4.0 BICYCLE AND PEDESTRIAN FACILITIES

The AFRH site is located in an area with limited existing pedestrian and bicycle facilities. Additional and enhanced facilities will be required to connect the site to adjacent land uses, such as CUA and the Washington Hospital Center, and transit options. This section will evaluate existing pedestrian and bicycle facilities within the area of the site, identify planned improvements, and recommend additional improvements to enhance the connectivity.

4.1 EXISTING FACILITIES

Limited pedestrian and bicycle facilities are provided within the immediate area of the site. According to the DC Bicycle Master Plan, Irving Street is designated as a signed bicycle route with a multi-use trail. However, the trail consists of a relatively narrow (five to six feet) concrete sidewalk along the south side of Irving Street between the intersection with Hobart Place and Michigan Avenue NE. Crosswalks are provided at all roadway crossings, including the ramps at the North Capitol Street interchange, where pedestrian crossing warning signs are also provided. An unsignalized crosswalk is provided at Kenyon Street to connect the sidewalk on Kenyon Street to the trail on Irving Street. Based on field observations, all crossings appear to have ADA compliant curb ramps, with the exception of the unsignalized crossing at Kenyon Street.

A five-foot sidewalk is also provided on the north side of the Scale Gate Road overpass. However, the sidewalk does not connect to any larger network and no curb ramps or crosswalks are provided.

While pedestrian facilities are relatively limited in the area immediately adjacent to the site, sidewalks are provided on both sides of study area roadway network streets with the exception of Irving Street and North Capitol Street between Michigan Avenue and Allison Street. No formal bicycle facilities (bike lanes or sharrows) are provided on any of the study area roadways.

4.1.1 Barriers to Walking and Biking

In addition to the lack of pedestrian and bicycle facilities immediately adjacent to the site, there are several transportation system features within the study area that act as barriers to the use of the existing facilities. These barriers include:

- **The North Capitol Street/Irving Street interchange ramps**: Ramps are traditionally undesirable locations for pedestrian crossings because vehicles movements are typically uncontrolled, vehicles are traveling at higher rates of speed, and driver attention is focused on merging, diverging, and weaving activity.
- **Irving Street**: Irving Street is a wide six-lane roadway. These types of roadways traditionally promote higher speeds, particularly during off-peak periods, making it difficult to cross.
- **The Armed Forces Retirement Home Campus/North Capitol Street:** The AFRH campus, between Irving Street and Harewood Road, poses an almost one-mile long barrier to both east-west and north-south pedestrian and bicycle flow.

4.2 PROPOSED PLANS

Stantec reviewed the following plans to assess existing and proposed pedestrian and bicycle facilities in the study area.

DC Bicycle Master Plan (2005)

The 2005 DC Bicycle Master Plan is a guide to establishing high-quality bicycle facilities and programs over the next 10 years. It identifies existing conditions and provides recommendations for more and better facilities, supportive policies, and education, promotion and enforcement. The 2005 Master Plan shows Irving Street NW/NE and Michigan Avenue NW/NE, within the study area, as having existing multi-use trails (see Section 4.1). Furthermore, both roadways are shown as having a bicycle LOS of D.

The DC Bicycle Master Plan also includes recommendations such as:

- Expand the bicycle route network;
- Provide bicycle facilities on roadways;
- Complete ongoing trail development and improvement projects;
- Provide bicycle parking in public and private spaces;
- Eliminate gaps in the existing system;
- Improve areas with a high number of bicycle crashes;
- Provide bicycle access through barrier areas (including the Washington Hospital Center);
- Improve bicycle access to public transportation;
- Provide more bicycle-friendly policies; and,
- Educate motorists, bicyclists, and youth regarding safe operating behaviors, among others.

However, it should be noted that the Master Plan does not include any recommendations for new or enhanced facilities within the study area, with the exception of a proposed bicycle lane on Park Place between Columbia Road and Grant Circle. It should also be noted that the moveDC plan supersedes this plan as of 2015.

Brookland Multi-Modal Transportation and Streetscape Study (2007)

The Brookland Multi-Modal Transportation and Streetscape Study recommends transportation and streetscape improvements within the Brookland neighborhood of the District. The study primarily focuses on 12th Street NE between Michigan Avenue NE and Rhode Island Avenue NE. The study area includes Michigan Avenue NE between North Capitol Street and Eastern Avenue NE, a portion of which falls within the AFRH study area. However, no specific recommendations are provided for Michigan Avenue NE within the AFRH study area. Rather, the plan calls for conformance to plan elements (streetscaping, pedestrian treatments, etc.) and current DDOT policies.

DC Pedestrian Master Plan (2009)

The 2009 DC Pedestrian Master Plan identifies deficiencies in the existing pedestrian network, recommends pedestrian treatments and identifies the following study area roadways as priority corridors:

- New Hampshire Avenue NW/NE between Park Road NW and Peabody Street NE
- North Capitol Street NE between Blair Road NE and Allison Street NE
- Kennedy Street NW between Georgia Avenue NW and North Capitol Street NW
- Michigan Avenue NE between North Capitol Street NE and 13th Place NE

The plan also includes conceptual improvements for the top priority corridor in each Ward. In Ward 4, New Hampshire Avenue is identified as the top priority corridor. Within the AFRH study area, improvements are proposed for the intersection of New Hampshire Avenue NE and North Capitol Street NE including reconstructed curb ramps, reduced turning radius for the northbound right turn from North Capitol Street NE to New Hampshire Avenue NE, and construction of a curb extension along northbound North Capitol Street NE where it reduces to one lane in the northbound direction. It should be noted that the moveDC plan supersedes this plan as of 2015.

moveDC (2014)

moveDC is a long-range multimodal transportation plan that addresses ways to improve the transportation system so that it operates more safely and efficiently. The plan addresses a variety of modes including pedestrians, bicyclists, transit, vehicle, and freight, as well as transportation demand management, parking, and sustainability/livability. The plan recommends a variety of policy and practices as it relates to the various modes. The plan also calls for several new facilities within the study area and establishes a priority system for implementation that ranges from Tier 1 (Highest Priority) to Tier 4 (Lowest Priority):

- A multi-use trail along the north side of Irving Street between Michigan Avenue NE and Park Place NW (Tier 1).
- A sidewalk along North Capitol Street between Irving Street and Harewood Road (Tier 1, Highest Priority).
- A sidewalk across the AFRH site, connecting Park Road NW to Harewood Road NE (Tier 3).

4.3 IMPACT OF PROPOSED DRIVEWAY ON EXISTING AND PROPOSED PLANS/FACILITIES

The AFRH site would not have a negative impact on existing or proposed pedestrian and bicycle facilities. In fact, many of the recommendations presented in the plans summarized in the previous section would be necessary to ensure adequate connections between the AFRH site, nearby transit options, and surrounding community. These enhancements would be needed particularly in the area of Irving Street NW where the site is anticipated to generate the most additional pedestrian and bicycle trips.

4.4 MITIGATION OPTIONS

In order to facilitate safe and efficient pedestrian and bicycle circulation within and outside of the AFRH site, several mitigation options are provided below. It should be noted that all options should follow the guidance presented in the master plans and documents presented in Section 4.2.

4.4.1 Internal

Internal pedestrian and bicycle circulation is critical to promoting pedestrian and bicycle use outside of the site, as well as minimizing internal vehicle trips. The following mitigation options should be incorporated within the AFRH site (AFRH Master Plan, 2008):

- Provide marked crosswalks across all approaches at all internal intersections.
- Provide sidewalks on both sides of all internal roadways with a minimum width of 16 feet along building frontages, and 11 feet along areas of open space.
- Provide dedicated bike lanes or paths on primary roadways within the site, as well as roadways which connect to the external transportation network. Shared bike lanes should be used on minor roadways. The AFRH Master Plan categorize each street within the proposed development in terms of load
- Incorporate Capital Bikeshare stations within the site along internal roadways as well as within parking facilities. The developer should work with DDOT and Capital Bikeshare personnel to determine how many Bikeshare stations are needed and the ideal locations the stations.
- Provide bicycle parking for every building as well as shower facilities for office buildings.

4.4.2 External

Facilities external to the site are also needed to mitigate the barriers to pedestrian and bicycle travel within the study area, as well as to connect the site with nearby land uses and transit. Potential external pedestrian and bicycle facilities are depicted in Figure 11 (and Exhibit 48 in Appendix A) and are described below.

Community Connectivity

The AFRH campus, including North Capitol Street, presents a significant barrier to east-west and north-south connectivity. The AFRH site is a closed/secure site which ultimately makes providing additional connectivity difficult. A broader discussion with AFRH would be required to provide connectivity across the AFRH campus. However, as part of the Zone A redevelopment the following additional east-west and north-south connections are recommended:

- Construct a 10-foot wide multi-use path along the north side of Irving Street/Kenyon Street between Park Place and Michigan Avenue NE. Where the path crosses the North Capitol Street ramp, provide high-visibility crosswalks, signing, and lighting. Consider installing yield pavement markings across exit ramps and stop-controlled entrance ramps for the proposed path, as well as the existing path on the south side of Irving Street.

- Construct a 10-foot wide multi-use path on the west side of North Capitol Street between Irving Street and Harewood Road. The path would connect to the proposed path on Irving Street, as well as Scale Gate Road, and provide a new north-south connection.
- Provide dedicated bike lanes and sidewalks on both sides of Scale Gate Road between the AFRH site and Harewood Road.
- Provide crosswalks across the west leg of the intersection of First Street NW and Irving Street NW, and across the east leg of the intersection Pershing Drive and Irving Street NW. Provide a minimum 16-foot wide pedestrian refuge median for both crosswalks.

Not only would these facilities improve overall pedestrian and bicycle circulation within the area of the site, they would provide the necessary connections between the site and nearby employment/activity centers, including the Washington Hospital Center, CUA, Trinity University, and the Arts Walk.

Transit Connectivity

Section 5 discusses enhanced transit services onsite. However, some transit services, such as Metrobus Route 80 and Metrorail, would remain off-site. Thus, pedestrian and bicycle facilities are needed to connect the site to those transit services to provide options for those who want to walk or bike as a "last mile" connection. The proposed multi-use path on Irving Street and sidewalk and bike lanes on Scale Gate Road would provide the needed connections between the AFRH site and transit services. The multi-use path on Irving Street would tie into pedestrian and bicycle facilities on Michigan Avenue NE and Kenyon Road/Irving Street NW which ultimately would connect to the Brookland-CUA and Columbia Heights Metro stations and other bus routes. The proposed bike lanes and sidewalks on Scale Gate Road would connect the northern end of the site to the Brookland-CUA Metro station and supplemental bus routes via existing facilities within and around the CUA campus.

In addition to the linear facilities, the developer should work with Capital Bikeshare to provide both onsite and offsite bikeshare stations. Bikeshare station coverage within the area of the AFRH site is relatively light. The closest bikeshare station is located on the Washington Hospital Center campus. Bikeshare should be considered a valuable "last mile" connecting mode, particularly between the site and the Brookland-CUA and Columbia Heights Metro station. However, additional facilities will be needed in order to provide the necessary coverage and capacity to make it a reliable travel option.

Bikeshare stations are provided within one block of both Metro stations. However, based on the Capital Bikeshare website, these locations are typically heavily utilized indicating that additional capacity is needed. Furthermore, the facility located on the Washington Hospital Center campus is also well-utilized. The ultimate AFRH developer should work with Capital Bikeshare to provide additional capacity near the AFRH site as well as at activity centers and Metro stations. Consideration should be given to providing a bikeshare station along Irving Street that could be utilized by both residents and employees of the AFRH site, as well as employees and visitors of the Washington Hospital Center.

Figure 11: Proposed External Bicycle and Pedestrian Facilities

5.0 TRANSIT SERVICE

The AFRH site is located in a relatively isolated area within the broad DC transit network. No bus service operates along the site's Irving Street NW or North Capitol Street frontages, and the closest bus stop is located within the Washington Hospital Center campus, approximately 2,000 feet (0.38 miles) from the approximate center of the site. Given that the typical acceptable walking distance for a bus service is one quarter mile, there are no existing bus services that are considered to be within walking distance of the site. Furthermore, a walking distance of one half mile is considered acceptable for a high-frequency rail service, like Metro. However, the AFRH site is located approximately one mile from the Brookland-CUA Metro Station (Red Line) and approximately 1.2 miles from the Columbia Heights Metro Station (Green/Yellow Lines). Thus, the site is considered to be outside the acceptable walking distance for heavy rail transit.

This section evaluates existing and potential future transit facilities in the vicinity of the site, assesses how the AFRH site would impact these services, and identifies transit facility improvements that could be utilized to reach the targeted mode splits discussed in Section 3.4.3.2.1 and shown in Table 20. It should be noted that enhancements to pedestrian and bicycle infrastructure, to achieve the target walk/bike mode split, were discussed in Section 4.0.

Table 20: Targeted Mode Splits

Mode	Split – Office/Medical Office/Institutional/Retail	Split – Residential
Auto	75%	63%
Bus	9%	12%
Metro	10%	21%
Walk/Bike/Other	6%	4%

5.1 METHODOLOGY

To identify and assess potential transit enhancements that could be utilized to achieve the desired mode splits shown in Table 20, the analysis will consider the following conditions:

- 2015 Existing Conditions
- 2045 Background/No Build Conditions
- 2045 Future Build Conditions

Even though the approximate center of the AFRH site (Zone A) is located more than one quarter mile from a bus stop and more than one half mile from a Metrorail station, it is likely that potential transit riders generated by the AFRH site would utilize nearby bus and Metrorail services if adequate connections could be provided, either via connecting services, such as shuttles, or by adjustments to the existing routes that bring them closer to the site. Thus, the transit capacity

analysis will include all bus services within a walking distance of one mile, as well as the Green/Yellow and Red Metrorail lines (see Exhibit 49 in Appendix A).

5.2 EXISTING TRANSIT SERVICES

The transit capacity analysis includes an evaluation of the following Metrobus and Metrorail routes, shown in Figure 12 (and Exhibit 49 in Appendix A):

- **Metrobus Route 80 - North Capitol Street Line:** Route 80 operates between the Kennedy Center to the south and the Fort Totten Metrorail station to the north. This is the primary north-south bus route operating within the area of the AFRH site and provides service to multiple Metrorail stations and Downtown. The route operates seven days a week at seven to 13 minute headways during weekday peak periods, 20 to 30 minute headways during Saturday peak periods, and 30 minute headways during Sunday peak periods. The closest stop location is at the intersection of Irving Street NE and Michigan Avenue NE, approximately 0.6 miles from the center of the AFRH site.
- **Metrobus Route H1 – Brookland to Potomac Park:** Route H1 provides directional north-south service between Potomac Park and the Brookland-CUA Metrorail station. The route operates Monday through Friday with southbound service (to Potomac Park) between 6:30 AM and 10:00 AM and northbound service (to Brookland-CUA) between 4:15 PM and 7:05 PM. The service operates at 15 to 20 minute headways during these periods. The closest stop location is at the intersection of Irving Street NE and Michigan Avenue NE, 0.6 miles from the center of the AFRH site. Given the distance of this
- **Metrobus Routes H2, H3, and H4 – Crosstown Line:** Routes H2, H3 and H4 provide east-west crosstown connections between the Brookland-CUA Metrorail station and the Tenleytown – CUA Metrorail station. The H2 and H4 lines run seven days a week, while the H3 line only operates Monday through Saturday. Between the three routes, the Crosstown line operates at five to 15 minute headways during the weekday peak periods, 15 minute headways during Saturday peak periods, and 20 minute headways on Sundays. The H2 and H4 lines serve the Washington Hospital Center and the Veterans Affairs Medical Center, and thus the stop for these lines would be an approximate walking distance of one half mile from the center of the AFRH site.
- **Metrobus Route D8 – Hospital Center Line:** Route D8 provides north-south service between Union Station and the Washington Hospital Center, including the Veterans Affairs Medical Center. This route operates seven days a week with 12 to 15 minute headways during weekday peak periods, 20 to 30 minute headways during Saturday peak periods, and 30 minute headways on Sundays. Similar to Routes H2 and H4, Route D8 stops at the Washington Medical Center and Veterans Affairs Medical Center, an approximately walking distance of 0.4 miles from the center of the AFRH site.
- **Metrorail Green/Yellow Lines:** The Green/Yellow Line provides dual service between Greenbelt, to the north, and L'Enfant Plaza, to the south. At L'Enfant Plaza, the Green Line travels southeast and ends at the Branch Avenue station in Prince George's County, Maryland. The Yellow Line crosses the Potomac River and travels to the Huntington station in Fairfax County, Virginia. During peak periods the Yellow Line also provides service along the Blue Line to Franconia-Springfield, Virginia. The line operates at six minute headways during weekday peak periods (three minutes at stations that serve both lines), 12 minute headways during Saturday peak periods (six minutes at stations that serve both lines), and 15 minute headways on Sundays. The Columbia Heights and Georgia Avenue-Petworth stations are both approximately 0.4 miles (walking distance) from the center of the AFRH site.

- **Metrorail Red Line:** The Red Line operates between the Shady Grove station in Montgomery County, Maryland and the Glenmont station, also in Montgomery County. Between these two stations, the Red Line travels through downtown DC. It operates at three to six minute headways during weekday peak periods, 12 minute headways during Saturday peak periods, and 15 minute headways on Sundays. The Brookland-CUA station is a 1.1 mile walk from the center of the AFRH site (via Scale Gate Road and the CUA campus).

5.3 2015 EXISTING CONDITION TRANSIT CAPACITY ANALYSIS

The 2015 Existing Condition transit capacity analysis evaluates the estimated demand versus the capacity of each bus route and Metrorail line, listed in the section above, during the AM and PM peak periods. A description of how these values were calculated, as well as the results of the analysis is provided below.

5.3.1 Buses

Existing bus route capacity was determined by estimating the total number of seats by route utilizing information contained in the *2010 Metrobus Fleet Management Plan* which indicates that the average non-articulated bus contains 41 seats. Current timetables provided on the WMATA website were used to determine the number of buses that serve the nearest bus stop during the AM and PM peak periods. Ridership (demand) was estimated utilizing 2015 daily ridership data for each route provided by WMATA. According to the *2010 Metrobus Fleet Management Plan*, 31.4% of daily ridership occurs during the four-hour morning peak period and 33.9% occurs during the four-hour evening peak period. Daily ridership was multiplied by the above percentages and divided by four to estimate the AM and PM peak hour ridership for each route. Northbound/southbound splits were determined utilizing the ratio of bus service in each direction.

The results of the capacity analysis indicate that the majority of the routes are at or above capacity (see Table 21). According to WMATA's 2000 *Metrobus Regional Bus Services Performance Assessment Report*, a rider versus capacity (R/C) ratio of 1.2 is acceptable for a radial service (such as Routes 80, D8, and H1), and a R/C ratio of 1.1 is acceptable for a crosstown service (such as Routes H2, H3, H4). These ratios account for passengers which may have to stand during peak periods. Applying these R/C ratios to the data, it can be seen that Routes 80 and D8 operate above the accepted R/C ratios during the PM peak hour.

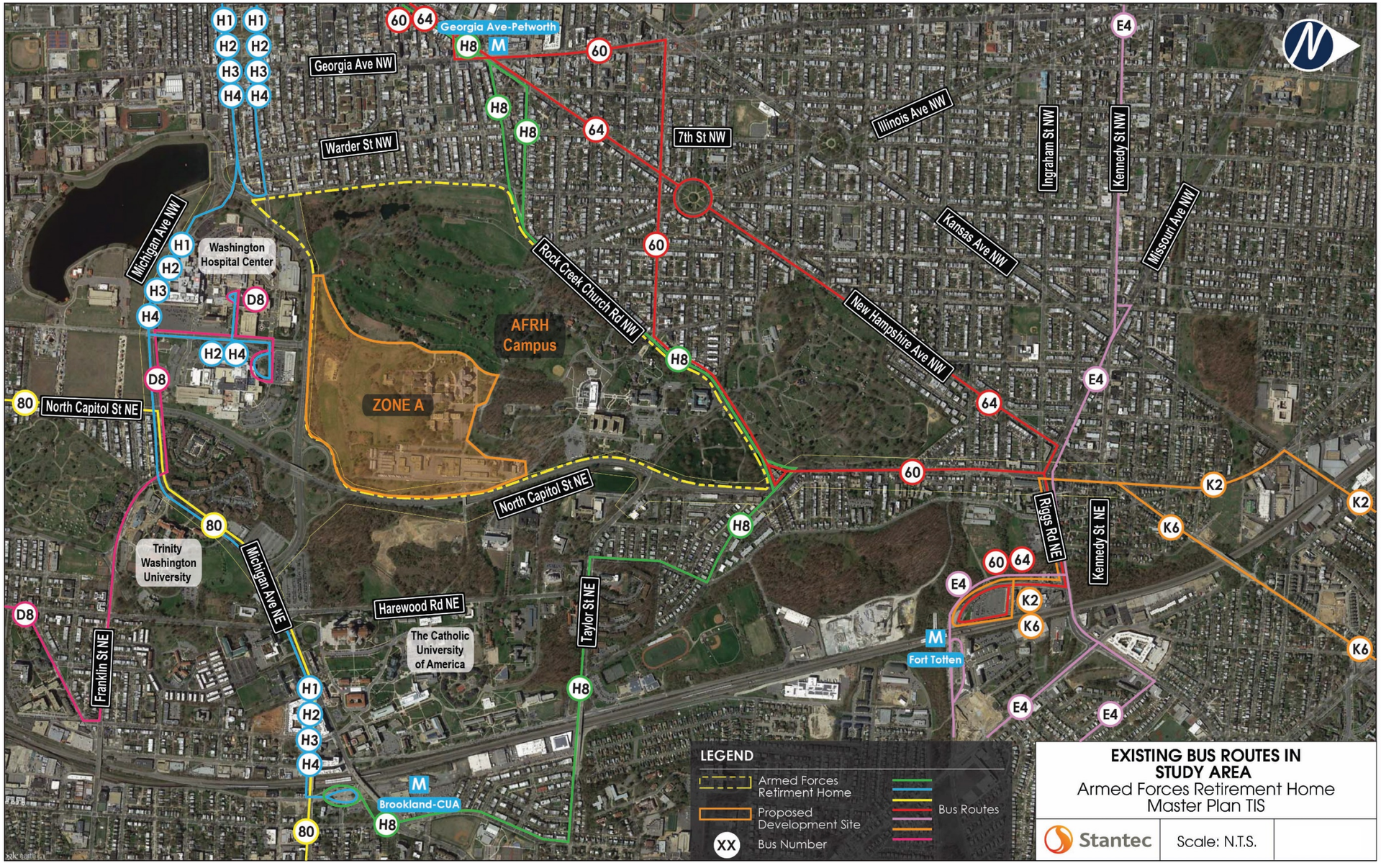

Figure 12: Existing Bus Routes in Study Area

Table 21: Existing Bus Route Capacity

Primary Direction	Line	Peak Hour	Direction	Ridership (pass/hr)	Capacity (pass/hr)	R/C	Acceptable?
NB/SB	80	AM	NB	213	205	1.04	YES
			SB	340	328	1.04	YES
		PM	**NB**	**326**	**246**	**1.32**	**NO**
			SB	**271**	**205**	**1.32**	**NO**
	H1	AM	NB	0	0	N/A	N/A
			SB	51	164	0.31	YES
		PM	NB	55	123	0.45	YES
			SB	0	0	N/A	N/A
	D8	AM	NB	157	164	0.96	YES
			SB	196	205	0.96	YES
		PM	**NB**	**191**	**123**	**1.55**	**NO**
			SB	**191**	**123**	**1.55**	**NO**
	TOTAL	AM	NB	370	369	1.00	YES
			SB	587	697	0.84	YES
		PM	NB	571	492	1.16	YES
			SB	**462**	**328**	**1.41**	**NO**
EB/WB	H2, H3, H4	AM	EB	172	164	1.05	YES
			WB	345	328	1.05	YES
		PM	EB	300	287	1.05	YES
			WB	258	246	1.05	YES

5.3.2 Metrorail

Given the proximity of the AFRH site to the Red and Yellow/Green Lines, it is anticipated that the Brookland-CUA and Columbia Heights stations would be most utilized for site Metrorail trips. 2015 daily weekday passenger boarding data was obtained from WMATA for those stations. WMATA's Metrorail Station Access and Capacity Study (2008) indicates that 60% of daily ridership occurred during the peak periods. Therefore, it is assumed that 20% of daily boardings occur during the AM and PM peak hours.

Metrorail system capacity is constrained by the capacity of the rail consists, rather than the stations. Therefore, to estimate capacity of the Red and Yellow/Green lines the passenger capacity per car (120) was multiplied by the number of cars in the consist (minimum of six) and the number of trains in the peak hour. Considering an average headway of five minutes, each line should be able to accommodate a minimum of 17,280 passengers during the AM and PM

peak hours. It should be noted that eight car trains operate on the both lines as well, which would increase the overall line capacities.

Based on the 2015 boarding data, the Columbia Heights station experiences a peak hour demand of approximately 2,500 passengers per hour, while the Brookland-CUA station experiences a peak hour demand of approximately 1,350 passengers per hour. When compared to the minimum line capacity of 17,280 passengers, the Brookland-CUA and Columbia Heights stations would not experience capacity issues under typical weekday conditions.

5.4 2045 BACKGROUND/NO BUILD CONDITION

The 2045 No Build Condition considers planned transit improvements and background transit ridership growth without the proposed AFRH development.

5.4.1 Background Growth

According to data contained in WMATA's 2017 Budget: Ridership and Revenue report, Metrobus ridership has increased steadily, by about 2% per year between 2011 and 2014, but appears to be leveling out in 2015, with most routes seeing none to negative growth between 2014 and 2015. WMATA is currently making efforts to improve the overall bus system, including off-board SmarTrip fare card loading and transit signal priority. As such, ridership growth is anticipated to continue, but at a reduced rate. Therefore, an annual growth rate of 0.5% per year was assumed for this analysis. This results in a total growth of 16% between 2015 and 2045.

Conversely, Metrorail ridership has decreased from a maximum of about 750,000 weekday boardings in 2010 to approximately 710,000 weekday boardings in 2015. The decrease in ridership is due to a variety of issues including changes to work patterns, lower transit subsidies, and safety and reliability issues. Improvements to the Metrorail system, such as increasing car capacity and adding more eight-car trains, will likely increase ridership, while at the same time increasing capacity. While it is unclear exactly how and when system enhancements will impact system capacity, it is assumed, for the purpose of this study, that Metrorail growth will be balanced with increases in capacity. Therefore, there are no anticipated capacity constraints at the stations closest to the AFRH site, and Metrorail capacity will no longer be considered for the remainder of this transit capacity analysis.

5.4.2 Planned Transit Improvements

Based on the review of a variety of sources, including the 2014 DC Circulator Transit Development Plan Update Report and the 2010 DC Transit System Future Plan , the following bus transit enhancements that have been proposed along the transit corridors near the site were identified and assumed to be completed by the 2045 analysis year (see Figure 13 in this report and Exhibit 50 in Appendix A):

Figure 13: Planned Transit Services

- **Brookland-CUA Metro to Union Station Neighborhood Connector**: This proposed route would extend from Union Station to the Brookland-CUA Metrorail station with connections to the Washington Hospital Center. The route would travel along North Capitol Street and transition over to First Street NW via Channing and Bryant Streets. From there it would travel through the Washington Hospital site to Irving Street NW, and then travel along Irving Street to Michigan Avenue NW. The route would come within a quarter mile of the center of the site on Irving Street and would operate at 15-minute headways, thus adding four new buses per hour per direction. This route mirrors components of both Routes 80 and D8. Therefore, the additional capacity was split evenly between the two existing routes for the purpose of this analysis.
- **Tenleytown to Brookland Circulator Route**: This proposed route would provide east-west connectivity between the Tenleytown and Brookland-CUA Metrorail stations that would likely supplement Route H2, H3, and H4. Therefore, the capacity was added to this route alignment for the purposes of this analysis. Current plans indicate that this route would add six buses during peak periods per direction. However, the proposed alignment shows this route operating along Michigan Avenue, which puts it outside the acceptable one quarter mile walking distance to the AFRH site.
- **MetroExtra Route 80X**: This would be an express bus for the Route 80 corridor that would operate during peak periods. Although a final alignment has not been selected, it is anticipated that this route would operate along the existing Route 80 alignment and would add four new buses during the AM and PM peak hours.
- **Woodley Park/Adams Morgan to Brookland Streetcar Line**: A proposed streetcar line that would operate along the Crosstown Corridor, adding significant capacity. However, it is still in the preliminary planning phases and two potential alignment options are shown: one on Michigan Avenue, and the other on Irving Street. The Irving Street alignment would be most beneficial to the site. A Michigan Avenue alignment would likely place the streetcar line outside of an acceptable walking distance from all but the southernmost buildings proposed on the AFRH site. The 2010 study indicates implementation in Phase III (2020) of the streetcar system plan. However, based on recent discussions with DDOT, it is unlikely that this streetcar line would be completed. Therefore, it was not included in this analysis.

5.4.3 Nearby Development Impacts

While the background transit trip growth rate would likely accommodate transit trips generated by most of the proposed developments within the area of the AFRH site, a substantial amount of additional transit ridership demand will be generated by the proposed McMillan development, located to the south of the AFRH site and Washington Hospital Center. This additional transit ridership would not be accounted for in the background growth rate and thus must be included separately in the No Build condition analysis. According to the 2014 Transportation Impact Study, the McMillan site is expected to generate 1,200 new bus trips during the AM peak hour and 1,337 new bus trips during the PM peak hour. These site-generated transit trips were distributed on the No Build transit network based on information contained in the Transportation Impact Study.

The proposed McMillan site is also anticipated to generate 600 new AM peak hour and 668 PM peak hour Metrorail trips. However, the Transportation Impact Study calls for a site-specific

shuttle service to connect the site to the Brookland-CUA Metrorail station. Therefore, the Metrorail trips are not included in the analysis as bus trips.

5.4.4 Capacity Analysis Results

The background transit growth was combined with the proposed McMillan transit trips to estimate future No Build R/C ratios (see Table 22). Despite the additional capacity added to the transit system by the proposed transit enhancements, the additional transit trips generated by the McMillan site would add significant demand to the transit system. Route 80 would exceed the acceptable R/C ratio during the PM peak hour and Route D8 would also exceed the acceptable R/C ratio during both peak hours.

Table 22: 2045 Background/No Build Condition Transit Capacity Analysis Results

Primary Direction	Line	Peak Hour	Direction	Ridership (pass/hr)	Capacity (pass/hr)	R/C	Acceptable?
NB/SB	80/80X*	AM	NB	481	451	1.07	YES
			SB	612	574	1.07	YES
		PM	**NB**	**623**	**492**	**1.27**	**NO**
			SB	**572**	**451**	**1.27**	**NO**
	H1	AM	NB	0	0	N/A	N/A
			SB	100	164	0.61	YES
		PM	NB	110	123	0.89	YES
			SB	0	0	N/A	N/A
	D8*	AM	**NB**	**321**	**246**	**1.31**	**NO**
			SB	**375**	**287**	**1.31**	**NO**
		PM	**NB**	**381**	**205**	**1.86**	**NO**
			SB	**381**	**205**	**1.86**	**NO**
	TOTAL	AM	NB	802	697	1.15	YES
			SB	1,087	1,025	1.06	YES
		PM	**NB**	**1,114**	**820**	**1.36**	**NO**
			SB	**953**	**656**	**1.45**	**NO**
EB/WB	H2, H3, H4/ Tenleytown to Brookland	AM	EB	425	410	1.04	YES
			WB	596	574	1.04	YES
		PM	EB	580	533	1.09	YES
			WB	535	492	1.09	YES

5.5 2045 FUTURE BUILD CONDITION

The 2045 Build Condition considers planned transit improvements and background transit ridership growth combined with the proposed AFRH development.

5.5.1 AFRH Transit Trip Generation and Distribution

Upon full build-out, the AFRH site is anticipated to generate a total of 936 new AM peak hour transit trips and 1,014 PM peak hour transit trips (see Table 23). Metrorail trips were divided between the Brookland-CUA station and Columbia Heights station based on their proximity to the AFRH site. As such, 70% of Metrorail trips were assigned to the Brookland-CUA station. However, since the stations are located outside of an acceptable walking distance, the Metrorail trips were assigned to the east-west bus corridor (H2, H3, H4, and the Tenleytown – Brookland Circulator). Bus trips were distributed to the existing transit corridors based on the regional trip distribution percentages utilized for the vehicular capacity analysis. The resulting transit trip distribution is shown in Table 24.

Table 23: AFRH Full Build-Out Transit Trip Generation

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Bus	187	134	321	139	208	347
Metro	224	220	444	219	266	485
Walk/Bike	115	56	171	61	121	182
Total	525	410	936	419	595	1,014

Table 24: AFRH Full Build-Out Transit Trip Distribution

Primary Direction	Line	Peak Hour	Direction	Ridership (pass/hr)
NB/SB	80/80X	AM	NB	80
			SB	79
		PM	NB	83
			SB	69
	H1	AM	NB	0
			SB	50
		PM	NB	45
			SB	0
	D8	AM	NB	0
			SB	49
		PM	NB	0
			SB	35
	TOTAL	AM	NB	80
			SB	178
		PM	NB	128
			SB	104
EB/WB	H2, H3, H4/ Tenleytown to Brookland	AM	EB	339
			WB	168
		PM	EB	406
			WB	194

5.5.2 Capacity Analysis Results

The results of the 2045 Build Condition transit capacity analysis are shown in Table 25 and indicate significant capacity deficiencies on the north-south and east-west corridors. Overall, the transit trips generated by the site result in all routes operating above the acceptable R/C ratio, with the exception of Route H1 in the AM peak hour. The most significant capacity deficiencies exist on Routes D8, H2, H3, and H4. While the deficiency on Route D8 is due largely to Background/No Build condition transit ridership, deficiencies on Routes H2, H3, and H4 are due to the large amount of Metrorail passengers generated by the ARFH site.

Table 25: 2045 Future Build Condition Transit Capacity Analysis Results

Primary Direction	Line	Peak Hour	Direction	Ridership (pass/hr)	Capacity (pass/hr)	R/C	Acceptable?
NB/SB	80/80X*	AM	**NB**	**561**	**451**	**1.24**	**NO**
			SB	**691**	**574**	**1.20**	**NO**
		PM	**NB**	**706**	**492**	**1.44**	**NO**
			SB	**641**	**451**	**1.42**	**NO**
	H1	AM	NB	0	0	N/A	N/A
			SB	150	164	0.91	YES
		PM	**NB**	**155**	**123**	**1.26**	**NO**
			SB	**0**	**0**	**N/A**	**N/A**
	D8*	AM	**NB**	**321**	**246**	**1.30**	**NO**
			SB	**424**	**287**	**1.48**	**NO**
		PM	**NB**	**381**	**205**	**1.86**	**NO**
			SB	**416**	**205**	**2.03**	**NO**
	TOTAL	AM	**NB**	**882**	**697**	**1.27**	**NO**
			SB	**1,265**	**1,025**	**1.23**	**NO**
		PM	**NB**	**1,242**	**820**	**1.51**	**NO**
			SB	**1,057**	**656**	**1.61**	**NO**
EB/WB	H2, H3, H4/ Tenleytown Circulator	AM	**EB**	**764**	**410**	**1.86**	**NO**
			WB	**764**	**574**	**1.33**	**NO**
		PM	**EB**	**986**	**533**	**1.85**	**NO**
			WB	**729**	**492**	**1.48**	**NO**

*Includes one half of the additional capacity provided by the Brookland to Union Station Circulator.

5.6 POTENTIAL MITIGATION MEASURES

The results of the 2045 Build Condition transit capacity analysis indicate several needs, including:

- Improving transit connections within one quarter mile of the center of the AFRH site.
- Additional capacity on the north-south corridors, particularly during the PM peak hour.
- Enhanced connections between the site and the Columbia Heights and Brookland-CUA Metrorail stations.

In order to address these needs, several mitigation measures were evaluated. A diagram of the potential mitigation measures can be found in Figure 14 (and Exhibit 51 in Appendix A).

Figure 14: Potential Future Transit Services

Establish a combined shuttle service to and from the Columbia Heights and Brookland-CUA Metrorail stations with the nearby hospitals.

The AFRH site is anticipated to generate a significant amount of Metro trips, as well as trips on Route 80/80X in the AM and PM peak hour. The additional east-west demand created by this new ridership would require buses operating at three minute headways on the Crosstown Route (H2, H3, H4). This would likely not be justified for the Crosstown Route given the cost and that the increased capacity would only be required for a portion of the routes. Therefore, a shuttle service may provide the most direct and cost-effective measure to connecting the AFRH site to Metro.

Shuttle services are typically utilized to provide a direct connection between a site and a transit station. They typically encourage greater transit use than connecting to a transit station through an existing bus route because they are usually free for users and they provide a direct connection to the transit station without making additional stops. This is evident in that both the Washington Hospital Center and Veterans Affairs Medical Center operate shuttles to the Brookland-CUA and Columbia Heights Metro stations.

AFRH should consider coordinating with these medical centers to provide a combined shuttle service that serves both Metro stations as well as the Route 80/80X stop at the intersection of Irving Street NE and Michigan Avenue NE. While a typical shuttle service operates a smaller vehicle with a capacity of 25 passengers per bus, combining shuttle services would likely require the use of full size buses, particularly during peak periods. Based on the projected Metro volumes, five round-trip shuttle trips (10 buses) to/from the adjacent Metro stations would be required. A potential combined shuttle route is shown in Exhibit 51 in Appendix A.

Shifting Routes H2, H4, or the proposed Tenleytown to Brookland Circulator from Michigan Avenue to Irving Street.

The existing and proposed east-west corridor services travel along Michigan Avenue, likely a result of the existing transit needs and patterns of development within the area. However, once new demand is created by the AFRH site, it may be more feasible to evenly distribute the existing and proposed east-west bus routes between Michigan Avenue and Irving Street. Consideration should be given to redirecting the H2 (or H4) and the proposed circulator along Irving Street, First Street NW, serving the Washington Hospital Center, and ultimately back to Michigan Avenue (see Figure 14).

Splitting the H2, H3, and H4 corridor would also decrease headways for the portion of the route that operates on Irving Street as well as Michigan Avenue, between Irving Street NE and First Street NW. Therefore, consideration should be given to providing one additional bus in each direction during each peak hour on the Michigan Avenue alignment.

Shift Route H1 to Irving Street.

Similar to the previous option, H1 could be shifted to Irving Street between First Street NW and Michigan Avenue. In addition to shifting the route, service frequency should be expanded to provide dual direction service, at the same frequencies as the existing service, during AM and PM peak periods. This would result in some trips shifting from Routes D8 and 80. For the purposes of this analysis, it was assumed that the existing share of trips for the primary direction would be applied to the new secondary direction.

Utilize articulated buses on Route 80/80X.

Increase passenger capacity on Route 80/80X by replacing half of the proposed Route 80 buses with articulated buses.

Extending Route D8 into the AFRH site.

Route D8 currently terminates at the Veterans Affairs Medical Center. Consideration could be given to extending the route to the north into the AFRH site as well as ensuring 10 minute headways during peak periods (see Figure 14).

5.6.1 2045 Build With Mitigation Analysis

The above mitigation measures represent significant investments in transit within the area of the AFRH site. These investments would result in a significant increase in capacity. Overall north-south and east-west corridor R/C ratios would improve significantly when compared to the No Build condition. All routes would operate within acceptable R/C rations except Routes 80/80X, D8, and H2, H3, H4 which would experience R/C ratios slightly over acceptable levels (less than 0.1 points). However, the proposed mitigation measures would improve R/C ratios when compared to the No Build condition (Table 26).

Table 26: 2045 Future Build Condition with Mitigation Transit Capacity Analysis Results

Primary Direction	Line	Peak Hour	Direction	Ridership (pass/hr)	Capacity (pass/hr)	R/C	Acceptable?
NB/SB	80/80X*	AM	NB	539	495	1.09	YES
			SB	691	662	1.04	YES
		PM	**NB**	**706**	**558**	**1.27**	**NO**
			SB	**623**	**495**	**1.26**	**NO**
	H1	AM	NB	22	164	0.13	YES
			SB	150	164	0.91	YES
		PM	NB	155	164	0.95	YES
			SB	29	164	0.18	YES
	D8*	AM	NB	373	328	1.14	YES
			SB	**424**	**328**	**1.29**	**NO**
		PM	NB	393	328	1.20	YES
			SB	**405**	**328**	**1.23**	**NO**
	TOTAL	AM	NB	934	987	0.95	YES
			SB	1,265	1,154	1.10	YES
		PM	NB	1,254	1,050	1.19	YES
			SB	1,057	987	1.07	YES
EB/WB	Metro Shuttles	AM	EB	369	410	0.90	YES
			WB	212	410	0.52	YES
		PM	EB	423	410	1.03	YES
			WB	196	410	0.48	YES
	H2 and Tenleytown Ciruclator**	AM	EB	187	369	0.51	YES
			WB	176	328	0.54	YES
		PM	EB	229	328	0.70	YES
			WB	211	328	0.64	YES
	Combined H3, H4, H2, and Circulator	AM	EB	453	451	1.00	YES
			WB	631	615	1.03	YES
		PM	**EB**	**647**	**574**	**1.13**	**NO**
			WB	**584**	**533**	**1.10**	**NO**
	TOTAL	AM	EB	822	861	0.95	YES
			WB	843	1,025	0.82	YES
		PM	EB	1,070	984	1.09	YES
			WB	780	943	0.83	YES

*Includes one half of the additional capacity provided by the Brookland to Union Station Circulator.
**Realigned to Irving Street.

5.7 IMPLEMENTATION

The mitigation measures discussed in Section 5.6 are intended to mitigate the full build condition. However, the exact land uses and phasing for development of the AFRH site are unknown. Thus, a sensitivity analysis was performed to determine when the various mitigation measures should be implemented and at what level. However, it should be noted that coordination between the AFRH site developer, WMATA, the Veterans Affairs Medical Center and Washington Medical Center should begin during the planning stages of the development.

20% of Full Build

- Begin working with WMATA to extend Route D8, realign H2 along Irving Street, and implement the Tenleytown to Brookland and Union Station to Brookland circulator routes.
- Begin shuttle service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street NE and Michigan Avenue NE. Shuttle service should be provided during the AM and PM peak periods (6:00 AM – 10:00 AM and 3:00 PM – 7:00 PM) at 15-minute headways.

40% of Full Build

- Extend Route D8 and realign H2 along Irving Street. Continue coordination with WMATA regarding circulator routes if they have not yet been implemented.
- Increase capacity on Route D8 by decreasing headways to 10 minutes during AM and PM peak periods.
- Enhance service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street and Michigan Avenue by providing midday service between 10:00 AM and 3:00 PM at 30 minute headways.

60% of Full Build

- Tenleytown to Brookland and Union Station to Brookland circulator routes should be operational.
- Enhance shuttle service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street NE and Michigan Avenue NE by providing 12 minute peak period headways and 15 minute midday headways. Work with residential, retail, and office tenants to determine if weekend and/or evening services are needed.
- Work with WMATA to re-evaluate need for articulated buses on Route 80 once Route 80X service begins.

80% of Full Build

- Realign Route H1 to travel along Irving Street and begin dual direction peak period service as recommended.

- Enhance shuttle service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street NE and Michigan Avenue NE by providing weekend and evening services at maximum headways of one hour.
- Begin articulated bus service on Route 80.

100% of Full Build

- Full implementation of all mitigation measures shown in Figure 14.

5.8 TRANSIT FACILITIES

5.8.1 Transit Hub

There are currently no transit facilities along the site frontage. Therefore, careful consideration of the location of bus and shuttle stops should be considered that maximum potential use by AFRH residents and employees, minimize potential safety hazards to transit users, and minimize impacts to existing transit users.

Based on the recommended alignments shown in Figure 14, transit riders would have to access eastbound/northbound bus services along eastbound Irving Street, and westbound/southbound bus services on southbound First Street NW. This would require transit riders to cross Irving Street, a wide roadway with three lanes in each direction as well as exclusive turn lanes at intersections. Not only would this roadway be difficult for pedestrians to cross, it would likely discourage some potential riders, particularly those that live or work in the northern sections of the site.

Therefore, it is recommended that a transit hub be constructed within the site, at the intersection of First Street NW and Pershing Drive. While this onsite location is not located at the center of the site, it is located in an area of the site where buses can easily return to their routes with minimal off-route time. Buses traveling westbound or southbound would enter the site via the driveway prior to First Street NW, travel westbound along Pershing Drive and depart southbound on First Street NW. Buses traveling northbound or eastbound would travel into the site via First Street NW, turn left onto Pershing Drive, and the exit at the westernmost driveway to eastbound Irving Street NW.

Given the relatively high frequency of the transit services that are required to serve the AFRH site, two bus pull-offs that can accommodate at least three buses each should be constructed for each direction (westbound/southbound and eastbound/northbound). A minimum of three shelters should also be provided at each stop location. The AFRH site developer should work with WMATA to provide rider information as well as real-time bus arrival information at the stop locations.

5.8.2 Transit Maintenance and Vehicle Storage

Increasing service frequency will require additional transit vehicles and maintenance and vehicle storage space for WMATA. The selected developer will likely need to work with WMATA

to ensure that the proposed service frequencies can be achieved within the existing, or future planned, maintenance and storage capacity. If WMATA does not have the maintenance or storage capacity to accommodate the additional transit vehicles, options to provide that capacity should be explored. However, it should be noted that a bus storage and maintenance facility is not part of the AFRH Master Plan, and is likely not an appropriate use for the site.

The selected developer should work with WMATA to evaluate potential strategies to provide the necessary storage and maintenance capacity to meet the needs of the proposed development.

5.9 CONCLUSIONS

The AFRH site would introduce a significant number of additional bus and Metro riders upon full build out to an area of the City that has few transit options within walking distance. Given the existing and future capacity constraints, as well as the site needs, significant adjustments and enhancements to the existing services would be required. On-site facilities, new services, and adjustments to existing services will need to be combined to provide the capacity and options needed to achieve the site's transit mode share goals. However, while the recommended mitigation measures are substantial, they are realistic in scope and would improve upon existing and future anticipated deficiencies that would exist even without the added AFRH site trips.

It is important to note that the mitigation options should be considered living, and should be updated as the size and scope of the actual development becomes clearer. Coordination with WMATA is paramount throughout all phases of the development to ensure that transit enhancements are implemented when they are needed, and that the facilities are available to support the additional transit vehicles that will be required. Furthermore, WMATA coordination will be necessary to determine if future potential transit services not currently anticipated (such as a light rail or streetcar line) would negate the need for some of the options.

6.0 SITE ACCESS AND LOADING

As mentioned previously in this report, this TIS is being completed for the site's Master Plan and EIS documentation. The current layout and programming of space presented in this report demonstrates the maximum development levels. As such, building layouts are only conceptual and do not fully address loading. Therefore, this section of the report will address site access and loading on a higher "master plan" level. A more detailed analysis should be conducted once a site plan is developed.

6.1 SITE ACCESS

The MPlan calls for the reopening of two existing vehicular driveways at Scale Gate Road and First Street NW, and the creation of two new driveways on Irving Street NW. It is anticipated that the new driveway to the east of the intersection of Irving Street NW and First Street NW would be right-in, right-out only due to the westbound exclusive turn lanes provided at the First Street NW intersection. It is also anticipated that the new driveway west of the intersection of Irving Street NW and First Street NW would be full-access and signalized. Accommodations for pedestrians and bicyclists will be provided at each access point.

The current DC truck and bus map identifies Irving Street and North Capitol Street as truck through routes. Therefore, it is recommended that the Scale Gate Road, First Street NW, and Pershing Drive access points be constructed to accommodate commercial vehicles in accordance with guidance provided in the DDOT Design and Engineering Manual. DDOT requires Autoturn diagrams as verification that no turning maneuvers will interfere with roadway operations or on-street parking lanes. However, given the uncertainty of the site design and layout, submission of Autoturn diagrams will be submitted once the developer provides a final site plan. Additionally, turns for a trash truck can range from 8 – 8.5 feet wide, 13 – 13.6 feet tall, and 35 – 40 feet long or a 40 foot truck, at a minimum, will be provided at that time.

It should also be noted that the remaining portion of the AFRH campus will remain secured. Access between the redevelopment site and the AFRH campus will be controlled at four card access gate locations so that residents can access the amenities at the redevelopment site. No public access will be provided through the AFRH campus. Therefore, all external vehicle trips will enter through one of the four access points on Irving Street NW and North Capitol Street.

6.2 LOADING

Building layouts have not been finalized and, therefore, the exact natures of the loading areas are not finalized. The Master Plan currently shows the majority of the access to the internal components of the building (specifically parking) off the site's cross-streets. Additional details regarding loading will be provided at a later date, once the selected developer has completed a final site plan.

It is recommended that the number and dimensions of loading facilities conform to DC Municipal Regulations (DCMR) Section 2201 (Schedule of Requirements for Loading Berths, Loading Platforms, and Service/Delivery Loading Spaces). If an exception is requested, the required loading will adequately serve all uses in the development using the DDOT provided truck delivery projections based on use should be demonstrated. The developer must also indicate how the provided loading will be accessed internally and externally. Internal access must be provided for all uses in the building.

7.0 PARKING

Currently, there are no parking facilities available within a five-minute walk of the AFRH campus, and therefore Zone A. According to the Master Plan, all proposed parking for the Zone A redevelopment would be located on-site, below grade where feasible, and supplemented by above grade, on-street, and surface lot facilities. Additional public parking would be provided for access to open spaces.

Based on the ratios provided in the Plan, the total parking demand for Zone A would be approximately 5,459 spaces for all land uses. Stantec compared these ratios with the ratios given in ITE's *Parking Generation*, 4th ed. and found that the total parking demand would be approximately 7,302 spaces, a difference of 1,843, for all land uses.

ITE states that for mixed-use developments, parking may be shared due to hourly variation for individual land uses, i.e. where the parking demand for one land use is high while the demand for a different land use is low. Therefore, a shared parking analysis was conducted for both AFRH and ITE ratios based on time-of-day distributions of parking demand for each land use. The results (see Exhibit 53 in Appendix A) show that the peak parking demand occurs at 4:00PM, regardless of the ratios used. However, the maximum number of parking spaces required would be approximately 3,538 and 5,188 for the AFRH and ITE ratios, respectively, a difference of 1,650. It should be noted that the Plan states that 5,189 spaces would be required, although it does not state how this number was derived. Based on the anticipated trip generation, the supply given by the ITE ratios would be adequate.

The Plan also does not state the amount of on-street or off-street parking that will be provided. It is assumed that the number of on-street parking spaces will be determined by dividing the length of roadway where parking is permitted by the length of a parking space. It is also assumed that the number of off-street parking spaces will be determined once the dimensions of the proposed structures and lots are known. However, although the ARFH Campus is currently zoned as an R-5-B Residential District, it is assumed that Zone A would be rezoned as a CR Mixed Use (Commercial Residential) District. Off-street parking requirements as per Section 11-2101 of the DC Municipal Regulations dictate that the developer would only be required to provide 2,141 off-street parking spaces. The remaining required spaces could be on-street if feasible. Additionally, in accordance with Section 11-2119, five percent of total auto parking for retail/commercial uses and one per three residential units would be bicycle parking. This would be approximately 260 spaces, the design of which would conform to DDOT standards. All spaces would be managed and signed according to the requirements set forth in the DC Municipal Regulations and DC Register.

Parking
January 5, 2017

It was noted by DDOT that the parking provision for this site is high and inconsistent with parking rates seen in other developments throughout the District, which would potentially encourage driving instead of non-auto travel. In addition to shared parking configurations, the following methods could be used by the developer to reduce parking supply on-site:

- Work with DDOT to establish a parking maximum for each building or the entire site.
- Establish minimum daily fees and unbundle parking from lease agreements.
- Limit the number of parking spaces provided for each residential unit and/or make residents purchase or rent parking spaces.

8.0 TRANSPORTATION DEMAND MANAGEMENT (TDM)

Transportation demand management (TDM) is the application of policies and strategies to reduce travel demand (typically single-occupancy private vehicles) or to redistribute that demand over other non-peak times. TDM will be a critical component to promoting alternative modes of travel to, from, and within the site to achieve, and potentially exceed, the multimodal trip percentage goals. This section will discuss potential TDM strategies that could be employed by the developer. The selected developer will be required to submit a complete TDM plan to DDOT for approval.

8.1 POTENTIAL TDM STRATEGIES

TDM includes a variety of strategies aimed at reducing or redistributing single vehicle occupancy trips which fall within three categories:

- Service
- Policy
- Facility

8.1.1 Service

Service strategies consist of methods that break down barriers to the use of other transportation modes, particularly the "last mile" connections to transit. Strategies can include carpool/vanpool programs and shuttle services to nearby park-and-rides and/or transit facilities, and enhanced outreach, education, and information regarding alternative transportation modes. Service strategies that should be considered for the AFRH site include:

- Designate a TDM coordinator to organize and promote the TDM plan and the use of alternative transportation modes. This person will also act as the point of contact with DDOT.
- Hold annual commuter fairs with representatives of various transportation providers to explain transportation services available to employees and residents.
- Provide real-time transit and alternative mode information using electronic message boards in the lobbies of residential and office buildings.
- Provide assistance with the formation of carpools and vanpools for site residents and employees.
- As discussed in Section 5.6, provide a shuttle service to connect the site with Bus Route 80/80X and the Columbia Heights and Brookland-CUA Metro stations. Work with nearby institutions to explore a shared shuttle service.

8.1.2 Policy Strategies

Policy strategies consist of methods that incentivize the use of alternative transportation modes and discourage single occupant vehicle trips. Strategies can include transit subsidies, preferential parking for carpool and vanpool vehicles, compressed day off, teleworking, and parking policies and fees. Policy strategies that should be considered for the AFRH site include:

- Establish a parking maximum to reduce the number of onsite parking spaces and encourage shared parking.
- Establish minimum daily parking fees based on market rates for parking within the area of the site, and unbundle parking from lease agreements.
- Encourage employers to provide SmartBenefits (transit subsidies) for their employees.
- Assist employers with developing compressed day off and telework programs.

8.1.3 Facility Strategies

Policy strategies consist of physical site and infrastructure improvements that provide priority facilities for alternative transportation modes. Facility strategies can include new transit services, transit priority lanes, and pedestrian and bicycle facilities, among others. Facility strategies that should be considered for the AFRH site include:

- Provide Capital Bikeshare stations throughout the site and along Irving Street. Work with Capital Bikeshare to evaluate the number and location of bikeshare stations (see Section 4.4).
- Provide priority parking for electric vehicles with charging stations.
- Accommodate carsharing onsite at highly-visible priority locations.
- Provide bicycle parking at all locations and shower accommodations within office buildings.
- Provide pedestrian and bicycle facilities as outlined in Section 4.

9.0 PERFORMANCE MONITORING AND MEASUREMENT

Given the overall scale of the development, the uncertainty of the site phasing, and uncertainty regarding the timing of improvements proposed as part of Crosstown Multimodal Transportation Study, DDOT has indicated that a performance monitoring plan must be implemented. The performance monitoring plan will be used to evaluate the impacts of the proposed site at various development stages to ensure that appropriate mitigation measures are being provided, and that previously implemented improvements are still effective. This section presents a potential performance monitoring plan. A formal monitoring plan will need to be finalized with DDOT.

9.1 PHASE EVALUATIONS

As previously stated in this report, no developer has been selected, so the timing and scale of each development phase is unknown. While this TIS document outlines recommended mitigation measures at various trip generation thresholds (20%, 40%, 60%, 80%, Full Build), changes to the transportation network, adjacent developments, and other factors may impact the effectiveness or timing of the proposed mitigation measures. Therefore, the selected developer shall work with DDOT to identify an appropriate interval at which to re-evaluate the findings of this document.

The developer shall work with DDOT to identify a study area and evaluation methodology that is appropriate for the scale of the development phases. The scope should follow the requirements of the CTR process and could include:

- AM and PM peak period turning movement counts at study area intersections.
- Development of an updated capacity analysis model (Synchro, etc.) that reflects current transportation network conditions and that is calibrated based on current travel time and queueing data collected in the field.
- A comparison of current intersection operations to what was estimated from previous evaluations, including this TIS document. Deficiencies will be identified as required.
- Re-evaluation of current transit, pedestrian, and bicycle facilities, operations, and capacity. Current needs, as well as strategies to address those needs will be identified.
- A revised trip generation and distribution analysis for the upcoming development phase.
- A capacity analysis for the study area that evaluates the impacts of the proposed development phase, as well as the effectiveness of the potential mitigation measures identified in this report. The developer may need to revise the mitigation measures based on current and planned transportation network enhancements.
- An evaluation of site transit, pedestrian, and bicycle trips, facilities, and capacity.
- Evaluation and recommendation of mitigation strategies.

A report should be prepared summarizing the results of the analysis and submitted to DDOT.

9.2 FULL BUILD-OUT PLAN

A full build-out performance monitoring plan may be required. The potential performance monitoring plan could consist of an annual report once the project reaches 80% of full build (or a specific phase as identified by DDOT). The purpose of this plan would be to verify the effectiveness of the mitigation measures that have been implemented and determine if additional measures will be required as the project reaches full build-out. Performance monitoring strategies may include:

- Monitor egress from site driveways and establish a trip cap.
- Measure queues along North Capitol Street and Irving Street.

The performance monitoring will have the following parameters:

- The evaluation will be conducted in the fall when Congress, colleges, and schools are in session. Evaluation periods will be approximately 12 months apart.
- Turning movement counts for the appropriate time periods will be submitted for the following intersections:
  - Irving Street NW and Pershing Drive (east of First Street NW)
  - Irving Street NW and First Street NW
  - Irving Street NW and Site Driveway (west of First Street NW)
  - North Capitol Street and Scale Gate Road Interchange
- Queuing analyses will be performed during the peak hour of the roadway for weekday AM and PM peak hours.
- Submit a copy of the analyses to DDOT and area neighborhood organizations no later than three months after data collection.
- When conditions are consistent with the requirements for two successive periods, the Applicant will be released from the monitoring requirement.
- In the event that trip caps are exceeded by 10% for two consecutive years, the Applicant will conduct a survey of users to determine travel patterns to and from the site. Based on this information, the Applicant will develop an implementation plan to help meet monitoring goals, subject to review from DDOT.

10.0 SAFETY

The study area has a variety of roadway types with varying lane widths, roadside features, and parking restrictions. In general, lane widths range from 10 to 12 feet (or wider to incorporate bike lanes), roadside features include sidewalks with some streetscaping, and parking is restricted to zone permit holders only. The area is not particularly pedestrian- nor bicycle-friendly, and on-road traffic is mostly composed of passenger vehicles, trucks, and buses. Traffic control includes both unsignalized and signalized intersections supplemented with signage. The primary users of the study area are commuters.

10.1 CRASH ANALYSIS

Stantec received crash analysis summaries (Appendix E) from DDOT for the study area intersections for the three-year period between January 2012 and December 2014 to evaluate any existing safety deficiencies. The analyses, further summarized in Table 27, revealed most crashes at the intersections are rear-end and sideswipe with property damage only. Three intersections had a higher percentage of right angle crashes than either rear-end or sideswipe (not both) and one intersection had a higher percentage of injury crashes, highlighted in Table 27. None of the intersections experienced fatal crashes.

According to the Highway Safety Manual (HSM), rear-end and sideswipe crashes are most commonly caused by: inappropriate approach speeds, poor visibility of signals, unexpected lane changes on approach, unexpected stops on approach, and/or excessive speed. Right angle crashes are most commonly caused by: poor visibility of signals, inadequate signal timing, excessive speed, slippery pavement, inadequate sight distance, and drivers running a red light.

A speed study performed in 2006 shows that four study area roadways experience excessive 85th percentile speeding over 10 mph over the posted limit, especially on North Capitol Street and Irving Street NW in the vicinity of the proposed development. This is likely due to characteristics such as ample sight distance, wide roadway width, very few access points, and very few conflicts with pedestrians and cyclists, four factors that can encourage speeding. In addition, the roadways can potentially experience peak period directional congestion, which can generate unexpected lane changes and stops on the approaches. Lastly, some of the intersections are wide or skewed and drivers may not anticipate post-mounted signals due to placement at the intersection, resulting in last-minute braking. However, considering these factors, the data does not identify a specific existing safety deficiency.

Table 27: Most Common Crash Types and Crash Severity

Intersection	Total Crashes	Most Common Crash Types						Crash Severity			
		Rear-End (Rt Angle)		Side-Swipe (Rt Angle)		Ped/Bike		Injury		PDO	
		#	%	#	%	#	%	#	%	#	%
N. Capitol St & Michigan Ave	72	26	36.1	17	23.6	6	8.3	29	40.3	43	59.7
N. Capitol St & Irving St	15	4	26.7	6	40.0	3	20.0	10	66.7	5	33.3
N. Capitol St & Harewood Rd	42	25	59.5	4	9.5	0	0.0	21	50.0	21	50.0
N. Capitol St & Hawaii Ave	24	8	33.3	5	20.8	3	12.5	8	33.3	16	66.7
N. Capitol St & Buchanan St	10	6	60.0	2	20.0	0	0.0	4	40.0	6	60.0
N. Capitol St & Missouri Ave	102	40	39.2	29	28.4	3	2.9	35	34.3	67	65.7
N. Capitol St & Kennedy St	14	6	42.9	2	14.3	0	0.0	5	35.7	9	64.3
N. Capitol St & N. Hamp. Ave	46	(14)	(30.4)	12	26.1	0	0.0	16	34.8	30	65.2
Hobart Pl & Park Pl, NW	4	3	75.0	(1)	(25.0)	0	0.0	1	25.0	3	75.0
Michigan Ave & First St, NW	83	15	18.1	32	38.6	7	8.4	28	33.7	55	66.3
Michigan Ave & Franklin St, NE	35	9	25.7	12	34.3	6	17.1	12	34.3	23	65.7
Michigan Ave & Irving St, NE	27	6	22.2	8	29.6	0	0.0	7	25.9	20	74.1
Irving St & First St NW	28	10	35.7	3	10.7	5	17.9	10	35.7	18	64.3
Kenyon St & Park Pl, NW	11	3	27.3	4	36.4	0	0.0%	4	36.4	7	63.6
Irving St & Park Pl, NW	30	2	6.7	(12)	(40.0)	1	3.3%	14	46.7	16	53.3

The proposed development would increase the number of access points on Irving Street NW, which would increase vehicle-vehicle, vehicle-pedestrian, and vehicle-bicycle conflicts. However, with the proper facilities, these conflicts would be mitigated and result in safer conditions for all road users. Mitigation could include:

- New signals;
- Signal timing and phasing adjustments, including prohibiting right turns on red;
- Roadway improvements such as curb radii, striping, realignment, and sidewalks;
- Installation of supplemental signage; and
- Installation of bicycle and pedestrian facilities such as signals, crosswalks, and island refuges.

11.0 STREETSCAPE AND THE PUBLIC REALM

It is anticipated that new development in Zone A would require extensive rehabilitation of the streetscape infrastructure between the curb and property lines along Irving Street NW and North Capitol Street. As discussed in the AFRH Master Plan, the vegetation buffer along the eastern and southern border of the site would be retained and enhanced with additional plantings and trees as necessary and appropriate. Invasive species would be removed on a regular basis to prevent damaging overgrowth.

The Plan also proposes new roadways that would retain and/or complement existing campus roadway features to maintain the picturesque and historical nature of the existing campus. Each of the three street types and bicycle path would comply with DDOT's requirements for the configuration of the public realm space, including public parking, sidewalk, and treebox/furnishing area widths according to the Design and Engineering Manual, Public Realm Design Manual, and Public Realm Design Handbook. Features such as plantings, furnishings, and lighting within these areas and the types of materials used would be consistent with guidelines set forth in these publications. For more detail, please refer to the Plan.

12.0 CONCLUSION

The redevelopment of the southeast quadrant of the Armed Forces Retirement Home campus to a mixed-use development will leverage AFRH's real estate and be the basis for facilitating and directing future development by the private sector to increase Trust Fund revenue. This redevelopment project, in combination with other projects in the area, would begin the transformation of this section of the District from a suburban-style, auto-oriented corridor that is a barrier between the northeast and northwest sections of the City, to a more urban environment where people can live, work, and play.

This Comprehensive Transportation Review (CTR) has been developed for use in compiling a revised Draft and Final Environmental Impact Statement (EIS) that will reflect the most current site master plan elements. It analyzes the potential transportation system impacts of the preferred alternative for the redevelopment zone of the AFRH campus (Zone A), and identifies, assesses, and recommends strategies to reduce the impact of the site on the transportation system.

The results of the analyses contained in this document indicate that the proposed site would generate a significant number of additional vehicle, pedestrian, bicycle, and transit trips that would need to be accommodated on a network that has existing capacity deficiencies. Therefore, the site developer must engage DDOT, WMATA, and other stakeholders to utilize a combination of mitigation strategies that would address the transportation system capacity deficiencies while also attempting to reduce the number of additional vehicle trips that would be generated by the site through TDM.

A developer for the site has not yet been selected and an exact phasing plan has not yet been developed. Therefore, the potential mitigation strategies shown in Table 28, and identified in this report, should be considered preliminary. The analysis presented in this CTR is for the maximum allowable density on the AFRH site which may or may not be achieved based on market forces. Furthermore, improvements to the transportation network within the study area may occur as part of other DDOT projects. Thus, additional coordination between DDOT and the developer would be required as a final site plan is developed. A developer may choose to implement these potential measures or may develop other mitigation measures to vet through DDOT based on the current conditions of the transportation network.

Table 28: Vehicle Mitigation Measure Implementation Strategy

Threshold (% of Full Build Trips)	Potential Vehicle Mitigation Measures		Potential Transit Mitigation Measures	Potential Pedestrian/Bicycle Mitigation Measures*
	With Existing Network	**With Crosstown Network**		
20%	• Upgrade all study area signalized intersections to be fully actuated and optimize phasing and offsets. • Option 1: At the intersection of Irving Street NW and First Street NW, provide an additional westbound left-turn lane, two northbound left-turn lanes, and an eastbound right-turn lane. **OR** • Option 2: Divert vehicles from the intersection of First Street NW and Irving Street NW by providing a secondary entrance to the Washington Hospital Center Campus from the North Capitol Street/Irving Street interchange.** • Provide a double left-turn lane at the intersection of Irving Street NW and Driveway 3. All traffic entering the site from eastbound Irving Street NW must do so at this intersection. • Signalize the intersections of Park Place NW and Hobart Place NW, Hobart Place NW and the Ramp to Michigan Avenue, and Michigan Avenue NW and the Ramp from Hobart Place/Park Place NW. Widen the Ramp to Michigan Avenue NW.	• Upgrade all study area signalized intersections to be fully actuated and optimize phasing and offsets. • Modify the proposed North Capitol Street/Irving Street interchange to provide additional connections between Irving Street, North Capitol Street and the Washington Hospital Center. • At the intersection of Irving Street NW and First Street NW, provide separate through and left-turn lanes. Restrict eastbound left-turns and move them to the signalized intersection of Irving Street NW and Proposed Driveway 3. • Provide a connection into the Washington Hospital Center from Park Place.	• Begin working with WMATA to extend Route D8, realign H2 along Irving Street, and implement the Tenleytown to Brookland and Union Station to Brookland circulator routes. • Begin shuttle service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street NE and Michigan Avenue NE. Shuttle service should be provided during the AM and PM peak periods (6:00 AM – 10:00 AM and 3:00 PM – 7:00 PM) at 15-minute headways. • Begin to work with WMATA to identify potential transit vehicle storage and maintenance space needs.	• Provide marked crosswalks across all approaches at all internal intersections. • Provide sidewalks on both sides of all internal roadways with a minimum width of 16 feet along building frontages, and 11 feet along areas of open space. • Provide dedicated bike lanes or paths on primary roadways within the site, as well as roadways which connect to the external transportation network. Shared bike lanes should be used on minor roadways. • Incorporate Capital Bikeshare stations within the site along internal roadways as well as within parking facilities. • Provide bicycle parking for every building as well as shower facilities for office buildings. • Construct a 10-foot wide multi-use path along the north side of Irving Street/Kenyon Street between Park Place and Michigan Avenue NE. • Construct a 10-foot wide multi-use path on the west side of North Capitol Street between Irving Street and Harewood Road. The path would connect to the proposed path on Irving Street, as well as Scale Gate Road, and provide a new north-south connection. • Provide dedicated bike lanes and sidewalks on both sides of Scale Gate Road between the AFRH site and Harewood Road. • Provide crosswalks across the west leg of the intersection of First Street NW and Irving Street NW, and across the east leg of the intersection Pershing Drive and Irving Street NW. Provide a minimum 16-foot wide pedestrian refuge median for both crosswalks. • Work with WMATA and DDOT to provide last-mile pedestrian and bicycle facilities to transit services. • Work with Capital Bikeshare to provide both offsite bikeshare stations near transit stops and other destinations.
40%	• Provide an additional northbound through lane at the intersection of North Capitol Street and New Hampshire Avenue NE. • Eliminate the Hawaii Avenue northbound left-turn movement at the intersection with North Capitol Street.	• Provide an additional northbound through lane at the intersection of North Capitol Street and New Hampshire Avenue NE. • Eliminate the Hawaii Avenue northbound left-turn movement at the intersection with North Capitol Street.	• Extend Route D8 and realign H2 along Irving Street. Continue coordination with WMATA regarding circulator routes if they have not yet been implemented. • Increase capacity on Route D8 by decreasing headways to 10 minutes during AM and PM peak periods. • Enhance service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street and Michigan Avenue by providing midday service between 10:00 AM and 3:00 PM at 30 minute headways.	
60%	• Replace the Scale Gate Road bridge over North Capitol Street to incorporate two lanes in each direction, as well as full sidewalks. Signalize the diamond interchange ramp intersections with Scale Gate Road. • Provide an additional southbound left-turn lane and westbound right-turn lane at the intersection of Michigan Avenue NW and First Street NW.	• Provide an additional southbound through lane at the intersection of North Capitol Street and Harewood Road. • Replace the Scale Gate Road bridge over North Capitol Street to incorporate two lanes in each direction, as well as full sidewalks. Signalize the diamond interchange ramp intersections with Scale Gate Road. • Provide an additional southbound left-turn lane and westbound right-turn lane at the intersection of Michigan Avenue NW and First Street NW.	• Tenleytown to Brookland and Union Station to Brookland circulator routes should be operational. • Enhance shuttle service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street NE and Michigan Avenue NE by providing 12 minute peak period headways and 15 minute midday headways. Work with residential, retail, and office tenants to determine if weekend and/or evening services are needed.	

Threshold (% of Full Build Trips)	Potential Vehicle Mitigation Measures		Potential Transit Mitigation Measures	Potential Pedestrian/Bicycle Mitigation Measures*
	With Existing Network	**With Crosstown Network**		
			• Work with WMATA to re-evaluate need for articulated buses on Route 80 once Route 80X service begins. • Construct onsite transit hub.	
80% - Full Build	• Provide an additional southbound through lane at the intersection of North Capitol Street and Harewood Road. • Implement traffic adaptive or demand responsive signals on North Capitol Street.	• Implement traffic adaptive or demand responsive signals on North Capitol Street.	• Realign Route H1 to travel along Irving Street and begin dual direction peak period service as recommended. • Enhance shuttle service to/from Brookland-CUA and Columbia Heights Metro stations, and the Route 80 stop at the intersection of Irving Street NE and Michigan Avenue NE by providing weekend and evening services at maximum headways of one hour. • Begin articulated bus service on Route 80.	

*Pedestrian and bicycle facilities should be constructed in conjunction with site development, as well as the implementation of off-site improvements.

** It should be noted that some improvements require coordination with MedStar, a private property owner. If an agreement cannot be reached with MedStar to provide the secondary entrance to the hospital campus, the developer may need to consider other internal site enhancements to divert traffic away from the intersection of Irving Street and First Street. For example, restricting through and left-turn movements exiting the site at the intersection could be used to divert exiting traffic to one of the adjacent driveways.