Permitted Phases				8								
Actuated Green, G (s)		23.5		35.0	35.0			46.0			46.0	
Effective Green, g (s)		23.5		35.0	35.0			46.0			46.0	
Actuated g/C Ratio		0.26		0.39	0.39			0.51			0.51	
Clearance Time (s)		3.5		4.0	4.0			5.0			5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1302		240	1320			2547			2587	
v/s Ratio Prot		c0.25		0.04	c0.26			c0.52			0.37	
v/s Ratio Perm				0.14								
v/c Ratio		0.95		0.47	0.66			1.02			0.73	
Uniform Delay, d1		32.7		21.2	22.6			22.0			17.2	
Progression Factor		1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2		14.7		1.4	1.2			22.1			1.1	
Delay (s)		47.4		22.6	23.8			44.1			18.3	
Level of Service		D		C	C			D			B	
Approach Delay (s)		47.4			23.6			44.1			18.3	
Approach LOS		D			C			D			B	

Intersection Summary			
HCM Average Control Delay	34.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	21	0	186	124	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	0	202	135	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	337	135	135			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	337	135	135			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	659	914	1450			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	23	202	135
Volume Left	0	0	0
Volume Right	23	0	0
cSH	914	1450	1700
Volume to Capacity	0.02	0.00	0.08
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	41	0	0	186	124	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	0	0	202	135	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	346	143	152			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	346	143	152			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	100	100			
cM capacity (veh/h)	651	904	1429			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	45	202	152
Volume Left	45	0	0
Volume Right	0	0	17
cSH	651	1429	1700
Volume to Capacity	0.07	0.00	0.09
Queue Length 95th (ft)	5	0	0
Control Delay (s)	10.9	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.9	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

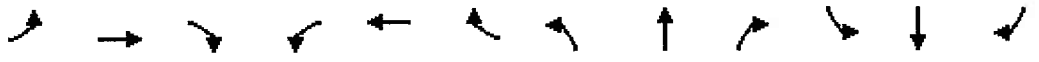
HCM Unsignalized Intersection Capacity Analysis
10: Scale Gate Rd & SB Off-Ramp

6/27/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	467	669	2	613	0	0	0	0	6	0	237
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	508	727	2	666	0	0	0	0	7	0	258
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	666			508			1542	1542	871	1542	1178	666
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	666			508			1542	1542	871	1542	1178	666
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	93	100	44
cM capacity (veh/h)	923			1057			41	115	350	94	190	459

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	1235	668	264
Volume Left	0	2	7
Volume Right	727	0	258
cSH	1700	1057	419
Volume to Capacity	0.73	0.00	0.63
Queue Length 95th (ft)	0	0	105
Control Delay (s)	0.0	0.1	27.2
Lane LOS		A	D
Approach Delay (s)	0.0	0.1	27.2
Approach LOS			D

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1005	467	466	716	1732	676	104	36	331	266	33	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0	3.0	3.0	4.0	3.0		3.0	3.0	3.0	3.0	
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00		1.00	0.88	0.94	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	1.00	
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583		1796	2787	4990	1725	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583		0	2787	4990	1725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1092	508	507	778	1883	735	113	39	360	289	36	35
RTOR Reduction (vph)	0	0	100	0	0	91	0	0	154	0	29	0
Lane Group Flow (vph)	1092	508	407	778	1883	644	0	152	206	289	42	0
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	Prot		
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8	2		2			
Actuated Green, G (s)	38.1	49.9	66.3	34.3	46.1	58.6		16.4	45.6	12.5	7.4	
Effective Green, g (s)	39.1	50.9	68.3	35.3	47.1	60.6		17.4	47.6	13.5	8.4	
Actuated g/C Ratio	0.31	0.41	0.55	0.28	0.38	0.48		0.14	0.38	0.11	0.07	
Clearance Time (s)	4.0	5.0	4.0	4.0	5.0	4.0		4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1074	2071	865	969	1916	767		250	1128	539	116	
v/s Ratio Prot	c0.32	0.10	0.07	0.23	c0.37	c0.09		c0.08	0.05	0.06	0.02	
v/s Ratio Perm			0.19			0.32			0.02			
v/c Ratio	1.02	0.25	0.47	0.80	0.98	0.84		0.61	0.18	0.54	0.36	
Uniform Delay, d1	43.0	24.4	17.3	41.6	38.5	28.0		50.6	25.8	52.8	55.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	31.7	0.3	0.4	4.9	16.9	8.0		4.1	0.1	1.0	1.9	
Delay (s)	74.7	24.7	17.7	46.5	55.4	36.0		54.7	25.8	53.8	57.7	
Level of Service	E	C	B	D	E	D		D	C	D	E	
Approach Delay (s)		48.9			49.2			34.4			54.6	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM Average Control Delay	48.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
10: Scale Gate Rd & SB Off-Ramp

8/23/2007

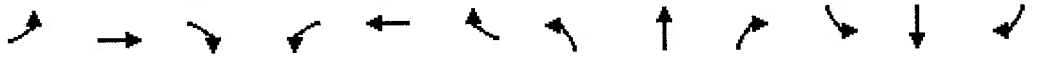
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	201	428	2	522	0	0	0	0	6	0	480
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	218	465	2	567	0	0	0	0	7	0	522
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	567			218			1545	1023	451	1023	790	567
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	567			218			1545	1023	451	1023	790	567
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	97	100	0
cM capacity (veh/h)	1005			1351			0	235	608	214	322	523

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	684	570	180	348
Volume Left	0	2	7	0
Volume Right	465	0	174	348
cSH	1700	1351	497	523
Volume to Capacity	0.40	0.00	0.36	0.67
Queue Length 95th (ft)	0	0	41	122
Control Delay (s)	0.0	0.0	16.3	24.5
Lane LOS		A	C	C
Approach Delay (s)	0.0	0.0	21.7	
Approach LOS			C	

Intersection Summary				
Average Delay	6.5			
Intersection Capacity Utilization	54.1%	ICU Level of Service	A	
Analysis Period (min)	15			

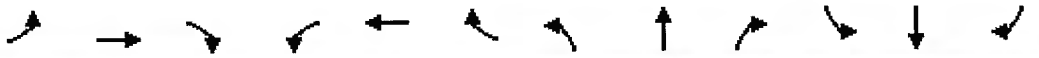
HCM Signalized Intersection Capacity Analysis
22: Irving St & Main Irving Gate

8/23/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	679	1135	171	162	799	341	321	32	1109	815	52	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0	3.0	3.0	4.0	3.0		3.0	3.0	3.0	3.0	
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	1.00		1.00	0.88	0.94	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	1.00	
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583		1782	2787	4990	1680	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.00	1.00	0.95	1.00	
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583		0	2787	4990	1680	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	738	1234	186	176	868	371	349	35	1205	886	57	108
RTOR Reduction (vph)	0	0	83	0	0	223	0	0	1	0	96	0
Lane Group Flow (vph)	738	1234	103	176	868	148	0	384	1204	886	69	0
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	Prot		
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8	2		2			
Actuated Green, G (s)	19.0	22.4	47.8	16.0	19.4	34.0		25.4	36.0	14.6	9.2	
Effective Green, g (s)	20.0	23.4	49.8	17.0	20.4	36.0		26.4	38.0	15.6	10.2	
Actuated g/C Ratio	0.22	0.26	0.55	0.19	0.23	0.40		0.29	0.42	0.17	0.11	
Clearance Time (s)	4.0	5.0	4.0	4.0	5.0	4.0		4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	763	1322	929	648	1153	633		523	1177	865	190	
v/s Ratio Prot	c0.21	c0.24	0.03	0.05	0.17	0.04		0.22	c0.19	c0.18	0.04	
v/s Ratio Perm			0.03			0.05			0.24			
v/c Ratio	0.97	0.93	0.11	0.27	0.75	0.23		0.73	1.02	1.02	0.36	
Uniform Delay, d1	34.7	32.5	9.6	31.2	32.4	17.9		28.6	26.0	37.2	36.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	24.5	13.2	0.1	0.2	4.6	0.2		5.3	32.2	36.9	1.2	
Delay (s)	59.2	45.8	9.6	31.4	37.0	18.1		33.9	58.2	74.1	38.1	
Level of Service	E	D	A	C	D	B		C	E	E	D	
Approach Delay (s)		47.2			31.4			52.3			68.5	
Approach LOS		D			C			D			E	

Intersection Summary			
HCM Average Control Delay	48.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	467	669	2	613	0	0	0	0	6	0	237
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	508	727	2	666	0	0	0	0	7	0	258
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	666			508			1799	1542	871	1542	1178	666
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	666			508			1799	1542	871	1542	1178	666
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	93	100	44
cM capacity (veh/h)	923			1057			27	115	350	94	190	459

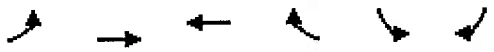
Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	1235	668	92	172
Volume Left	0	2	7	0
Volume Right	727	0	86	172
cSH	1700	1057	360	459
Volume to Capacity	0.73	0.00	0.26	0.37
Queue Length 95th (ft)	0	0	25	43
Control Delay (s)	0.0	0.1	18.4	17.4
Lane LOS		A	C	C
Approach Delay (s)	0.0	0.1	17.8	
Approach LOS			C	

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	77.5%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	355	667	466	716	1832	576	104	36	331	66	33	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0		3.0	4.0			3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.91		0.97	0.91			1.00	0.88	1.00	1.00	
Frt	1.00	0.94		1.00	0.96			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	4771		3433	4903			1796	2787	1770	1725	
Flt Permitted	0.06	1.00		0.95	1.00			0.74	1.00	0.27	1.00	
Satd. Flow (perm)	115	4771		3433	4903			1370	2787	509	1725	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	386	725	507	778	1991	626	113	39	360	72	36	35
RTOR Reduction (vph)	0	76	0	0	36	0	0	0	318	0	20	0
Lane Group Flow (vph)	386	1156	0	778	2581	0	0	152	42	72	51	0
Turn Type	pm+pt			Prot			Prot		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4								2	6		
Actuated Green, G (s)	90.8	63.8		37.2	74.0			16.0	16.0	30.2	30.2	
Effective Green, g (s)	92.8	64.8		38.2	75.0			17.0	17.0	31.2	31.2	
Actuated g/C Ratio	0.64	0.45		0.26	0.52			0.12	0.12	0.22	0.22	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	395	2144		909	2550			162	329	208	373	
v/s Ratio Prot	c0.19	0.24		c0.23	c0.53					c0.03	0.03	
v/s Ratio Perm	0.44							c0.11	0.02	0.05		
v/c Ratio	0.98	0.54		0.86	1.01			0.94	0.13	0.35	0.14	
Uniform Delay, d1	49.0	28.9		50.4	34.6			63.1	57.0	46.7	45.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	38.9	1.0		8.0	20.9			52.1	0.2	1.0	0.2	
Delay (s)	87.9	29.8		58.3	55.5			115.2	57.1	47.7	45.8	
Level of Service	F	C		E	E			F	E	D	D	
Approach Delay (s)		43.7			56.1			74.4			46.7	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM Average Control Delay	54.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	144.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	650	1288	1868	100	200	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5046		1770	1583
Flt Permitted	0.06	1.00	1.00		0.95	1.00
Satd. Flow (perm)	113	5085	5046		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	707	1400	2030	109	217	605
RTOR Reduction (vph)	0	0	4	0	0	1
Lane Group Flow (vph)	707	1400	2135	0	217	604
Turn Type	pm+pt					pm+ov
Protected Phases	7	4	8		6	7
Permitted Phases	4					6
Actuated Green, G (s)	121.0	121.0	62.0		19.8	74.8
Effective Green, g (s)	121.0	121.0	62.0		19.8	74.8
Actuated g/C Ratio	0.81	0.81	0.41		0.13	0.50
Clearance Time (s)	4.0	5.0	5.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	700	4107	2088		234	833
v/s Ratio Prot	c0.37	0.28	0.42		c0.12	0.27
v/s Ratio Perm	c0.45					0.12
v/c Ratio	1.01	0.34	1.02		0.93	0.73
Uniform Delay, d1	49.6	3.8	43.9		64.3	29.4
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	36.5	0.0	25.6		39.0	3.2
Delay (s)	86.1	3.9	69.5		103.3	32.6
Level of Service	F	A	E		F	C
Approach Delay (s)		31.5	69.5		51.3	
Approach LOS		C	E		D	

Intersection Summary			
HCM Average Control Delay	50.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	149.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	96.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

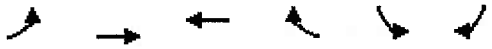
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	201	428	2	522	0	0	0	0	6	0	480
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	218	465	2	567	0	0	0	0	7	0	522
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	567			218			1023	1023	451	1023	790	567
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	567			218			1023	1023	451	1023	790	567
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	97	100	0
cM capacity (veh/h)	1005			1351			0	285	608	214	322	523

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	684	570	180	348
Volume Left	0	2	7	0
Volume Right	465	0	174	348
cSH	1700	1351	497	523
Volume to Capacity	0.40	0.00	0.36	0.67
Queue Length 95th (ft)	0	0	41	122
Control Delay (s)	0.0	0.0	16.3	24.5
Lane LOS		A	C	C
Approach Delay (s)	0.0	0.0	21.7	
Approach LOS			C	

Intersection Summary				
Average Delay	6.5			
Intersection Capacity Utilization	54.1%	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)	179	1735	171	162	919	221	321	32	1109	215	52	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.0		3.0	4.0			3.0	3.0	3.0	3.0	
Lane Util. Factor	1.00	0.91		0.97	0.91			1.00	0.88	1.00	1.00	
Frt	1.00	0.99		1.00	0.97			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5017		3433	4938			1782	2787	1770	1680	
Flt Permitted	0.14	1.00		0.95	1.00			0.63	1.00	0.29	1.00	
Satd. Flow (perm)	253	5017		3433	4938			1179	2787	534	1680	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	195	1886	186	176	999	240	349	35	1205	234	57	108
RTOR Reduction (vph)	0	12	0	0	40	0	0	0	123	0	50	0
Lane Group Flow (vph)	195	2060	0	176	1199	0	0	384	1082	234	115	0
Turn Type	pm+pt			Prot			Prot		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4								2	6		
Actuated Green, G (s)	40.0	40.0		5.0	34.5			34.0	34.0	42.0	42.0	
Effective Green, g (s)	41.0	41.0		6.0	35.5			35.0	35.0	43.0	43.0	
Actuated g/C Ratio	0.41	0.41		0.06	0.36			0.35	0.35	0.43	0.43	
Clearance Time (s)	4.0	5.0		4.0	5.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	278	2057		206	1753			413	975	291	722	
v/s Ratio Prot	0.08	c0.41		0.05	c0.24					c0.04	0.07	
v/s Ratio Perm	0.21							0.33	c0.39	0.31		
v/c Ratio	0.70	1.00		0.85	0.68			0.93	1.11	0.80	0.16	
Uniform Delay, d1	22.4	29.5		46.6	27.5			31.3	32.5	26.8	17.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	7.8	20.2		27.5	2.2			27.1	63.9	14.8	0.1	
Delay (s)	30.1	49.7		74.0	29.7			58.4	96.4	41.6	17.5	
Level of Service	C	D		E	C			E	F	D	B	
Approach Delay (s)		48.0			35.2			87.2			31.6	
Approach LOS		D			D			F			C	

Intersection Summary			
HCM Average Control Delay	54.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	500	1485	1219	120	600	940
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0		4.0	4.0
Lane Util. Factor	1.00	0.91	0.91		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	5085	5017		1770	1583
Flt Permitted	0.12	1.00	1.00		0.95	1.00
Satd. Flow (perm)	233	5085	5017		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	543	1614	1325	130	652	1022
RTOR Reduction (vph)	0	0	12	0	0	0
Lane Group Flow (vph)	543	1614	1443	0	652	1022
Turn Type	pm+pt					pm+ov
Protected Phases	7	4	8		6	7
Permitted Phases	4					6
Actuated Green, G (s)	57.0	57.0	28.0		34.0	59.0
Effective Green, g (s)	57.0	57.0	28.0		34.0	59.0
Actuated g/C Ratio	0.57	0.57	0.28		0.34	0.59
Clearance Time (s)	4.0	5.0	5.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	517	2898	1405		602	997
v/s Ratio Prot	0.26	0.32	0.29		c0.37	c0.26
v/s Ratio Perm	c0.34					0.39
v/c Ratio	1.05	0.56	1.03		1.08	1.02
Uniform Delay, d1	29.3	13.5	36.0		33.0	20.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	53.4	0.8	31.3		61.2	34.9
Delay (s)	82.7	14.3	67.3		94.2	55.4
Level of Service	F	B	E		F	E
Approach Delay (s)		31.5	67.3		70.5	
Approach LOS		C	E		E	

Intersection Summary			
HCM Average Control Delay	53.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	467	669	2	613	0	0	0	0	6	0	237
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	508	727	2	666	0	0	0	0	7	0	258
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	666			508			1542	1542	871	1542	1178	666
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	666			508			1542	1542	871	1542	1178	666
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	93	100	44
cM capacity (veh/h)	923			1057			41	115	350	94	190	459

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	1235	668	92	172
Volume Left	0	2	7	0
Volume Right	727	0	86	172
cSH	1700	1057	360	459
Volume to Capacity	0.73	0.00	0.26	0.37
Queue Length 95th (ft)	0	0	25	43
Control Delay (s)	0.0	0.1	18.4	17.4
Lane LOS		A	C	C
Approach Delay (s)	0.0	0.1	17.8	
Approach LOS			C	

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	77.5%	ICU Level of Service	D	
Analysis Period (min)	15			

Appendix A-8:
Trip Generation

AFRH-W Site Trip Generation for Proposed Lane Use (Zones 3 & 4):

Building	Land Use (Stories)	ITE Code	SF/Dw. Units	Unit	AM Rate	Percentage		Total Trips (AM)		TOTAL	PM Rate	Percentage		Total Trips (PM)		TOTAL
						IN	OUT	IN	OUT			IN	OUT	IN	OUT	
A	Hotel (2 to 4)	310	123,026	123	0.56	61%	39%	42	27	**69**	0.61	53%	47%	40	35	**75**
B	Medical Clinic (4 to 5)	630	240,974	241	5.46	50%	50%	658	658	**1,316**	5.18	50%	50%	624	624	**1,248**
C	Office (4 to 6)	710	60,000	60	1.56	88%	12%	82	11	**93**	1.49	17%	83%	15	74	**89**
C	Retail (4 to 6)	820	80,000	80	1.03	61%	39%	50	32	**82**	3.74	48%	52%	144	156	**300**
D	Office (4 to 5)	710	239,426	239	1.56	88%	12%	329	45	**374**	1.49	17%	83%	61	296	**357**
D	Retail (4 to 5)	820	10,000	10	1.03	61%	39%	6	4	**10**	3.74	48%	52%	18	19	**37**
E	Office (6 to 7)	710	475,442	475	1.56	88%	12%	653	89	**742**	1.49	17%	83%	120	588	**708**
F	Office (7 to 8)	710	329,200	329	1.56	88%	12%	452	62	**514**	1.49	17%	83%	83	407	**490**
G	Resi - Apt (4)	223	159,036	149	0.30	31%	69%	14	31	**45**	0.39	58%	42%	34	24	**58**
H	Resi - Condo (6 to 8)	232	249,833	233	0.34	19%	81%	15	64	**79**	0.38	62%	38%	55	34	**89**
H	Retail (6 to 8)	820	77,105	77	1.03	61%	39%	48	31	**79**	3.74	48%	52%	138	150	**288**
I	Resi - Condo (6 to 8)	232	222,156	208	0.34	19%	81%	13	57	**70**	0.38	62%	38%	49	30	**79**
I	Retail (6 to 8)	820	16,939	17	1.03	61%	39%	11	7	**18**	3.74	48%	52%	30	33	**63**
J	Resi - Condo (6)	232	150,462	141	0.34	19%	81%	9	39	**48**	0.38	62%	38%	33	20	**53**
K	Resi - Condo (6)	232	221,375	207	0.34	19%	81%	13	57	**70**	0.38	62%	38%	49	30	**79**
K	Retail (6)	820	44,458	44	1.03	61%	39%	28	18	**46**	3.74	48%	52%	80	86	**166**
L	Resi - Apt (4)	223	114,395	107	0.30	31%	69%	10	22	**32**	0.39	58%	42%	24	18	**42**
L	Office (4)	710	17,461	17	1.56	88%	12%	24	3	**27**	1.49	17%	83%	4	22	**26**
M	Resi - Apt (4 to 6)	223	350,593	328	0.30	31%	69%	30	68	**98**	0.39	58%	42%	74	54	**128**
N	Resi - Condo (6 to 8)	232	256,546	240	0.34	19%	81%	15	66	**81**	0.38	62%	38%	56	35	**91**
O	Resi - Apt (4)	223	230,600	215	0.30	31%	69%	20	45	**65**	0.39	58%	42%	49	35	**84**
P	Resi - Apt (4 to 5)	223	142,104	133	0.30	31%	69%	12	27	**39**	0.39	58%	42%	30	22	**52**
Q	Resi - Apt (4)	223	143,662	134	0.30	31%	69%	12	28	**40**	0.39	58%	42%	30	22	**52**
Q	Retail (4)	820	1,700	2	1.03	61%	39%	1	1	**2**	3.74	48%	52%	3	3	**6**
R	Resi - Apt (5)	223	105,472	99	0.30	31%	69%	9	20	**29**	0.39	58%	42%	22	16	**38**
S	Office (4)	710	170,000	170	1.56	88%	12%	233	32	**265**	1.49	17%	83%	43	210	**253**
S	Retail (4)	820	3,360	3	1.03	61%	39%	2	1	**3**	3.74	48%	52%	6	7	**13**
T	Office (4)	710	92,044	92	1.56	88%	12%	126	17	**143**	1.49	17%	83%	23	114	**137**
T	Retail (4)	820	10,000	10	1.03	61%	39%	6	4	**10**	3.74	48%	52%	18	19	**37**
			4,337,369				**Totals**	2,923	1,566	**4,489**			**Totals**	1,955	3,183	**5,138**

NOTE: *All Trip Generation Rates and Directional Distribution Rates are based on ITE's Trip Generation, 6th Edition*

Land use for buildings and square footage based on data received from EEK as of 05/09/2007

Appendix-A8: Trip Generation

Appendix A-9:
Glossary

Glossary

95% Queue -- The maximum amount of vehicles queued, assuming 95 percentile traffic volumes. Synchro software utilizes an adjustment, known as the 95th percentile arrival rate, to calculate the 95% Queue. This adjustment factors up the vehicle arrival rate to adjust for fluctuations in traffic entering the intersection. A consequence of this methodology is that Synchro's vehicle queues are longer than other methodologies because it also includes vehicles that arrive during the queue clearance stage.

Accident – An incident involving a moving vehicle. Includes collisions with a vehicle, object or person and derailment/left roadway. Produces unintended injury, death or property damage.

Accident Type – A classification as either "collision" or "non-collision".

Alighting – The act of getting off a bus.

Approach Leg – A set of lanes accommodating all left-turn, through, and right-turn movements arriving at an intersection from a given direction.

Arterial Street – A major thoroughfare, used primarily through traffic rather than for access to adjacent land that is characterized by high vehicular capacity and continuity of movement.

Articulated Bus – A bus usually 55 feet or more in length with two connected passenger compartments that bends at the connection point when the bus turns a corner.

Bike Lane – A portion of a roadway, which has been designated by striping, signing and pavement markings, for the preferential or exclusive use of bicyclists***.***

Bus Bay -- The designated space for a bus at a transit facility.

Business District - The territory contiguous to and including a highway when within any 600 feet along such highway there are buildings in use for business or industrial purposes, including but not limited to hotels, banks, or office buildings which occupy at least 300 feet of frontage on one side or 300 feet collectively on both sides of the highway.

Capacity -- the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic and control conditions. In the Highway Capacity Manual (HCM) approach, capacity at intersections is defined for lane groups rather than for approaches or the intersection as a whole. A lane group may be a single movement, a group of movements, or an entire approach and is defined by the geometry of the intersection and the distribution of movements over the various lanes. Capacity of a lane group is calculated as the maximum rate of flow that may pass through the intersection under prevailing traffic, roadway, and signalization conditions. The rate of flow is generally measured or projected for a 15-minute period and capacity is stated in vehicles per hour. Capacity analysis of intersections involves the computation of volume-to-capacity (V/C) ratios for each lane group, from which an overall intersection V/C ratio may be derived.

Generally, when two opposing flows are moving during a single phase, one of the lane groups will require more green time than another to process all of its volume. This is defined as the "critical" lane group for the subject signal phase. The concept of a critical V/C ratio is used to evaluate the intersection as a whole, considering only the critical lane groups or those with the greatest demand for green time within each signal phase. This procedure assumes that green time has been appropriately allocated. Thus, it is possible to have an overall intersection V/C of less than 1.00 (under capacity), but still have individual movements be over saturated within the signal cycle if the green time has not been appropriately allocated to the various approaches.

Charter Bus -- A bus transporting a group of persons who pursuant to a common purpose, and under a single contract at a fixed price, have acquired the exclusive use of a bus to travel together under an itinerary.

Collectors -- Surface streets that provide land access and traffic circulation service within residential, commercial, and industrial areas.

Collision Accident -- An accident involving a collision between a commercial motor vehicle and another object. Collision objects include trains, other motor vehicles, pedestrians, bicyclists, animals, and fixed objects.

Commercial District -- A land use designation referring to an area with a high density of business and commercial activity and a relatively low density of households and population.

Commute -- Regular travel between home and a fixed location.

Commuter -- A person who travels regularly between home and work or school.

Commuter Bus Service -- Fixed route bus service, characterized by service predominately in one direction during peak periods, limited stops, use of multi-ride tickets, and routes of extended length, usually between the central business district and outlying suburbs. Commuter bus service may also include other service, characterized by a limited route structure, limited stops, and coordinated relationship to another mode of transportation.

Conflicting Routes -- Two or more routes, opposing, converging or intersecting, over which movements cannot be made simultaneously without possibility of collision.

Conflicting Traffic Volume -- The volume of traffic which conflicts with a specific movement at an unsignalized intersection.

Constrained Operation --An operating condition in a weaving area where weaving vehicles are unable to occupy as large a portion of available lanes as required to achieve balanced operation because of geometric constraints.

Corridor -- A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways, and transit route alignments.

Coverage – A design measure applies on a system wide basis, rather than at the route level. For high-density areas with at least 3 households per acre, 90% of households should be within one quarter of a mile of a bus route.

Crowding – A passenger's perception of crowding on a bus is most easily quantified by the load factor—the number of passengers on board at the peak load point divided by the number of seats. A load factor above 1.0 indicates that some people were forced to stand for a portion of the trip. Except for infrequent services (headway greater than 30 minutes) the load factor on one individual trip is not critical; thus this measure considers the average load over two consecutive trips for medium frequency services, and over all trips within the peak 30 minutes for frequent services.

Cross town -- Non-radial bus or rail service which does not enter the Central Business District (CBD).

Cycle Splits – The sum of time allocated to a movement phase which includes; Red + Yellow Time and Green Time.

Cycle Splits/Signal Phasing/ Timing -- Each intersection's directional traffic flow is governed by the amount of time (i.e. green signal) allocated to vehicles passing through the intersection. For example, an intersection is assigned a fixed amount of time, called a cycle. The phasing progression pattern within a cycle refers to the order that each directional movement can proceed on a green signal. A phase is the assigned order that a vehicle movement occurs, each phase having a proportion of the total cycle time allocated to it. A cycle split is the total time to sequence through the RED light, YELLOW light and GREEN light with the duration of time that the GREEN light stays on is know as the GREEN time.

Therefore, the amount of Green time allocated to a given vehicle volume generally determines the Approach LOS. The more green time allotted to the greatest number vehicles in a movement results in a better Approach LOS and Overall Intersection LOS.

Daily Vehicle Travel -- The amount of vehicle travel (in thousands) accumulated over a 24-hour day, midnight-to-midnight, traversed along a public road by motorized vehicles, excluding construction equipment or farm tractors. Vehicle travel not occurring on public roads, such as that occurring on private land roads (private roads in parking lots, shopping centers, etc.) must also be excluded.

Delay -- Additional travel time experienced by a driver, passenger or pedestrian beyond what would reasonably be desired for a given trip. Delay is a complex measure that depends upon a number of variables such as quality of signal progression, cycle length, allocation of green time, and V/C ratio. Of all the factors cited, V/C ratios have the least effect on delay. Thus, for any given V/C ratio, a range of delay values (and therefore, LOS) may result. Conversely, for a given LOS, the V/C ratio may lie anywhere within a broad range.

Demand Response -- Non-fixed-route service utilizing vans or buses with passengers boarding and alighting at pre-arranged times at any location within the system's service area. Also called "Dial-a-Ride."

Department of Transportation -- Establishes the nation's overall transportation policy. Under its umbrella there are ten administrations whose jurisdictions include highway planning, development and construction; urban mass transit; railroads; aviation; and the safety of waterways, ports, highways, and oil and gas pipelines. The Department of Transportation (DOT) was established by act of October 15, 1966, as amended (49 U.S.C. 102 and 102 note), "to assure the coordinated, effective administration of the transportation programs of the Federal Government" and to develop "national transportation policies and programs conducive to the provision of fast, safe, efficient, and convenient transportation at the lowest cost consistent therewith."

Design Capacity -- The capacity associated with the direction of the flow observed on the peak day.

Design Measures – The *Washington Metropolitan Area Regional Bus Study* evaluation measure concerned with where bus routes ought to be operated and what the service characteristics of those routes should be. The Design Measures include *Coverage, Span of Service, Frequency, Travel Time*.

Destination -- For travel period trips, the destination is the farthest point of travel from the point of origin of a trip of 75 miles or more one-way. For travel day trips, the destination is the point at which there is a break in travel.

Diverge -- A movement in which a single lane of traffic separates into two separate lanes without the aid of traffic control devices.

Divided Highway -- A multi-lane facility with a curbed or positive barrier median, or a median that is at least 4 feet (1.2 meters) wide.

Dynamic Routing -- In demand-response transportation systems, the process of constantly modifying vehicle routes to accommodate service requests received after the vehicle began operations, as distinguished from predetermined routes assigned to a vehicle.

Effective Green Time --The time allocated for a given traffic movement (green plus yellow) at a signalized intersection, less the start-up and clearance lost times for the movement.

Effective Red Time -- The time during which a given traffic movement or set of movements is directed to stop; cycle length minus effective green time.

Exclusive Left Turn Lane -- A lane dedicated for the sole use of left turning vehicles.

Express -- Express routes are those which run on major highways for a majority of their route length and make no or limited stops for significant stretches. It can extend all the way into the downtown area, or it would end at a Metrorail station outside of the CBD.

Express Bus -- A bus that operates a portion of the route without stops or with a limited number of stops.

Expressway -- A divided highway for through traffic with full or partial access control and including grade separations at all or most major intersections.

Federal Highway Administration -- Became a component of the Department of Transportation in 1967 pursuant to the Department of Transportation Act (49 U.S.C. app. 1651 note). It administers the highway transportation programs of the Department of Transportation under pertinent legislation and the provisions of law cited in section 6a of the act (49 U.S.C. 104). The Administration encompasses highway transportation in its broadest scope seeking to coordinate highways with other modes of transportation to achieve the most effective balance of transportation systems and facilities under cohesive Federal transportation policies pursuant to the act. The Administration administers the Federal-Aid Highway Program; is responsible for several highway-related safety programs; is authorized to establish and maintain a National Network for trucks; administers a coordinated Federal lands program; coordinated varied research, development and technology transfer activities; supports and participates in efforts to find research and technology abroad; plus a few additional programs.

Feeder Bus -- A bus service that picks up and delivers passengers to a rail rapid transit station or express bus stop or terminal.

Fixed Route -- Service provided on a repetitive, fixed-schedule basis along a specific route with vehicles stopping to pick up and deliver passengers to specific locations; each fixed-route trip serves the same origins and destinations, unlike demand response and taxicabs.

Freeway and Expressway -- All urban principal arterial with limited control of access not on the interstate system.

Frequency of Service – A transit design measure or threshold seeking to ensure a basic level of service for the area served by a route. For dense areas, service should be provided at least every 15 minutes in peak periods and at least every 30 minutes in off-peak periods. For less dense areas, the thresholds are 30 minutes for peak periods and 60 minutes for off-peak periods. For many routes, demand will dictate frequencies higher (shorter headways) than these minimums.

Fringe Parking -- An area for parking usually located outside the Central Business District (CBD) and most often used by suburban residents who work or shop downtown.

Gap Acceptance – The distance between moving vehicles between which it is safe for a vehicle making an opposing movement to pull out into the intersection.

Geographical Information System -- A system of hardware, software, and data for collecting, storing, analyzing, and disseminating information about areas of the Earth. For Highway Performance Monitoring System (HPMS) purposes, Geographical Information System (GIS) is defined as a highway network (spatial data which geographically represents the geometry of the highways, an electronic map) and its geographically referenced component attributes (HPMS socioeconomic data) that are integrated through GIS technology to perform analyses. From this, GIS can display attributes and analyze results electronically in map form.

Gore Area -- The area located immediately between the left edge of a ramp pavement and the right edge of the roadway pavement at a merge or diverge area.

Head On Collision -- 1) Refers to a collision where the front end of one vehicle collides with the front-end of another vehicle while the two vehicles are traveling in opposite directions. 2) A collision in which the trains or locomotives involved are traveling in opposite directions on the same track.

Headways – the interval of time between transit vehicles arriving at a specific stop.

Heavy Vehicles – Any vehicle with more than 4 wheels touching the pavement during normal operation.

Highway Capacity Manual -- A publication of the Institute of Transportation Engineers defining level of service criteria to determine peak hour traffic congestion.

Household Trip -- One or more household members traveling together.

Intermodalism -- Typically used in three contexts: 1) most narrowly, it refers to containerization, piggyback service, or other technologies that provide the seamless movement of good and people by more than one mode of transport. 2) more broadly, inter-modalism refers to the provision of connections between different modes, such as adequate highways to ports or bus feeder services to rail transit. 3) In its broadest interpretation, intermodalism refers to a holistic view of transportation in which individual modes work together or within their own niches to provide the user with the best choices of service, and in which the consequence on all modes of policies for a single mode are considered. This view has been called balanced, integrated, or comprehensive transportation in the past.

Intersection Vehicle Queue: is a method to gauge intersection performance by visually examining the number of vehicles waiting or queued at an intersection during the red-light phase. Vehicle queues are mutually exclusive of LOS such that an approach may operate at a satisfactory LOS but have a large number of vehicles queued at that intersection. Thus, examining queues as an additional criterion helps to determine the impact of a timing plan and how the intersection geometric layout affects operations. For example, at the intersection of 3rd and H Streets, the eastbound approach operates at LOS (B) but has a significant vehicle queue at that intersection.

Lane - A portion of a street or highway, usually indicated by pavement markings, that is intended for one line of vehicles.

1) A set of characteristics that indicate the quality and quantity of transportation service provided, including characteristics that are quantifiable and those that are difficult to quantify.
2) For highway systems, a qualitative rating of the effectiveness of a highway or highway facility in serving traffic, in terms of operating conditions.
3) For paratransit, a variety of measures meant to denote the quality of service provided, generally in terms of total travel time or a specific component of total travel time.
4) For pedestrians, sets of area occupancy classifications to connect the design of pedestrian facilities with levels of service.

Level of Service (LOS) -- Levels of Service (LOS) rankings are calculated for each intersection during the AM and PM peak demand periods to analyze and compare intersection operations and traffic service levels. A letter grade A-F, defines an intersection's ability to pass traffic through the intersection. A LOS A represents excellent free flow conditions and LOS (F) represents failing conditions. For example, if an intersection operates at LOS (E) implies it is operating at maximum capacity. In comparison, an intersection at LOS (F) represents a situation in which the drivers experience significant delays, having to wait through multiple cycles before passing through. Generally, LOS (D) is considered to be the worst tolerable ranking and considered as acceptable conditions.

LOS	Control Delay Per Vehicle
A	≤ 10 seconds
B	> 10 and ≤ 20 seconds
C	> 20 and ≤ 35 seconds
D	> 35 and ≤ 55 seconds
E	> 55 and ≤ 80 seconds
F	> 80 seconds

Local Roads -- Those roads and streets whose principal function is to provide direct access to abutting land.

Local Streets -- Streets whose primary purpose is feeding higher order systems, providing direct access with little or no through traffic.

Measures of Effectiveness -- Parameters describing the quality of service provided by a traffic facility to drivers, passengers or pedestrians; examples include speed density delay and similar measures.

Mid Block Sink Source – A term used in Synchro to reflect a business or activity that is located midway along the block. This business or activity attracts traffic from its through movement from one intersection to the next. The result is a difference in traffic volume between 2 adjacent intersections. The difference is the traffic that is accessing the business or activity.

Modal Split -- 1) The proportion of total person trips that uses each of various specified modes of transportation. 2) The process of separating total person trips into the modes of travel used. 3) A term that describes how many people use alternative forms of transportation. It is frequently used to describe the percentage of people who use private automobiles, as opposed to the percentage who use public transportation.

Mode -- Transportation planners, analysts, and decision makers refer to the means of transportation as a mode.

Non-Collision Accident -- A motor vehicle accident, which does not involve a collision. Non-collision accidents include jackknifes, overturns, fires, cargo shifts and spills, and incidents in which trucks run off the road.

Occupancy -- The number of persons, including driver and passenger(s) in a vehicle. Nationwide Personal Transportation Survey (NPTS) occupancy rates are generally calculated as person miles divided by vehicle miles.

Off Peak --Those periods of the day when demand for transportation systems is not at its greatest.

Operational Analysis -- A use of capacity analysis to determine the prevailing level of service on an existing or projected facility, with known or projected traffic, roadway, and control conditions.

Optimization – The process of adjusting an individual or series of signalized intersections' operation parameters in order to improve traffic flow progression.

Origin -- Starting point of a trip.

Parking Stalls -- A standard (non handicapped) parking stall dimensions are typically 20 ft long by 8 ft wide. Regarding on street parking, the amount of parking stalls per length of curb increases with the angle of parking stall orientation to the curb. Such that stalls oriented at 90^{o} can supply 2.5 more spaces compared to parallel parking for a given curb length.

Parking Turnover --the number of different vehicles using the parking spaces within the specific parking analysis unit (block face, lot, and so forth).

Parking Average Turnover – The extent of the study period the spaces are occupied – usually expressed in percent.

Passenger Alightings -- Passengers getting off a transit vehicle at a designated stop.

Passenger Boardings – Passengers getting on a transit vehicle at a designated stop.

Peak Period – Consecutive hours throughout the day, usually in 2-3 hour blocks, that define the a.m., p.m. or midday rush hours.

Pedestrian Crossing (Crosswalk) -- The marked crossing area for pedestrians crossing the street at an intersection or designated mid-block location.

Performance Measure – The Washington Metropolitan Area Regional Bus Study evaluation measure that quantifies how well existing bus routes are used and whether service is comfortable and reliable for the passengers. The Performance Measures include *Productivity, Comfort/Crowding and Reliability.*

Permitted Parking -- An area designated and exclusively reserved for drivers/vehicles who meet the regulation criteria established by the parking control agency. Typical examples include handicap parking and residential permitted parking. The latter relates to the parking supply being reserved for local residents.

Person Trip -- A person trip is a trip by one or more persons in any mode of transportation. Each person is considered as making one-person trip. For example, four persons traveling together in one auto make for person trips.

Phasing -- The part of the signal cycle allocated to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals.

Principal Arterial -- Major streets or highways, many with multi-lane or freeway design, serving high-volume traffic corridor movements that connect major generators of travel.

Productivity – A measure of efficiency of resource utilization; defined as the sum of the outputs divided by the sum of the inputs. It measures the level of demand for the bus route. The demand is quantified in terms of the number of boardings per vehicle revenue hour, or boardings per trip for express routes. The measure has separate thresholds for peak period and off-peak period service, and also a full-day threshold in case ridership and operational data are not available for peak and off-peak service separately.

Protected Turns -- Left or right turns at a signalized intersection made with no opposing or conflicting vehicular or pedestrian flow.

Public Transit -- Passenger transportation services, usually local in scope, that is available to any person who pays a prescribed fare. It operates on established schedules along designated routes or lines with specific stops and is designed to move relatively large numbers of people at one time.

Radial Line Haul -- Routes that are oriented radially to the central business district (CBD) and either reach or pass through this area. In Washington, D.C., the radial line haul routes are connected to the Metrorail system, and thus act, as feeders to the rail system. Radial routes in general have boardings and alightings all along their alignments, but the peak flow is toward the CBD in the morning and away from the CBD in the afternoon.

Rapid Transit -- Rail or motorbus transit services operating completely separate from all modes of transportation on an exclusive right-of-way.

Reliability – A transit performance measure that indicates the adherence of a particular bus to its schedule. WMATA calls for 85% of the trips to depart and arrive 0-5 minutes late (with an early arrival allowance for express routes).

Residential District – A land use term referring to the portion of the study area with highest density of population and households. In an urban setting, residential areas should be in close proximity to major thoroughfares, and transit system with direct connections to work and leisure-time areas; bounded but not penetrated by street; and internally served by a system of collector and service streets. Urban residential areas should be integrated with shopping, school, church and recreation facilities.

Ridership – The number of rides by people, using a public transportation system within a given time period.

Road Functional Classification/Road Class -- The classification of a road in accordance with the Bureau of Land Management (BLM) 9113.16. Code as follows: C-collector, L-local, R-resource.

Roadway Function Class -- The classification describing the character of service the street or highway is intended to provide.

Shoulder -- An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection.

Signal Coordination – The process of adjusting the traffic signals to improve the flow of traffic on the roadway corridor.

Signalized Control -- The control of the length and occurrence of a signal's phasing can be Fully Actuated or Pre-timed:

Fully Actuated Control – Signal control of an intersection in which the occurrence and length of every phase is controlled by actuations of vehicle detector placed on each approach to the intersection.

Pre-timed Control – Traffic signal control in which the cycle length, phase plan, and phase times are preset and are repeated continuously according to the preset plan.

Span of Service -- A transit design measure applying to how many days per week and how long on each day service should be provided. These proposed spans are minimums. For many routes, demand will justify service earlier in the morning and later in the evening than the listed times.

Suburban Classes – All of the study area outside of the urban core. Suburban development is generally at a lower density than urban, with more distributed open space and developable land. Suburban feeder/distributor routes mainly serve to carry people to and from Metrorail stations, commuter rail stations, and line haul bus routes. The ridership patterns on these routes would be similar to those of urban feeder/distributor routes, though the area they serve would be of lower density in general. These routes often serve additional functions during off-peak periods, sometimes resulting in a markedly different ridership pattern.

Traffic Analysis Zone (TAZ) – In planning, this is a geographic division of a study area that is represented by a '"centroid" and used for traffic assignment purposes.

Traffic Capacity Analysis -- is the study of how traffic flows through an intersection, whether signalized or unsignalized. A traffic signal controls traffic by assigning right-of-way to one traffic movement or several non-conflicting traffic movements at a time. Right-of-way is assigned by turning on a green signal for a certain length of time or an interval. Right-of-way is ended by a yellow change interval during which a yellow signal is displayed, followed by the display of a red signal. The device that times these intervals and switches the signal lamps is called a controller unit.

Traffic Circle – A junction of roads that form a circle around which traffic normally moves in one direction.

Traffic Count -- A record of the number of vehicles, people aboard vehicles, or both, that pass a given checkpoint during a given time period.

Traffic Flow Management -- The process that ensures optimum flow of air traffic to and through areas during times when demand exceeds, or is expected to exceed, the available capacity of the system; an element of the air traffic management process.

Traffic Model – A representation of the roadway system and associated traffic in a computerized form used for analysis of different transportation and land use options.

Traffic Model – A computerized representation of the regional roadway network that includes estimated traffic volumes. The model typically includes a four-step process of trip generation, trip distribution, modal estimation, and traffic/transit assignment. The MWCOG traffic model used the Citilabs-TP+ software package.

Traffic Pattern -- The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from, an airport.

Traffic Simulation – A computerized micro- traffic analysis process that includes detailed assessments of traffic at intersections, traffic queuing, signal timing and the interface of vehicles, transit and pedestrians.

Traffic Violation -- Conviction, when operating a commercial motor vehicle, of: 1) Excessive speeding, involving any single offense for any speed of 15 miles per hour or more above the posted speed limit; 2) Reckless driving, as defined by State or local law or regulation, including but not limited to offenses of driving a commercial motor vehicle in willful or wanton disregard for the safety of persons or property; 3) Improper or erratic traffic lane changes; 4) Following the vehicle ahead too closely; or 5) A violation, arising in connection with a fatal accident, of State or local law relating to motor vehicle traffic control other than a parking violation.

Transfer Center -- A fixed location where passengers interchange from one route or vehicle to another.

Transit Bus -- A bus designed for frequent stop service with front and center doors, normally with a rear-mounted diesel engine, low-back seating, and without luggage storage compartments or rest room facilities. Includes motorbus and trolley coach.

Transit Mode -- Generally defined as urban and rural public transportation service- including commuter trains, ferry service, heavy rail (rapid rail) and light rail (streetcar) transit systems, and local transit buses- and taxis.

Transit System -- An organization (public or private) providing local or regional multi-occupancy-vehicle passenger service. Organizations that provide service under contract to another agency are generally not counted as separate systems.

Travel Time – A transit design measure to make bus service as competitive as possible with the option of driving. It encompasses both route directness and travel speed, since it compares the in-

vehicle travel time on a bus from point A to point B to the driving time from point A to point B. Bus routes that are indirect or that have an excessive number of stops would have more difficulty attaining the threshold of having a travel time not more than twice the driving time.

Transportation Improvement Program -- As stated in FHWA joint regulations that govern transportation programming, a prioritized program of transportation projects to be implemented in appropriate stages over several years (i.e., 3-5 yr.). The projects are recommended from those in the transportation systems management element and the long-range element of the planning process. This program is required as a condition for a locality to receive federal transit and highway grants.

Turning Movement Count -- The process of counting vehicles by their movements through an intersection, recorded by time of day.

Trip Generation -- In planning, this is the 1st step in the typical 4-step transportation modeling process, which estimates the movement of trips between zones by using surveys or models. In Impact Studies this refers to the site generation of trips, typically these are vehicle trips.

Unsignalized Control (Stop / Yield) -- An intersection where vehicles are restricted in movement based on a STOP or YIELD sign at the approach. For example at a four-legged intersection, a Two-Way Stop controlled intersection has two approaches where vehicles travel through without any restrictions. Its two other approaches require vehicles to come to a full stop.

Urban Area -- Any area that includes a municipality or other built up place which is appropriate, in the judgment of the Secretary of Transportation, for a public transportation system to serve commuters or others in the locality taking into consideration the local patterns and trends of urban growth.

Urban Arterial Route -- Those public roads that are functionally classified as a part of the urban principal arterial system or the urban minor arterial system as described in volume 20, appendix 12, Highway Planning Program Manual.

Urban Classes -- There are three classes of urban routes: circulator, cross-town, and feeder/distributor. The function of the first is to serve movements within certain neighborhoods or around particular activity centers. The second class serves circumferential movements around the CBD, often connecting two or more rail lines. Feeder/distributor routes serve mainly to carry riders to and from rail stations or radial bus routes, at least during peak periods. During off-peak periods, these routes often have additional functions including circulator or local service.

Urban Collector Routes -- Those public roads that are functionally classified as a part of the urban collector system as described in volume 20, appendix 12, Highway Planning Program Manual.

Vehicle Mile of Travel -- A unit of measure vehicle travel made by a private vehicle, such as an automobile, van, pickup truck, or motorcycle. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle.

Vehicle Miles -- The total number of miles traveled by all types of motor vehicles as determined by the States on the basis of actual traffic counts and established estimating procedures.

Vehicle Occupancy -- The number of people aboard a vehicle at a given time; also known as auto or automobile occupancy when the reference is to automobile travel only.

Vehicle Trip -- A trip by a single vehicle regardless of the number of persons in the vehicle.

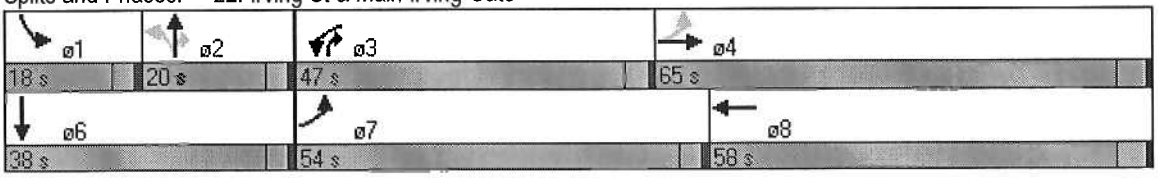
Weaving Area -- Weaving is the crossing of two or more traffic streams traveling in the same general direction along a significant length of highway, without the aid of traffic control devices. Weaving areas are formed when a merge area is closely followed by a diverge area, or when an on-ramp is closely followed by an off-ramp and the two are joined by an auxiliary lane. Weaving areas require intense lane-changing maneuvers, as drivers must access lanes appropriate to their desired exit point. Thus, traffic in a weaving area is subject to turbulence in excess of that normally present on basic highway sections.

Appendix A-10:
Signal Timing & Phasing

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	1005	467	716	1732	104	36	331	266	33
Turn Type	pm+pt		Prot		Perm		pm+ov	Prot	
Protected Phases	7	4	3	8		2	3	1	6
Permitted Phases	4				2		2		
Detector Phase	7	4	3	8	2	2	3	1	6
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0
Minimum Split (s)	8.0	21.0	8.0	21.0	20.0	20.0	8.0	7.0	20.0
Total Split (s)	54.0	65.0	47.0	58.0	20.0	20.0	47.0	18.0	38.0
Total Split (%)	36.0%	43.3%	31.3%	38.7%	13.3%	13.3%	31.3%	12.0%	25.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	Max	None	Max	None	None	None	None	None
Act Effct Green (s)	109.0	64.3	40.7	54.0		17.0	60.7	15.0	35.0
Actuated g/C Ratio	0.73	0.43	0.27	0.36		0.11	0.40	0.10	0.23
v/c Ratio	1.67	0.67	0.84	1.45		0.98	0.27	1.63	0.17
Control Delay	339.8	29.8	60.2	242.0		132.2	5.3	348.5	28.9
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	339.8	29.8	60.2	242.0		132.2	5.3	348.5	28.9
LOS	F	C	E	F		F	A	F	C
Approach Delay		190.5		200.3		43.0			285.5
Approach LOS		F		F		D			F

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.67	
Intersection Signal Delay: 189.2	Intersection LOS: F
Intersection Capacity Utilization 135.7%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 22: Irving St & Main Irving Gate



Phasings
22: Irving St & Main Irving Gate

6/29/2007

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Protected Phases	7	4	3	8		2	3	1	6
Permitted Phases	4				2		2		
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0
Minimum Split (s)	8.0	21.0	8.0	21.0	20.0	20.0	8.0	7.0	20.0
Total Split (s)	54.0	65.0	47.0	58.0	20.0	20.0	47.0	18.0	38.0
Total Split (%)	36.0%	43.3%	31.3%	38.7%	13.3%	13.3%	31.3%	12.0%	25.3%
Maximum Green (s)	50.0	60.0	43.0	53.0	16.0	16.0	43.0	14.0	34.0
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	None	Max	None	None	None	None	None
Walk Time (s)		5.0		5.0	5.0	5.0			5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)		0		0	0	0			0
90th %ile Green (s)	50.0	60.0	43.0	53.0	16.0	16.0	43.0	14.0	34.0
90th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold
70th %ile Green (s)	50.0	60.0	43.0	53.0	16.0	16.0	43.0	14.0	34.0
70th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold
50th %ile Green (s)	50.0	61.7	41.3	53.0	16.0	16.0	41.3	14.0	34.0
50th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Max	Hold
30th %ile Green (s)	50.0	65.3	37.7	53.0	16.0	16.0	37.7	14.0	34.0
30th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Max	Hold
10th %ile Green (s)	50.0	69.6	33.4	53.0	16.0	16.0	33.4	14.0	34.0
10th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Max	Hold

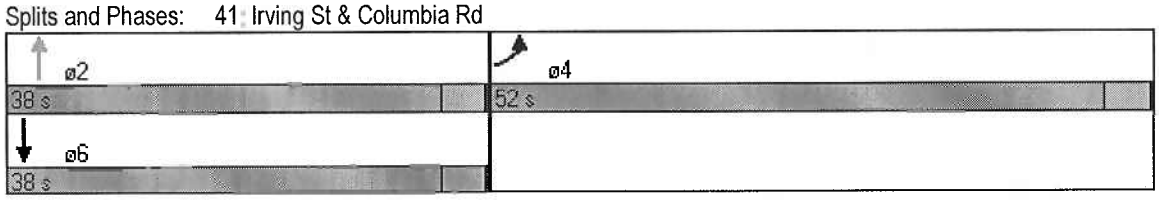
Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 150
70th %ile Actuated Cycle: 150
50th %ile Actuated Cycle: 150
30th %ile Actuated Cycle: 150
10th %ile Actuated Cycle: 150

Lane Group	EBL	NBT	SBT
Lane Configurations			
Volume (vph)	1705	233	772
Turn Type			
Protected Phases	4		6
Permitted Phases		2	
Detector Phase	4	2	6
Switch Phase			
Minimum Initial (s)	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0
Total Split (s)	52.0	38.0	38.0
Total Split (%)	57.8%	42.2%	42.2%
Yellow Time (s)	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	Max
Act Effct Green (s)	48.0	34.0	34.0
Actuated g/C Ratio	0.53	0.38	0.38
v/c Ratio	0.70	0.13	0.63
Control Delay	25.0	18.6	25.4
Queue Delay	125.9	0.0	0.0
Total Delay	150.9	18.6	25.4
LOS	F	B	C
Approach Delay	150.9	18.6	25.4
Approach LOS	F	B	C

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 103.8 Intersection LOS: F
Intersection Capacity Utilization 109.3% ICU Level of Service H
Analysis Period (min) 15

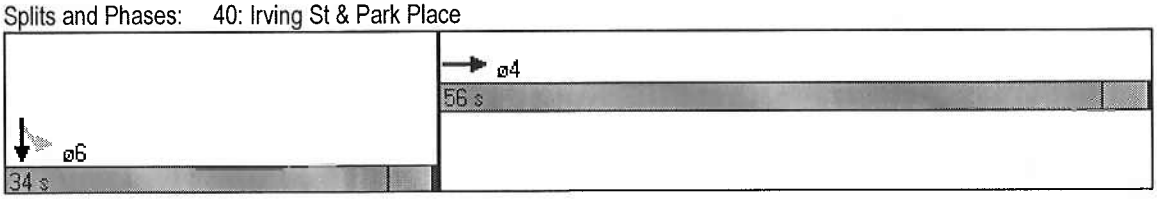
Splits and Phases: 41: Irving St & Columbia Rd



Lane Group	EBT	SBT
Lane Configurations		
Volume (vph)	1472	684
Turn Type		
Protected Phases	4	6
Permitted Phases		
Detector Phase	4	6
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	56.0	34.0
Total Split (%)	62.2%	37.8%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	4.0	4.0
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	Max
Act Effct Green (s)	52.0	30.0
Actuated g/C Ratio	0.58	0.33
v/c Ratio	0.63	0.59
Control Delay	13.5	7.2
Queue Delay	212.0	0.1
Total Delay	225.5	7.4
LOS	F	A
Approach Delay	225.5	7.4
Approach LOS	F	A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green	
Natural Cycle: 45	
Control Type: Pretimed	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 148.9	Intersection LOS: F
Intersection Capacity Utilization 58.0%	ICU Level of Service B
Analysis Period (min) 15	

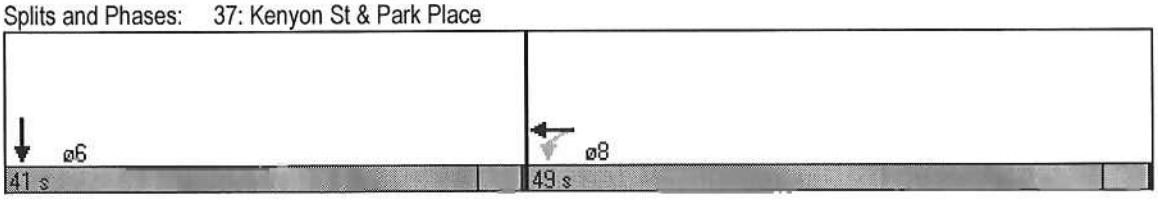
Splits and Phases: 40: Irving St & Park Place



Lane Group	WBT	SBT
Lane Configurations		
Volume (vph)	1612	876
Turn Type		
Protected Phases	8	6
Permitted Phases		
Detector Phase	8	6
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	49.0	41.0
Total Split (%)	54.4%	45.6%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	4.0	4.0
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	Max
Act Effct Green (s)	45.0	37.0
Actuated g/C Ratio	0.50	0.41
v/c Ratio	0.71	0.69
Control Delay	19.2	24.8
Queue Delay	0.0	0.0
Total Delay	19.2	24.8
LOS	B	C
Approach Delay	19.2	24.8
Approach LOS	B	C

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 8:WBTL, Start of Green	
Natural Cycle: 45	
Control Type: Pretimed	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 21.2	Intersection LOS: C
Intersection Capacity Utilization 64.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 37: Kenyon St & Park Place

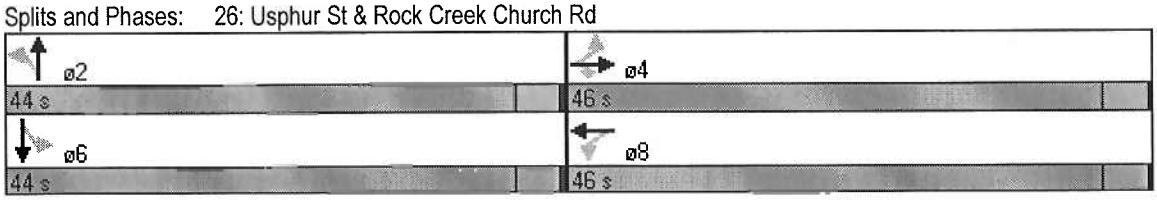


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	306	36	10	26	26	5	119	67	192
Turn Type	Perm		Perm	Perm		Perm		Perm	
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	46.0	46.0	46.0	46.0	46.0	44.0	44.0	44.0	44.0
Total Split (%)	51.1%	51.1%	51.1%	51.1%	51.1%	48.9%	48.9%	48.9%	48.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		42.0	42.0		42.0		40.0		40.0
Actuated g/C Ratio		0.47	0.47		0.47		0.44		0.44
v/c Ratio		0.63	0.01		0.16		0.19		0.64
Control Delay		23.8	7.0		7.7		15.0		21.6
Queue Delay		0.0	0.0		0.0		0.0		0.0
Total Delay		23.8	7.0		7.7		15.0		21.6
LOS		C	A		A		B		C
Approach Delay		23.4			7.7		15.0		21.6
Approach LOS		C			A		B		C

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 19.9 Intersection LOS: B
Intersection Capacity Utilization 67.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 26: Usphur St & Rock Creek Church Rd



Lane Group	NBT	NBR	SBL	SBT
Lane Configurations				
Volume (vph)	119	383	21	606
Turn Type		Perm	Perm	
Protected Phases	4			8
Permitted Phases		4	8	
Detector Phase	4	4	8	8
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0
Total Split (s)	90.0	90.0	90.0	90.0
Total Split (%)	100.0%	100.0%	100.0%	100.0%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	Max	Max	Max	Max
Act Effct Green (s)	90.0	90.0		90.0
Actuated g/C Ratio	1.00	1.00		1.00
v/c Ratio	0.07	0.26		0.37
Control Delay	0.1	0.4		0.6
Queue Delay	0.0	0.0		0.0
Total Delay	0.1	0.4		0.6
LOS	A	A		A
Approach Delay	0.3			0.6
Approach LOS	A			A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:NBT, Start of Green	
Natural Cycle: 40	
Control Type: Pretimed	
Maximum v/c Ratio: 0.37	
Intersection Signal Delay: 0.5	Intersection LOS: A
Intersection Capacity Utilization 63.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: Harewood Rd & Rock Creek Church Rd

Lane Group	EBT	NBT	NBR	SBL	SBT
Lane Configurations					
Volume (vph)	309	1309	123	98	2641
Turn Type			Perm	Prot	
Protected Phases	4	2		1	6
Permitted Phases			2		
Detector Phase	4	2	2	1	6
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0
Total Split (s)	20.0	82.0	82.0	18.0	100.0
Total Split (%)	16.7%	68.3%	68.3%	15.0%	83.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag		Lead	Lead	Lag	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	15.7	78.3	78.3	14.0	96.3
Actuated g/C Ratio	0.13	0.65	0.65	0.12	0.80
v/c Ratio	0.87	0.62	0.12	0.52	1.01
Control Delay	69.4	13.6	1.5	41.1	28.8
Queue Delay	0.0	0.2	0.0	0.0	73.1
Total Delay	69.4	13.9	1.5	41.1	101.9
LOS	E	B	A	D	F
Approach Delay	69.4	12.8			99.7
Approach LOS	E	B			F

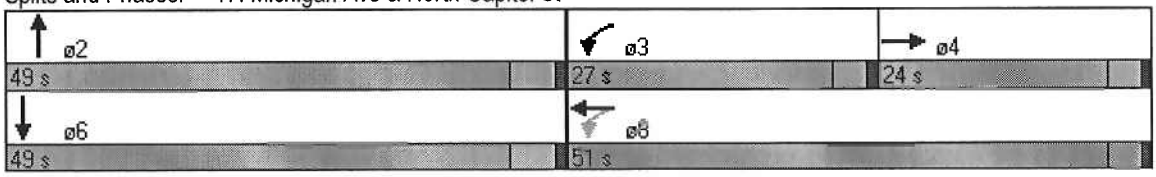
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 69.8	Intersection LOS: E
Intersection Capacity Utilization 90.0%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 2: Harewood Rd & North Capitol St

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Configurations					
Volume (vph)	547	335	1450	1626	1957
Turn Type		pm+pt			
Protected Phases	4	3	8	2	6
Permitted Phases		8			
Detector Phase	4	3	8	2	6
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	8.0	20.0	21.0	21.0
Total Split (s)	24.0	27.0	51.0	49.0	49.0
Total Split (%)	24.0%	27.0%	51.0%	49.0%	49.0%
Yellow Time (s)	3.0	3.0	3.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	5.0	5.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	None	Max	None	None	None
Act Effct Green (s)	20.0	47.0	47.0	44.0	44.0
Actuated g/C Ratio	0.20	0.47	0.47	0.44	0.44
v/c Ratio	0.74	0.76	1.03	0.91	1.08
Control Delay	39.4	32.9	57.9	33.3	71.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	39.4	32.9	57.9	33.3	71.9
LOS	D	C	E	C	E
Approach Delay	39.4		53.5	33.3	71.9
Approach LOS	D		D	C	E

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 52.4	Intersection LOS: D
Intersection Capacity Utilization 94.1%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 17: Michigan Ave & North Capitol St

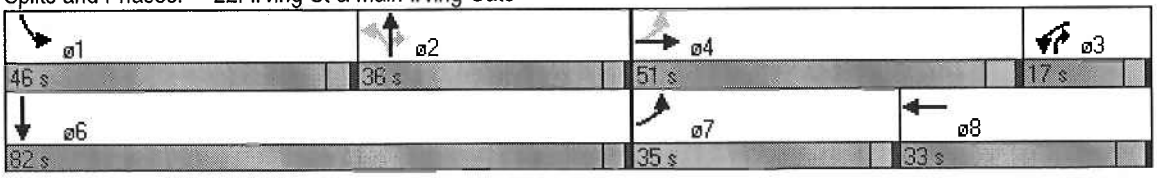


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	679	1135	162	799	321	32	1109	815	52
Turn Type	pm+pt		Prot		Perm		pm+ov	Prot	
Protected Phases	7	4	3	8		2	3	1	6
Permitted Phases	4				2		2		
Detector Phase	7	4	3	8	2	2	3	1	6
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	9.0	21.0	21.0	21.0	9.0	9.0	21.0
Total Split (s)	35.0	51.0	17.0	33.0	36.0	36.0	17.0	46.0	82.0
Total Split (%)	23.3%	34.0%	11.3%	22.0%	24.0%	24.0%	11.3%	30.7%	54.7%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	Max	None	Max	None	None	None	None	None
Act Effct Green (s)	48.0	47.0	14.0	29.0		33.0	47.0	43.0	79.0
Actuated g/C Ratio	0.32	0.31	0.09	0.19		0.22	0.31	0.29	0.53
v/c Ratio	1.71	1.30	0.55	1.25		1.48	1.36	1.75	0.18
Control Delay	360.5	181.3	72.0	167.3		276.5	200.6	376.7	8.2
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	360.5	181.3	72.0	167.3		276.5	200.6	376.7	8.2
LOS	F	F	E	F		F	F	F	A
Approach Delay		242.6		155.5		218.9			318.8
Approach LOS		F		F		F			F

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.75
Intersection Signal Delay: 229.6 Intersection LOS: F
Intersection Capacity Utilization 138.6% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 22: Irving St & Main Irving Gate



Phasings
22: Irving St & Main Irving Gate

6/29/2007

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Protected Phases	7	4	3	8		2	3	1	6
Permitted Phases	4				2		2		
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	9.0	21.0	21.0	21.0	9.0	9.0	21.0
Total Split (s)	35.0	51.0	17.0	33.0	36.0	36.0	17.0	46.0	82.0
Total Split (%)	23.3%	34.0%	11.3%	22.0%	24.0%	24.0%	11.3%	30.7%	54.7%
Maximum Green (s)	31.0	46.0	13.0	28.0	32.0	32.0	13.0	42.0	78.0
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	None	Max	None	None	None	None	None
Walk Time (s)		5.0		5.0	5.0	5.0			5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)		0		0	0	0			0
90th %ile Green (s)	31.0	46.0	13.0	28.0	32.0	32.0	13.0	42.0	78.0
90th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold
70th %ile Green (s)	31.0	46.0	13.0	28.0	32.0	32.0	13.0	42.0	78.0
70th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold
50th %ile Green (s)	31.0	46.0	13.0	28.0	32.0	32.0	13.0	42.0	78.0
50th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold
30th %ile Green (s)	31.0	46.0	13.0	28.0	32.0	32.0	13.0	42.0	78.0
30th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold
10th %ile Green (s)	31.0	46.0	13.0	28.0	32.0	32.0	13.0	42.0	78.0
10th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Max	Hold

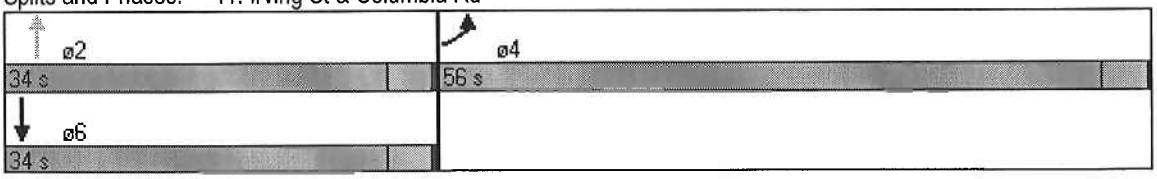
Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 150
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 150
70th %ile Actuated Cycle: 150
50th %ile Actuated Cycle: 150
30th %ile Actuated Cycle: 150
10th %ile Actuated Cycle: 150

Lane Group	EBL	NBT	SBT
Lane Configurations			
Volume (vph)	1332	653	155
Turn Type			
Protected Phases	4		6
Permitted Phases		2	
Detector Phase	4	2	6
Switch Phase			
Minimum Initial (s)	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0
Total Split (s)	56.0	34.0	34.0
Total Split (%)	62.2%	37.8%	37.8%
Yellow Time (s)	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0
Lead/Lag			
Lead-Lag Optimize?			
Recall Mode	Max	Max	Max
Act Effct Green (s)	52.0	30.0	30.0
Actuated g/C Ratio	0.58	0.33	0.33
v/c Ratio	0.50	0.42	0.14
Control Delay	19.1	24.2	21.4
Queue Delay	1.7	0.0	0.0
Total Delay	20.8	24.2	21.4
LOS	C	C	C
Approach Delay	20.8	24.2	21.4
Approach LOS	C	C	C

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 40
Control Type: Pretimed
Maximum v/c Ratio: 0.50
Intersection Signal Delay: 21.9 Intersection LOS: C
Intersection Capacity Utilization 118.0% ICU Level of Service H
Analysis Period (min) 15

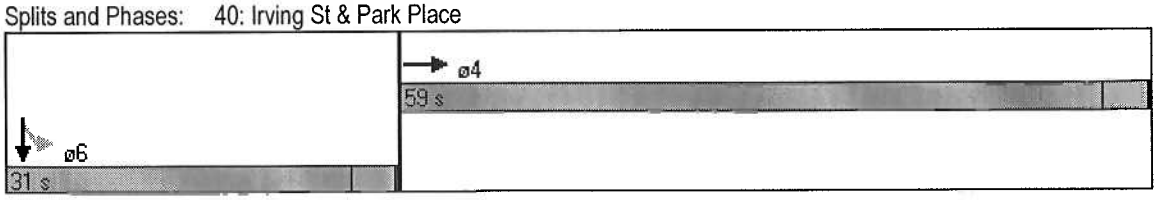
Splits and Phases: 41: Irving St & Columbia Rd



Lane Group	EBT	SBT
Lane Configurations		
Volume (vph)	1213	513
Turn Type		
Protected Phases	4	6
Permitted Phases		
Detector Phase	4	6
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	59.0	31.0
Total Split (%)	65.6%	34.4%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	4.0	4.0
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	Max
Act Effct Green (s)	55.0	27.0
Actuated g/C Ratio	0.61	0.30
v/c Ratio	0.50	0.44
Control Delay	10.0	6.3
Queue Delay	0.3	0.0
Total Delay	10.3	6.3
LOS	B	A
Approach Delay	10.3	6.3
Approach LOS	B	A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green	
Natural Cycle: 40	
Control Type: Pretimed	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 9.1	Intersection LOS: A
Intersection Capacity Utilization 46.8%	ICU Level of Service A
Analysis Period (min) 15	

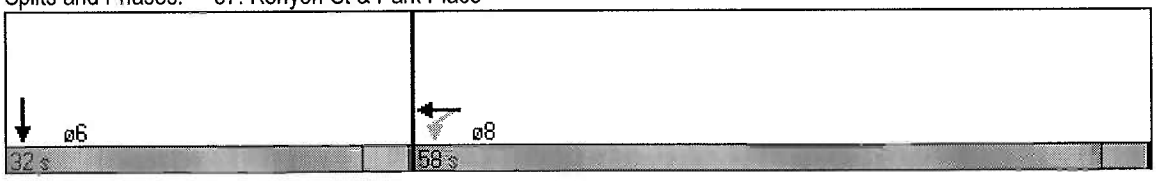
Splits and Phases: 40: Irving St & Park Place



Lane Group	WBT	SBT
Lane Configurations		
Volume (vph)	1977	606
Turn Type		
Protected Phases	8	6
Permitted Phases		
Detector Phase	8	6
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	20.0
Total Split (s)	58.0	32.0
Total Split (%)	64.4%	35.6%
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)	0.0	0.0
Total Lost Time (s)	4.0	4.0
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	Max	Max
Act Effct Green (s)	54.0	28.0
Actuated g/C Ratio	0.60	0.31
v/c Ratio	0.71	0.65
Control Delay	14.2	29.8
Queue Delay	0.0	0.0
Total Delay	14.2	29.8
LOS	B	C
Approach Delay	14.2	29.8
Approach LOS	B	C

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 8:WBTL, Start of Green	
Natural Cycle: 50	
Control Type: Pretimed	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 18.1	Intersection LOS: B
Intersection Capacity Utilization 63.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 37: Kenyon St & Park Place

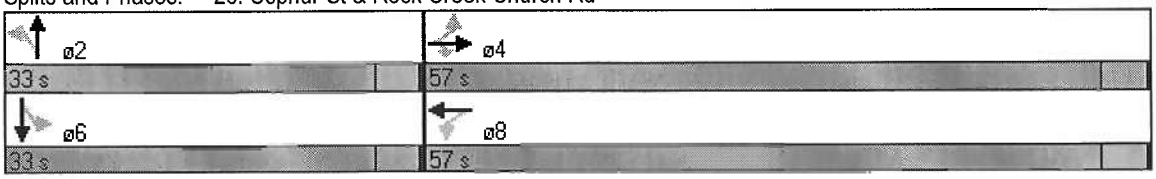


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	373	21	21	16	36	5	202	36	124
Turn Type	Perm		Perm	Perm		Perm		Perm	
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	57.0	57.0	57.0	57.0	57.0	33.0	33.0	33.0	33.0
Total Split (%)	63.3%	63.3%	63.3%	63.3%	63.3%	36.7%	36.7%	36.7%	36.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		53.0	53.0		53.0		29.0		29.0
Actuated g/C Ratio		0.59	0.59		0.59		0.32		0.32
v/c Ratio		0.63	0.02		0.19		0.42		0.51
Control Delay		17.3	3.3		3.3		26.0		25.1
Queue Delay		0.0	0.0		0.0		0.0		0.0
Total Delay		17.3	3.3		3.3		26.0		25.1
LOS		B	A		A		C		C
Approach Delay		16.6			3.3		26.0		25.1
Approach LOS		B			A		C		C

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 72.6% ICU Level of Service C
Analysis Period (min) 15

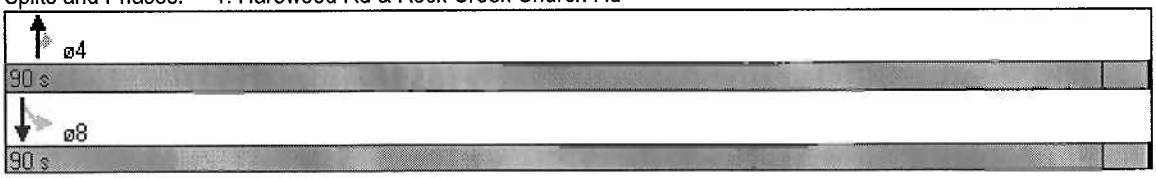
Splits and Phases: 26: Usphur St & Rock Creek Church Rd



Lane Group	NBT	NBR	SBL	SBT
Lane Configurations				
Volume (vph)	218	394	10	420
Turn Type		Perm	Perm	
Protected Phases	4			8
Permitted Phases		4	8	
Detector Phase	4	4	8	8
Switch Phase				
Minimum Initial (s)	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0
Total Split (s)	90.0	90.0	90.0	90.0
Total Split (%)	100.0%	100.0%	100.0%	100.0%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	Max	Max	Max	Max
Act Effct Green (s)	90.0	90.0		90.0
Actuated g/C Ratio	1.00	1.00		1.00
v/c Ratio	0.13	0.27		0.25
Control Delay	0.1	0.4		0.3
Queue Delay	0.0	0.0		0.0
Total Delay	0.1	0.4		0.3
LOS	A	A		A
Approach Delay	0.3			0.3
Approach LOS	A			A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green	
Natural Cycle: 40	
Control Type: Pretimed	
Maximum v/c Ratio: 0.27	
Intersection Signal Delay: 0.3	Intersection LOS: A
Intersection Capacity Utilization 53.7%	ICU Level of Service A
Analysis Period (min) 15	

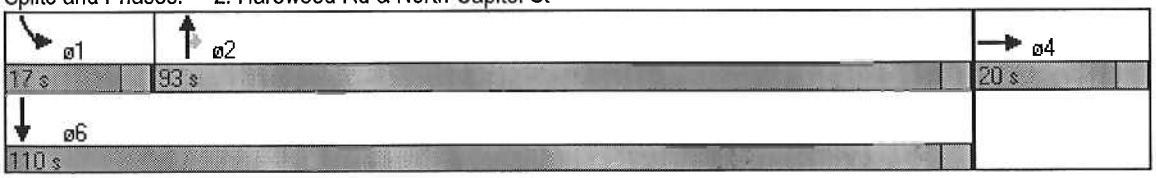
Splits and Phases: 1: Harewood Rd & Rock Creek Church Rd



Lane Group	EBT	NBT	NBR	SBL	SBT
Lane Configurations					
Volume (vph)	360	2347	262	159	1206
Turn Type			Perm	Prot	
Protected Phases	4	2		1	6
Permitted Phases			2		
Detector Phase	4	2	2	1	6
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	14.5	26.5
Total Split (s)	20.0	93.0	93.0	17.0	110.0
Total Split (%)	15.4%	71.5%	71.5%	13.1%	84.6%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0
Lead/Lag		Lag	Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	Max	C-Max
Act Effct Green (s)	16.0	89.0	89.0	13.0	106.0
Actuated g/C Ratio	0.12	0.68	0.68	0.10	0.82
v/c Ratio	1.00	1.05	0.26	0.98	0.45
Control Delay	98.8	55.5	6.8	133.6	3.0
Queue Delay	0.0	24.4	0.0	17.8	0.1
Total Delay	98.8	80.0	6.8	151.4	3.1
LOS	F	E	A	F	A
Approach Delay	98.8	72.6			20.4
Approach LOS	F	E			C

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection	
Natural Cycle: 130	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 58.7	Intersection LOS: E
Intersection Capacity Utilization 109.1%	ICU Level of Service H
Analysis Period (min) 15	

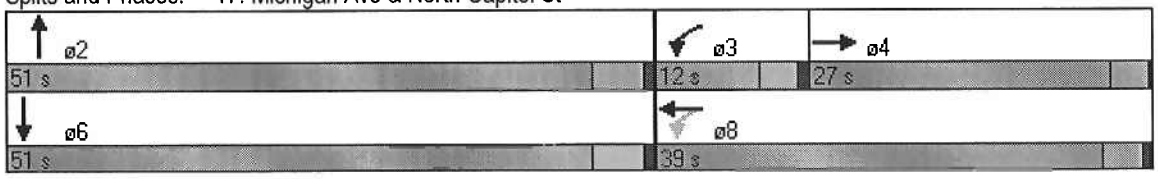
Splits and Phases: 2: Harewood Rd & North Capitol St



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Configurations					
Volume (vph)	1009	103	580	2080	1692
Turn Type		pm+pt			
Protected Phases	4	3	8	2	6
Permitted Phases		8			
Detector Phase	4	3	8	2	6
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	19.5	8.0	20.0	21.0	21.0
Total Split (s)	27.0	12.0	39.0	51.0	51.0
Total Split (%)	30.0%	13.3%	43.3%	56.7%	56.7%
Yellow Time (s)	3.0	3.0	3.0	4.0	4.0
All-Red Time (s)	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.5	4.0	4.0	5.0	5.0
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	None	Max	None	None	None
Act Effct Green (s)	23.5	35.0	35.0	46.0	46.0
Actuated g/C Ratio	0.26	0.39	0.39	0.51	0.51
v/c Ratio	0.95	0.47	0.66	1.02	0.73
Control Delay	48.3	24.7	25.5	44.5	19.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	48.3	24.7	25.5	44.5	19.3
LOS	D	C	C	D	B
Approach Delay	48.3		25.4	44.5	19.3
Approach LOS	D		C	D	B

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 35.3	Intersection LOS: D
Intersection Capacity Utilization 86.8%	ICU Level of Service E
Analysis Period (min) 15	

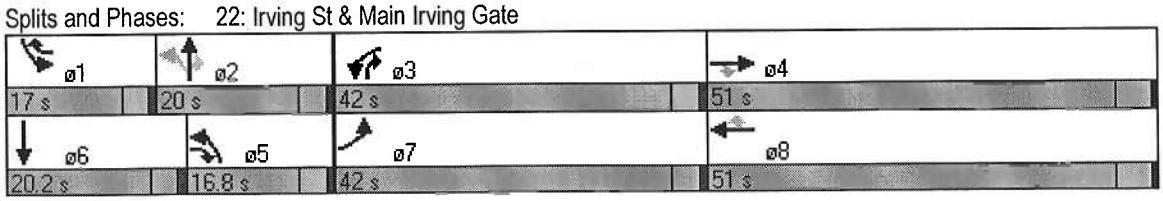
Splits and Phases: 17: Michigan Ave & North Capitol St



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	1005	467	466	716	1732	676	104	36	331	266	33
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	Prot	
Protected Phases	7	4	5	3	8	1	5	2	3	1	6
Permitted Phases			4			8	2		2		
Detector Phase	7	4	5	3	8	1	5	2	3	1	6
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0
Minimum Split (s)	8.0	21.0	8.5	8.0	21.0	7.0	8.5	20.0	8.0	7.0	20.0
Total Split (s)	42.0	51.0	16.8	42.0	51.0	17.0	16.8	20.0	42.0	17.0	20.2
Total Split (%)	32.3%	39.2%	12.9%	32.3%	39.2%	13.1%	12.9%	15.4%	32.3%	13.1%	15.5%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Max	None	None	Max	None	None	None	None	None	None
Act Effct Green (s)	39.1	50.9	69.9	35.3	47.1	64.6		17.4	49.8	13.5	9.7
Actuated g/C Ratio	0.31	0.41	0.56	0.28	0.38	0.52		0.14	0.40	0.11	0.08
v/c Ratio	1.01	0.24	0.51	0.80	0.98	0.81		0.60	0.28	0.53	0.44
Control Delay	72.8	25.9	8.2	48.0	54.2	27.4		62.5	7.5	56.8	42.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	72.8	25.9	8.2	48.0	54.2	27.4		62.5	7.5	56.8	42.2
LOS	E	C	A	D	D	C		E	A	E	D
Approach Delay		45.9			47.0			23.8			54.0
Approach LOS		D			D			C			D

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 124.2	
Natural Cycle: 130	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 45.2	Intersection LOS: D
Intersection Capacity Utilization 88.2%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 22: Irving St & Main Irving Gate



Phasings
22: Irving St & Main Irving Gate

8/23/2007

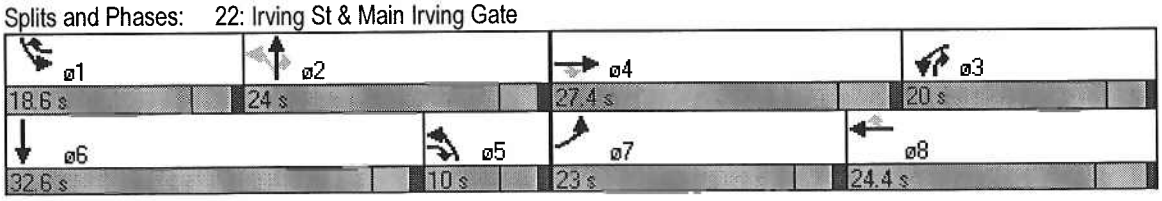
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Protected Phases	7	4	5	3	8	1	5	2	3	1	6
Permitted Phases			4			8	2		2		
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0
Minimum Split (s)	8.0	21.0	8.5	8.0	21.0	7.0	8.5	20.0	8.0	7.0	20.0
Total Split (s)	42.0	51.0	16.8	42.0	51.0	17.0	16.8	20.0	42.0	17.0	20.2
Total Split (%)	32.3%	39.2%	12.9%	32.3%	39.2%	13.1%	12.9%	15.4%	32.3%	13.1%	15.5%
Maximum Green (s)	38.0	46.0	12.8	38.0	46.0	13.0	12.8	16.0	38.0	13.0	16.2
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	None	None	Max	None	None	None	None	None	None
Walk Time (s)		5.0			5.0			5.0			5.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0
Pedestrian Calls (#/hr)		0			0			0			0
90th %ile Green (s)	38.0	46.0	16.3	38.0	46.0	13.0	16.3	16.0	38.0	13.0	12.7
90th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Max	Max	Max	Gap
70th %ile Green (s)	38.0	46.0	17.5	38.0	46.0	13.0	17.5	14.7	38.0	13.0	10.2
70th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Gap	Max	Max	Gap
50th %ile Green (s)	38.0	47.4	15.2	36.6	46.0	13.0	15.2	10.6	36.6	13.0	8.4
50th %ile Term Code	Max	Hold	Hold	Gap	MaxR	Max	Hold	Gap	Gap	Max	Gap
30th %ile Green (s)	38.0	51.4	12.8	32.6	46.0	13.0	12.8	6.5	32.6	13.0	6.7
30th %ile Term Code	Max	Hold	Hold	Gap	MaxR	Max	Hold	Gap	Gap	Max	Gap
10th %ile Green (s)	38.0	57.2	20.0	26.8	46.0	10.5	20.0	5.5	26.8	10.5	0.0
10th %ile Term Code	Max	Hold	Hold	Gap	MaxR	Gap	Hold	Gap	Gap	Gap	Skip

Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 124.2
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 128.7
50th %ile Actuated Cycle: 124.6
30th %ile Actuated Cycle: 120.5
10th %ile Actuated Cycle: 117

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	679	1135	171	162	799	341	321	32	1109	815	52
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	Prot	
Protected Phases	7	4	5	3	8	1	5	2	3	1	6
Permitted Phases			4			8	2		2		
Detector Phase	7	4	5	3	8	1	5	2	3	1	6
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	8.5	9.0	21.0	8.5	8.5	20.0	9.0	8.5	21.0
Total Split (s)	23.0	27.4	10.0	20.0	24.4	18.6	10.0	24.0	20.0	18.6	32.6
Total Split (%)	25.6%	30.4%	11.1%	22.2%	27.1%	20.7%	11.1%	26.7%	22.2%	20.7%	36.2%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Max	None	None	Max	None	None	None	None	None	None
Act Effct Green (s)	20.0	23.4	53.8	17.0	20.4	40.0		26.4	38.0	15.6	10.2
Actuated g/C Ratio	0.22	0.26	0.60	0.19	0.23	0.44		0.29	0.42	0.17	0.11
v/c Ratio	0.97	0.93	0.18	0.27	0.75	0.41		0.73	1.02	1.02	0.58
Control Delay	61.5	46.6	2.0	32.5	37.3	3.2		40.2	50.4	74.9	22.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Delay	61.5	46.6	2.0	32.5	37.3	3.2		40.2	50.4	74.9	22.5
LOS	E	D	A	C	D	A		D	D	E	C
Approach Delay		47.8			27.8			47.9			66.6
Approach LOS		D			C			D			E

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 46.5	Intersection LOS: D
Intersection Capacity Utilization 86.2%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 22: Irving St & Main Irving Gate



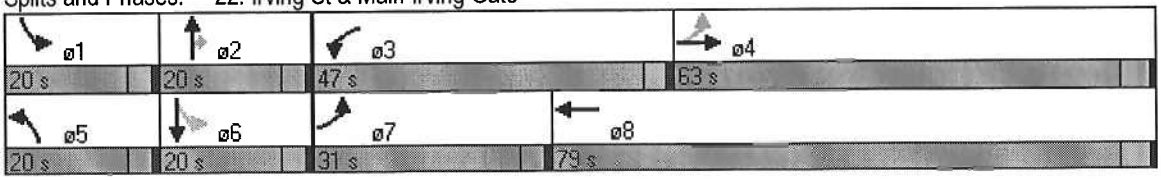
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Protected Phases	7	4	5	3	8	1	5	2	3	1	6
Permitted Phases			4			8	2		2		
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	8.5	9.0	21.0	8.5	8.5	20.0	9.0	8.5	21.0
Total Split (s)	23.0	27.4	10.0	20.0	24.4	18.6	10.0	24.0	20.0	18.6	32.6
Total Split (%)	25.6%	30.4%	11.1%	22.2%	27.1%	20.7%	11.1%	26.7%	22.2%	20.7%	36.2%
Maximum Green (s)	19.0	22.4	6.0	16.0	19.4	14.6	6.0	20.0	16.0	14.6	28.6
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	None	None	Max	None	None	None	None	None	None
Walk Time (s)		5.0			5.0			5.0			5.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0
Pedestrian Calls (#/hr)		0			0			0			0
90th %ile Green (s)	19.0	22.4	20.0	16.0	19.4	14.6	20.0	20.0	16.0	14.6	14.6
90th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Max	Max	Max	Gap
70th %ile Green (s)	19.0	22.4	23.5	16.0	19.4	14.6	23.5	20.0	16.0	14.6	11.1
70th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Max	Max	Max	Gap
50th %ile Green (s)	19.0	22.4	26.0	16.0	19.4	14.6	26.0	20.0	16.0	14.6	8.6
50th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Max	Max	Max	Gap
30th %ile Green (s)	19.0	22.4	28.4	16.0	19.4	14.6	28.4	20.0	16.0	14.6	6.2
30th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Max	Max	Max	Gap
10th %ile Green (s)	19.0	22.4	29.1	16.0	19.4	14.6	29.1	20.0	16.0	14.6	5.5
10th %ile Term Code	Max	MaxR	Hold	Max	MaxR	Max	Hold	Max	Max	Max	Gap

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 90
70th %ile Actuated Cycle: 90
50th %ile Actuated Cycle: 90
30th %ile Actuated Cycle: 90
10th %ile Actuated Cycle: 90

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT	ø5
Lane Configurations									
Volume (vph)	355	667	716	1832	36	331	66	33	
Turn Type	pm+pt		Prot			Perm	pm+pt		
Protected Phases	7	4	3	8	2		1	6	5
Permitted Phases	4					2	6		
Detector Phase	7	4	3	8	2	2	1	6	
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	21.0	8.0	21.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	31.0	63.0	47.0	79.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	20.7%	42.0%	31.3%	52.7%	13.3%	13.3%	13.3%	13.3%	13%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Max	None	Max	None	None	None	None	None
Act Effct Green (s)	93.8	64.8	38.3	75.0	0.0	17.0	31.3	31.3	
Actuated g/C Ratio	0.65	0.45	0.27	0.52	0.00	0.12	0.22	0.22	
v/c Ratio	0.97	0.56	0.85	1.01	no cap	0.56	0.35	0.18	
Control Delay	85.3	27.6	60.3	54.2		9.1	50.7	31.1	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Total Delay	85.3	27.6	60.3	54.2	Error	9.1	50.7	31.1	
LOS	F	C	E	D	F	A	D	C	
Approach Delay		41.4		55.6	Err			41.0	
Approach LOS		D		E	F			D	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 144.3	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: Err	
Intersection Signal Delay: Err	Intersection LOS: F
Intersection Capacity Utilization 92.2%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 22: Irving St & Main Irving Gate



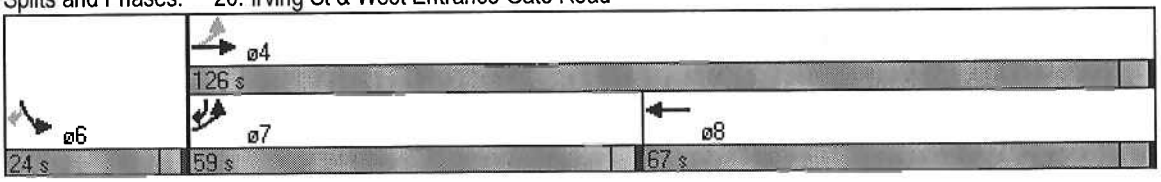
Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT	ø5
Protected Phases	7	4	3	8	2		1	6	5
Permitted Phases	4					2	6		
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	21.0	8.0	21.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	31.0	63.0	47.0	79.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	20.7%	42.0%	31.3%	52.7%	13.3%	13.3%	13.3%	13.3%	13%
Maximum Green (s)	27.0	58.0	43.0	74.0	16.0	16.0	16.0	16.0	16.0
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	None	Max	None	None	None	None	None
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0		0	0	0	0	0	0
90th %ile Green (s)	27.0	58.0	43.0	74.0	16.0	16.0	14.0	34.0	0.0
90th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Gap	Hold	Skip
70th %ile Green (s)	27.0	59.7	41.3	74.0	16.0	16.0	11.8	31.8	0.0
70th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Hold	Skip
50th %ile Green (s)	27.0	62.8	38.2	74.0	16.0	16.0	10.2	30.2	0.0
50th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Hold	Skip
30th %ile Green (s)	27.0	66.7	34.3	74.0	16.0	16.0	8.7	28.7	0.0
30th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Hold	Skip
10th %ile Green (s)	27.0	71.2	29.8	74.0	16.0	16.0	6.7	26.7	0.0
10th %ile Term Code	Max	Hold	Gap	MaxR	Max	Max	Gap	Hold	Skip

Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 144.3
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 148
70th %ile Actuated Cycle: 145.8
50th %ile Actuated Cycle: 144.2
30th %ile Actuated Cycle: 142.7
10th %ile Actuated Cycle: 140.7

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations					
Volume (vph)	650	1288	1868	200	557
Turn Type	pm+pt				pm+ov
Protected Phases	7	4	8	6	7
Permitted Phases	4				6
Detector Phase	7	4	8	6	7
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	20.0	9.0
Total Split (s)	59.0	126.0	67.0	24.0	59.0
Total Split (%)	39.3%	84.0%	44.7%	16.0%	39.3%
Yellow Time (s)	3.0	4.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0
Lead/Lag	Lead		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes
Recall Mode	None	None	None	Min	None
Act Effct Green (s)	122.0	121.0	62.0	19.8	78.8
Actuated g/C Ratio	0.81	0.81	0.41	0.13	0.53
v/c Ratio	1.01	0.34	1.02	0.93	0.73
Control Delay	76.4	4.1	68.3	106.5	33.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	76.4	4.1	68.3	106.5	33.5
LOS	E	A	E	F	C
Approach Delay		28.3	68.3	52.8	
Approach LOS		C	E	D	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 149.8	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 49.2	Intersection LOS: D
Intersection Capacity Utilization 96.2%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 20: Irving St & West Entrance Gate Road



Phasings
20: Irving St & West Entrance Gate Road

8/23/2007

Lane Group	EBL	EBT	WBT	SBL	SBR
Protected Phases	7	4	8	6	7
Permitted Phases	4				6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	20.0	9.0
Total Split (s)	59.0	126.0	67.0	24.0	59.0
Total Split (%)	39.3%	84.0%	44.7%	16.0%	39.3%
Maximum Green (s)	55.0	121.0	62.0	20.0	55.0
Yellow Time (s)	3.0	4.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	None	None	Min	None
Walk Time (s)		5.0	5.0	5.0	
Flash Dont Walk (s)		11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0	0	0	
90th %ile Green (s)	55.0	121.0	62.0	20.0	55.0
90th %ile Term Code	Max	Hold	Max	Max	Max
70th %ile Green (s)	55.0	121.0	62.0	20.0	55.0
70th %ile Term Code	Max	Hold	Max	Max	Max
50th %ile Green (s)	55.0	121.0	62.0	20.0	55.0
50th %ile Term Code	Max	Hold	Max	Max	Max
30th %ile Green (s)	55.0	121.0	62.0	20.0	55.0
30th %ile Term Code	Max	Hold	Max	Max	Max
10th %ile Green (s)	55.0	121.0	62.0	18.8	55.0
10th %ile Term Code	Max	Hold	Max	Gap	Max

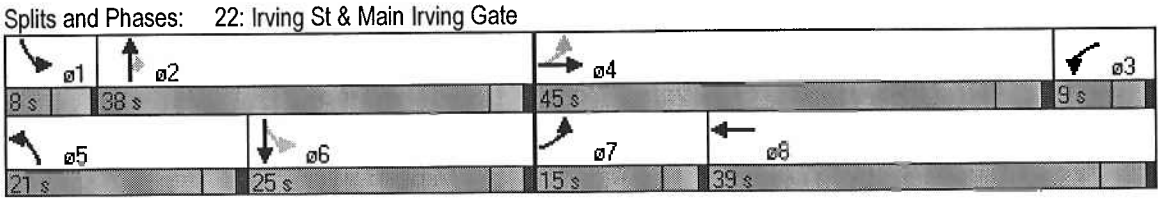
Intersection Summary
Cycle Length: 150
Actuated Cycle Length: 149.8
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 150
70th %ile Actuated Cycle: 150
50th %ile Actuated Cycle: 150
30th %ile Actuated Cycle: 150
10th %ile Actuated Cycle: 148.8

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT	ø5
Lane Configurations									
Volume (vph)	179	1735	162	919	32	1109	215	52	
Turn Type	pm+pt		Prot			Perm	pm+pt		
Protected Phases	7	4	3	8	2		1	6	5
Permitted Phases	4					2	6		
Detector Phase	7	4	3	8	2	2	1	6	
Switch Phase									
Minimum Initial (s)	4.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
Minimum Split (s)	9.0	21.0	9.0	21.0	21.0	21.0	8.0	21.0	21.0
Total Split (s)	15.0	45.0	9.0	39.0	38.0	38.0	8.0	25.0	21.0
Total Split (%)	15.0%	45.0%	9.0%	39.0%	38.0%	38.0%	8.0%	25.0%	21%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	0.5	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Max	None	Max	None	None	None	None	None
Act Effct Green (s)	42.0	41.0	6.0	35.5	0.0	35.0	43.0	43.0	
Actuated g/C Ratio	0.42	0.41	0.06	0.36	0.00	0.35	0.43	0.43	
v/c Ratio	0.69	1.00	0.85	0.69	no cap	1.10	0.80	0.21	
Control Delay	33.9	49.9	81.6	28.7		85.4	44.3	9.4	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	
Total Delay	33.9	49.9	81.6	28.7	Error	85.4	44.3	9.4	
LOS	C	D	F	C	F	F	D	A	
Approach Delay		48.5		35.3	Err			29.9	
Approach LOS		D		D	F			C	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: Err
Intersection Signal Delay: Err — Intersection LOS: F
Intersection Capacity Utilization 98.0% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 22: Irving St & Main Irving Gate



Phasings
22: Irving St & Main Irving Gate

8/23/2007

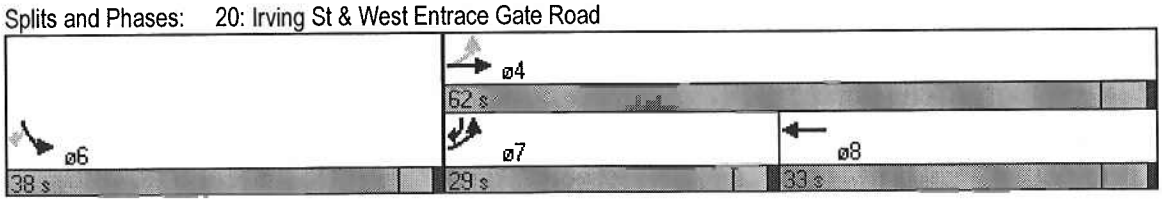
Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT	ø5
Protected Phases	7	4	3	8	2		1	6	5
Permitted Phases	4					2	6		
Minimum Initial (s)	4.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
Minimum Split (s)	9.0	21.0	9.0	21.0	21.0	21.0	8.0	21.0	21.0
Total Split (s)	15.0	45.0	9.0	39.0	38.0	38.0	8.0	25.0	21.0
Total Split (%)	15.0%	45.0%	9.0%	39.0%	38.0%	38.0%	8.0%	25.0%	21%
Maximum Green (s)	11.0	40.0	5.0	34.0	34.0	34.0	4.0	21.0	17.0
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	3.0	3.5	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	0.5	1.0	1.0
Lead/Lag	Lead	Lead	Lag	Lag	Lag	Lag	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	None	Max	None	None	None	None	None
Walk Time (s)		5.0		5.0	5.0	5.0		5.0	5.0
Flash Dont Walk (s)		11.0		11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0		0	0	0		0	0
90th %ile Green (s)	11.0	40.0	5.0	34.0	34.0	34.0	4.0	42.0	0.0
90th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Hold	Skip
70th %ile Green (s)	11.0	40.0	5.0	34.0	34.0	34.0	4.0	42.0	0.0
70th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Hold	Skip
50th %ile Green (s)	11.0	40.0	5.0	34.0	34.0	34.0	4.0	42.0	0.0
50th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Hold	Skip
30th %ile Green (s)	11.0	40.0	5.0	34.0	34.0	34.0	4.0	42.0	0.0
30th %ile Term Code	Max	MaxR	Max	MaxR	Max	Max	Max	Hold	Skip
10th %ile Green (s)	8.7	40.0	5.0	36.3	34.0	34.0	4.0	42.0	0.0
10th %ile Term Code	Gap	MaxR	Max	Hold	Max	Max	Max	Hold	Skip

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 100
50th %ile Actuated Cycle: 100
30th %ile Actuated Cycle: 100
10th %ile Actuated Cycle: 100

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations					
Volume (vph)	500	1485	1219	600	940
Turn Type	pm+pt				pm+ov
Protected Phases	7	4	8	6	7
Permitted Phases	4				6
Detector Phase	7	4	8	6	7
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	21.0	21.0	21.0	8.0
Total Split (s)	29.0	62.0	33.0	38.0	29.0
Total Split (%)	29.0%	62.0%	33.0%	38.0%	29.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	4.0
Lead/Lag	Lead		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes
Recall Mode	None	Max	Max	None	None
Act Effct Green (s)	58.0	57.0	28.0	34.0	63.0
Actuated g/C Ratio	0.58	0.57	0.28	0.34	0.63
v/c Ratio	1.05	0.56	1.03	1.08	1.02
Control Delay	80.3	14.5	66.9	94.3	55.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	80.3	14.5	66.9	94.3	55.0
LOS	F	B	E	F	D
Approach Delay		31.1	66.9	70.3	
Approach LOS		C	E	E	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Natural Cycle: 100	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 53.3	Intersection LOS: D
Intersection Capacity Utilization 98.0%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 20: Irving St & West Entrace Gate Road



Lane Group	EBL	EBT	WBT	SBL	SBR
Protected Phases	7	4	8	6	7
Permitted Phases	4				6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	21.0	21.0	21.0	8.0
Total Split (s)	29.0	62.0	33.0	38.0	29.0
Total Split (%)	29.0%	62.0%	33.0%	38.0%	29.0%
Maximum Green (s)	25.0	57.0	28.0	34.0	25.0
Yellow Time (s)	3.0	4.0	4.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lead/Lag	Lead		Lag		Lead
Lead-Lag Optimize?	Yes		Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max	Max	None	None
Walk Time (s)		5.0	5.0	5.0	
Flash Dont Walk (s)		11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0	0	0	
90th %ile Green (s)	25.0	57.0	28.0	34.0	25.0
90th %ile Term Code	Max	MaxR	MaxR	Max	Max
70th %ile Green (s)	25.0	57.0	28.0	34.0	25.0
70th %ile Term Code	Max	MaxR	MaxR	Max	Max
50th %ile Green (s)	25.0	57.0	28.0	34.0	25.0
50th %ile Term Code	Max	MaxR	MaxR	Max	Max
30th %ile Green (s)	25.0	57.0	28.0	34.0	25.0
30th %ile Term Code	Max	MaxR	MaxR	Max	Max
10th %ile Green (s)	25.0	57.0	28.0	34.0	25.0
10th %ile Term Code	Max	MaxR	MaxR	Max	Max

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Control Type: Actuated-Uncoordinated
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 100
50th %ile Actuated Cycle: 100
30th %ile Actuated Cycle: 100
10th %ile Actuated Cycle: 100

APPENDIX B

SHUTTLE SERVICE ANALYSIS

Memo

To: Project Files

From: Bobby Zeiller, Zac Vuncannon, Crescent Resources LLC

CC: Vic Siaurusaitis, Michele Monde, Rob d'Abadie

Date: June 19, 2008

Re: Updated Analysis and Cost Estimate for Proposed Shuttle Services

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Site Visits

The site of the proposed development at the DC Armed Forces Retirement Home (AFRH) was first investigated on the morning of May 26, 2008 from approximately 8:30am until 11:30am. The Washington Hospital Center (WHC) currently runs a shuttle service to the Brookland-CUA Metro Station. The field investigation included riding the WHC shuttle for 3 round trips to establish realistic run times along the route, traveling the route in an automobile to further observe conditions, and a photo inventory of the main intersections adjacent to the site.

A second site visit was performed on the afternoon and evening of June 18, 2008 to determine the route for the Columbia Heights Metro Station shuttle service. Travel times were estimated from runs done in an automobile, including travel during the evening peak period. It should be noted that the WHC currently runs a shuttle service during morning and evening peak hours to the Columbia Heights Metro Station.

Proposed and Alternative Routings

Shuttle service connecting the AFRH development with the Washington Metro Red and Green/Yellow Lines has been proposed to reduce the number of auto trips made to the site. It is recommended that two separate routes be run: the Red Line will be accessed at the Brookland-Catholic University Station, and service to the Green/Yellow Lines would use the Columbia Heights Station. All routes would travel through the site on the same roads and stop to pick up passengers at the same locations to avoid rider confusion. The site can be effectively served with approximately 5 stops; each building would be within a couple blocks of the nearest shuttle stop (exact locations would be determined once individual building designs are completed). Off-site, the shuttles would run as express services making no stops until reaching the metro stations. Service would be provided using 24 passenger shuttle buses. Attachments at the end of this memorandum illustrate the proposed routes.

The first proposed shuttle route would connect the AFRH development with the Brookland Metro Station. The route would start at the First and Irving Street entrance to the development. The route would travel a one-loop configuration through the development, exiting onto Irving Street at

First Street, and then travel east along Irving Street Northeast and Michigan Avenue Northeast to the dedicated shuttle area at the Brookland Metro station. The westbound return trip would be along Michigan Avenue Northeast and Irving Street, re-entering the site at First Street.

The second proposed shuttle route would connect the AFRH development with the Columbia Heights Metro Station. This route would begin by circulating through the site and exiting at First Street, heading west on Irving Street. The route would merge onto Kenyon Street and proceed west to 16th Street. The route would turn left on southbound 16th Street and left on eastbound Irving Street. The shuttle would stop at the bus stop on the southwest corner of Irving and 14th Street to load and off-load passengers. The shuttle would then continue east on Irving Street and back to the site.

Running Times

Estimated running times for the Brookland shuttle were based on field observations of the WHC shuttle service. The presence of several signals along the route resulted in highly variable travel times. Observed run times from the front entrance of the WHC at the intersection of First and Irving Streets to the shuttle stop at the Metro station ranged from 5 to 10 minutes. The variation in run times was entirely due to signals. To account for future congestion, a run time from the Metro station and the entrance of the AFRH development on Irving Street was estimated at 10 minutes each way. To circulate through the site and make the required stops, an additional 10 minutes would be required. The total time to navigate the route would be approximately 30 minutes, inclusive of additional wait times needed to assure schedule adherence. This route would require 1 shuttle bus to maintain the desired 30 minute headways (the time between bus arrivals at any given stop.)

Estimated running times on the shuttle to the Columbia Heights Metro Station were based on travel times in an automobile. This route could experience significant delays due to congestion in the area west of 13th Street and in the vicinity of the Metro station. In addition, Kenyon Street currently has uncoordinated signal timings which contribute to the delays. Travel times from the intersection of First and Irving Streets to the Metro station, with speed and acceleration deliberately slowed to approximate bus operations, are estimated at 10-12 minutes each way. With the addition of 10 minutes for internal circulation at the site, travel time along this route would be approximately 30 minutes. This route could be served with 3 shuttles during the peak periods to maintain desired headways.

Service Pattern

The service patterns for the proposed shuttles are summarized in the tables below. Note that headways would be somewhat variable in the peak period due to traffic congestion. The shuttle would run on a fixed schedule during the off-peak periods.

Brookland – CUA Weekday Shuttle

Time Period	Approximate Headway (Minutes)	Vehicles in Service	Vehicle Hours of Service (Hours)
6:30AM - 9:00AM	30	1	2.5
9:00AM – 4:30PM	30	1	7.5
4:30PM – 7:00PM	30	1	2.5
7:00PM – 8:00PM	30	1	1
		Total	13.5

Columbia Heights Weekday Shuttle

Time Period	Approximate Headway (Minutes)	Vehicles in Service	Vehicle Hours of Service (Hours)
6:30AM – 9:00AM	10	3	7.5
9:00AM – 4:30PM	30	1	7.5
4:30PM – 7:00PM	10	3	7.5
7:00PM – 8:00PM	30	1	1
		Total	23.5

Columbia Heights Saturday Shuttle

9:00AM – 6:00PM	30	1	9

Cost Estimate

Cost estimates were based on the total vehicle hours estimated above, an assumption of 252 weekday operating days/year (Monday-Friday minus 8 holidays) along with 52 weekend days. Operating costs were estimated at $65/Vehicle Hour[1]. Total annual costs for each route are summarized on the following page:

[1]Annual Operating costs, inclusive of vehicle, fuel and driver costs, are based on telephone inquires with shuttle operators. The minimum liability insurance required by law would be the responsibility of the development.

Brookland – CUA Shuttle Costs

	Daily Hours	Annual Hours	Annual Cost
Weekday	13.5	3,402	$221,130
Weekend	-	-	-
Total	13.5	3,402	$221,130

Columbia Heights Shuttle Costs

	Daily Hours	Annual Hours	Annual Cost
Weekday	23.5	5,922	$384,930
Weekend	9	468	$30,420
Total	-	6,390	$415,350