



MEMORANDUM

TO: Murat Omay, DDOT

FROM: Jami L. Milanovich, P.E.
Amber N. Mikec, P.E.
Kyle L. Brown, E.I.T.

COPY: Michael Burns, GW
Charles Barber, GW
David Avitabile, Goulston & Storrs

DATE: February 22, 2013

RE: Transportation Assessment for The George Washington University
Site 77A Redevelopment
Washington, D.C.

INTRODUCTION

This memorandum presents a transportation assessment for the proposed redevelopment of Site 77A on The George Washington University's (GW's or the University's) Foggy Bottom Campus, in Washington, D.C. This transportation assessment was conducted in accordance with the Comprehensive Transportation Review (CTR) Scoping Form finalized on February 15, 2013 (see Attachment A), which was agreed upon by the District Department of Transportation (DDOT).

On March 12, 2007, the Zoning Commission of the District of Columbia approved two applications by The George Washington University: (1) a special exception for a new Campus Plan and (2) first-stage approval of a Planned Unit Development (PUD) and related amendments to the Zoning Map of the District of Columbia.

The approved Campus Plan identified Site 77A, which includes Lots 5, 845, and 846, as one of the potential redevelopment sites on campus. The Campus Plan also contemplated the closure of a portion of the alley on Square 77, and it identified Site 77A as a potential new parking location. In conjunction with the First-Stage PUD approval, Site 77A was rezoned from R-5-D to C-3-C. The University is moving forward now with the Second-Stage PUD application for the Site 77A redevelopment. The redevelopment of Site 77A includes the closure of a portion of the alley (as identified in the Campus Plan); however, the University does not propose to provide parking on Site 77A. The University is required to maintain a minimum of 2,800 parking spaces and has determined that it can meet the minimum requirement without additional parking on Site 77A.

Site 77A lies mid-block within Square 77 and is located between the Marvin Center and the Academic Center, as shown on Figure 1. Square 77 is located in Ward 2 and is bounded by H Street to the south, I Street to the north, 21st Street to the east, and 22nd Street to the west. Details regarding the roadway segments bordering Square 77 are summarized in Table 1.

Table I
 Roadway Segment Details

Roadway	Functional Classification	Average Daily Traffic (vehicles per day)*	Speed Limit (miles per hour)
I Street	Principal Arterial	2,400	25
H Street	Collector	10,600	25
21 st Street	Collector	7,400	25
22 nd Street	Collector	5,800	25
23 rd Street	Principal Arterial	17,300	25

* The ADT volume is based on data collected in 2010, which is the most recent data available.

Site 77A currently is occupied by three existing residence halls, Schenley, Crawford, and West End, which house 568 beds. Since Site 77A is located within the proposed Foggy Bottom Campus Historic District, the residence hall façades bordering H and I Streets will be preserved with the Site 77A redevelopment while the back portions of the buildings will be demolished. The redeveloped Site 77A will include a new residence hall with up to 894 beds (see Figure 2A). The completion of the new residence hall will provide approximately 326 net new additional on-campus beds to partially offset the planned discontinuation of undergraduate housing at City Hall, an off-campus property (located approximately 3½ blocks away at 950 24th Street, NW). City Hall currently houses up to 381 students. City Hall also has 85 below-grade parking spaces. To-date, 69 permits have been issued for City Hall (32 for GW staff, 34 for medical students and 3 for vendors). It is anticipated that City Hall permits will be transferred to other on-campus parking garages once the University ceases use of City Hall. The relocation of the off-campus housing at City Hall to a location on-campus is required as a condition of the Campus Plan/PUD Order.

The Site 77A redevelopment also will include approximately 1,600 square feet (SF) of ground-floor retail space along I Street (see Figure 2A) as well as approximately 5,000 SF of lower-level space for retail/dining venues in the B1 level of the project (see Figure 2B). The University also plans to relocate GW Mail Services to Site 77A. GW Mail Services currently is located in the Support Building at 2025 F Street, NW, near the southern perimeter of the Campus. Currently, GW Mail Services receives all U.S. Mail delivered to the University's zip code (20052) and then distributes such mail to individual academic and administrative departments and residence halls throughout the campus (primarily on foot by University mail carriers). UPS, FedEx, and other carriers deliver packages for students living in on-campus residence halls to GW Mail Services and students pick up the packages at Mail Services. Packages for academic and administrative departments are delivered directly to the appropriate building or department by University mail carriers. The relocated Mail Services will be located on the B1 level of the Project and will consist of approximately 6,400 SF that will serve as a centralized location for all on-campus students to pick up mail and packages (see Figure 2B). The balance of the B1 level will contain approximately 8,000 SF of student life space that will include seating for the retail venues, informal social spaces, and similar uses (see Figure 2B). The B2 level will contain an additional 11,300 SF of student program space as well as building support space and portions of the building's mechanical systems (see Figure 2C). No parking is proposed in conjunction with the Site 77A redevelopment.

Based on the agreed upon scope, this memorandum will assess various transportation modes as they relate to the redevelopment of Site 77A. Specifically, this memorandum includes: (1) a discussion of the anticipated vehicle trip generation to/from the redeveloped site, (2) the University's extensive

Transportation Management Plan (TMP) as it applies to the redeveloped site, (3) a discussion of the alternative modes of transportation available in the site vicinity, (4) a safety evaluation of nearby intersections and along the site frontages on H and I Streets, (5) a quantitative and qualitative assessment of the existing and proposed loading operations for Square 77, and (6) the proposed loading management plan for Square 77.

VEHICLE TRIP GENERATION

RESIDENCE HALLS

As briefly described in the introduction, the proposed dorm will not increase the number of new beds used by GW students. There currently are approximately 568 beds in Schenley, Crawford, and West End Halls today and the redeveloped Site 77A will include up to 894 beds. The net new increase in beds on the square (approximately 326) will partially offset the loss of approximately 381 beds resulting from the closure of City Hall (located at 950 24th Street, 3½ blocks away). Based on the University's current TMP (see Attachment B), freshmen and sophomores are prohibited from bringing a car on campus except in special circumstances. Upperclassmen are discouraged from bringing a car to campus through parking pricing policies. Additionally, the University provides three shuttle bus services, including the Colonial Express (which provides two routes, each with five stops on the Foggy Bottom Campus), the Vern Express (which provides access between the Mount Vernon and Foggy Bottom Campuses), and the Virginia Science and Technology Campus (VSTC) Shuttle (which provides access between the VSTC and Foggy Bottom Campus). Ample public transportation, including the Foggy Bottom Metrorail Station, Metrobus, and the D.C. Circulator, all provide additional transportation options (see the Alternative Modes of Transportation section of this memorandum for a more detailed discussion).

A transportation survey was conducted for the GW University population in April 2010. Based on the survey (see Attachment C), 92 percent of the students who reside on the Foggy Bottom campus do not have a car on campus. The few students who do have cars on campus can park their vehicle at any University Parking facility designated for student parking. Students who reside on-campus (especially urban campuses), generally do not use their vehicles for daily travel. Vehicles are typically used for off-peak, weekend travel. Therefore, there are no anticipated peak hour vehicle impacts associated with the residential component of Site 77A.

MAIL SERVICES

Approximately 6,400 SF of the below-grade space will be devoted to the University's Mail Services. Mail Services will be relocated from its existing location at 2025 F Street, NW, which is approximately three blocks from Site 77A. Since the use is being relocated from a nearby location, it is not anticipated that the employees associated with Mail Services would alter their mode of travel to/from work, their time of travel to/from work, or (for those who drive) their parking location. Therefore, the new location of Mail Services will not add new employee vehicle trips to/from Square 77. However, the current employees of Mail Services were surveyed and Table 2 provides a detailed breakdown of their current modes of travel and the number of employees working each shift.

Table 2
Mail Services Employee Transportation Modes

Number of Employees per Shift	
Morning	13
Full Day	15
Evening/Night	3
Total	31
Mode of Transportation	
Bike	0
Walk	0
Metrobus	9
Metrorail	19
Drive	3
Total	31

The only new vehicle trips to/from Square 77 that would be associated with the relocated Mail Services will be related to deliveries. These deliveries will be relocated trips and, while they are new to the square, they are not new trips to the Campus or surrounding roadway network. Currently, GW Mail Services receives all U.S. Mail delivered to the University's zip code (20052) and then distributes such mail to individual academic and administrative departments and residence halls throughout the Campus (primarily on foot by University mail carriers). The number of U.S. Mail deliveries to the current facility is on the order of two per day, according to the loading coordinator at the current facility.

UPS, FedEx, and other carriers deliver all student packages to GW Mail Services. These deliveries result in an average of 3.3 deliveries per day, according to data provided by the loading coordinator at the existing facility. Students, on foot, then pick up the packages at Mail Services. UPS, FedEx, and other carrier packages for academic and administrative departments are received directly at the appropriate building or department (and do not go through the Mail Services facility).

With the relocation of Mail Services to Site 77A, students will pick up both their mail and packages on foot at the new building. Therefore, considering no new employee or student vehicular trips are anticipated with the relocated Mail Services and the minimal increase in vehicular trips due to deliveries to/from the square, the relocation of the GW Mail Services is expected to have a negligible vehicular impact on the roadways surrounding Square 77.

FOOD SERVICE VENUE

The food service venue will include approximately 6,600 SF of space (approximately 1,600 SF on the ground floor along I Street and approximately 5,000 SF below-grade). The food service venue would not include vehicular trip generating uses (except for deliveries) as it is intended to serve the Campus community and surrounding neighborhood. For purposes of estimating the trip generating characteristics of the proposed food venue, we used employee information from Ivory Tower, a GW Residence Hall and food venue (located at 616 23rd Street NW). Table 3 summarizes the number of employees and mode of transportation for the Ivory Tower Food Service Venue.

Table 3
 Ivory Tower Food Service Venue Transportation Modes

	Potbelly	Gallery Café	Dunkin' Donuts	Pita Pit	Gallery Market	Total
Number of Employees per Shift						
Morning	5	12	6	1	1	25
Noon	12	12	3	2	1	30
Evening/Night	5	8	2	1	2	18
Total	22	32	11	4	4	73
Mode of Transportation						
Bike	0	0	0	0	0	0
Walk	1	0	0	0	1	2
Metrobus	0	0	2	0	1	3
Metrorail	17	28	7	4	1	57
Drive	4	4	2	0	1	11
Total	22	32	11	4	4	73

As shown in Table 3, for the five food services at Ivory Tower, there currently are a total of 25 employees during the morning shift, 30 employees during the lunch shift, and 18 employees during the evening shift. As shown, only 11 employees drive to/from work on a regular basis, which equates to a non-auto mode split of 85 percent. Therefore, during the busiest shift, only five employees drive to/from work. Based on this information, the vehicular impacts associated with the proposed food service venue on Site 77A would be negligible.

SUMMARY

As discussed above, the redevelopment of Site 77A will not result in a significant increase in vehicular trip generation to/from the Campus or to/from Square 77. Specifically, the net number of beds serving the Campus population will not increase even though the number of on-campus beds will increase by shifting off-campus housing to on-campus housing. Furthermore, freshmen and sophomores are prohibited from bringing cars to campus, upperclassmen are discouraged from bringing cars to campus, and students who do have cars on-campus generally do not use their vehicles on a daily basis or for daily peak hour travel. The proposed retail/dining venues, mail/package services, and student life spaces serve the existing campus community and will not generate vehicular trips. Employees of the retail/dining venues will generate negligible new vehicular trips and the employees of the proposed mail/package services will be relocated from an existing on-campus location. Therefore, as documented in the CTR Scoping Form (see Attachment A), a CTR was not required to address the impact of vehicular trip generation. Based on the various information discussed above, Table 4 details the anticipated vehicle trip generation of the Site 77A uses. Note, however, that not all of these trips are new to the GW Campus or new to Square 77, as previously discussed.

Table 4
 Site 77A Peak Hour Vehicle Trip Generation

LAND USE	AM PEAK HOUR			PM PEAK HOUR		
	In	Out	Total	In	Out	Total
Residence Hall	0	0	0	0	0	0
Mail Services	3	0	3	0	2	2
Food Venue Services	4	0	4	3	5	8

TRANSPORTATION MANAGEMENT PLAN

In conjunction with the 2007 Foggy Bottom Campus Plan and First-Stage PUD, the University proposed and DDOT agreed to a comprehensive TMP for the Foggy Bottom campus. This TMP (see Attachment B) promotes safe and efficient traffic operations within the Campus, encourages alternate modes of transportation, and maximizes the use of the on- and off-street parking facilities to efficiently serve the Campus parking demands. The TMP also prohibits freshmen and sophomores from bringing vehicles to campus except in special circumstances. In April 2010, GW conducted a University-wide transportation survey of students and employees that assessed the effectiveness of the TMP (see Attachment C). The TMP is effective in encouraging alternative modes of transportation and promoting safe and efficient transportation operations within the Campus.

Attachment D includes a brochure developed by GW, which advertises various elements of the TMP, including: public transportation options, bicycle facilities, shuttles, and parking options. As part of the campus-wide TMP, the following specific transportation demand management (TDM) strategies are recommended for the Site 77A redevelopment:

- Public Transportation Orientation – Students moving into the Site 77A residence hall will be provided an introduction to the WMATA public transportation program.
- Shuttle Bus Service Plan –The Colonial Express, the Vern Express, and the VSTC Shuttle services will be advertised to students and employees of Site 77A.
- Car Sharing – There are currently 27 on-street car sharing spaces on or immediately adjacent to the Foggy Bottom Campus.
- Bicycle Parking – In order to facilitate travel by bicycle, the proposed residence hall will include secure, indoor bicycle parking on the ground floor of the proposed building with a capacity of approximately 40 bicycles and 32 outdoor bicycle parking spaces along H Street and I Street.
- Transportation Management Coordinator – The University’s Transportation Management Coordinator will advise Site 77A students of the various TMP initiatives through student and faculty/staff orientation programs and by marketing and promoting TMP program initiatives through printed materials and online resources.

ALTERNATIVE MODES OF TRANSPORTATION

OVERVIEW

The proposed redevelopment site is considered to be a “walker’s paradise”, a “rider’s paradise”, and is “bikeable” according to the Walk Score website (www.walkscore.com). The Walk Score considers how close various amenities, such as coffee shops, grocery stores, schools, parks, and banks are to the site. The transit score considers how close rail and bus services are to the site. The bike score measures whether a location is good for biking based on the availability of on or off-street bicycle lanes/paths, topography, destinations and road connectivity, and the bicycle commuting mode share.

The scales utilized by Walk Score are shown in Table 5. Site 77A scores a 97 out of a possible 100 on the walk score scale, a 91 out of a possible 100 on the transit score scale, and a 69 out of a possible 100 on the bike score scale.

Table 5
 Walk, Transit, and Bike Score Scales

WALK SCORE	DESCRIPTION
90–100	Walker's Paradise — Daily errands do not require a car.
70–89	Very Walkable — Most errands can be accomplished on foot.
50–69	Somewhat Walkable — Some amenities within walking distance.
25–49	Car-Dependent — A few amenities within walking distance.
0–24	Car-Dependent — Almost all errands require a car.
TRANSIT SCORE	DESCRIPTION
90–100	Rider's Paradise — World-class public transportation.
70–89	Excellent Transit — Transit is convenient for most trips.
50–69	Good Transit — Many nearby public transportation options.
25–49	Some Transit — A few nearby public transportation options.
0–24	Minimal Transit — It is possible to get on a bus.
BIKE SCORE	DESCRIPTION
90–100	Biker's Paradise — Daily errands can be accomplished on a bike.
70–89	Very Bikeable — Biking is convenient for most trips.
50–69	Bikeable — Some bike infrastructure.
0–49	Somewhat Bikeable — Minimal bike infrastructure.

METRO RAIL SERVICE/FACILITIES

The Foggy Bottom-GWU Metrorail Station is located on the northwest quadrant of the 23rd Street/I Street intersection (see Figure 3), less than 1,000 feet walking distance from the subject site. This station is the eighth busiest station in the Metrorail system with an average weekday ridership of nearly 41,000 passengers based on 2006 data (see Attachment E).¹ The 2006 peak hour boardings and alightings at the Foggy Bottom-GWU Metrorail station are summarized in Table 6.

Table 6
 Foggy Bottom-GWU Metrorail Station Passenger Boardings and Alightings

Time of Day	Boardings	Alightings	Total
AM Peak Hour	910	4,220	5,130
PM Peak Hour	3,666	1,307	4,973

The most recent ridership data available from the Washington Metropolitan Area Transit Authority (WMATA) (see Attachment E) shows a 1.9 percent annual growth rate, compounded from 2006 to 2012, for passenger boardings at the Foggy Bottom-GWU Metrorail Station.²

The majority of passengers (74 to 89 percent) walk to and from the station; less than 10 percent drive or are driven to the station, as shown in Table 7.

Table 7
 Foggy Bottom-GWU Metrorail Station Passenger Access Modes³

Mode	Percent	
	AM Peak	PM Peak
Metrobus	13.3	2.8
Other Bus	1.7	6.7
Park & Ride	3.3	1.0
Carpool	1.0	0.0
Kiss & Ride	6.6	0.9
Bike	0.0	0.0
Walk	74.1	88.6
Taxi	0.0	0.0
Total	100.0	100.0

¹ Foggy Bottom-GWU Station Second Entrance Demand Analysis, Final Report, Washington Metropolitan Area Transit Authority, March 1, 2007.

² 2012 Metrorail Boarding by Station, Washington Metropolitan Area Transit Authority, June 2012, [http://www.wmata.com/about_metro/public_rr.cfm].

³ Foggy Bottom-GWU Station Second Entrance Demand Analysis, Final Report, Washington Metropolitan Area Transit Authority, March 1, 2007.

As shown in Table 9, a total of 450 bus-trips are operated on the WMATA lines on a typical weekday, 287 bus-trips on a typical Saturday, and 230 bus-trips on a typical Sunday.

Table 9
 WMATA Metrobus Service – Number of Bus Trips

LINE			WEEKDAY SERVICE			SATURDAY SERVICE			SUNDAY SERVICE		
NAME	NUMBER	DIRECTION	AM Service	PM Service	After Midnight	AM Service	PM Service	After Midnight	AM Service	PM Service	After Midnight
			Wisconsin Avenue	31	NB	18	31	-	11	24	1
	SB	19	32		-	12	24	-	10	16	-
Pennsylvania Avenue	32	EB	20	27	3	19	26	3	13	20	3
		WB	32	30	4	19	26	3	11	22	3
	36	EB	15	25	2	15	20	2	13	20	2
		WB	19	16	4	13	22	3	11	22	3
Pennsylvania Avenue Express	39	EB	-	12	-	-	-	-	-	-	-
		WB	12	-	-	-	-	-	-	-	-
North Capitol Street	80	NB	27	38	3	14	27	3	11	23	1
		SB	-	-	-	-	-	-	-	-	-
Brookland - Potomac Park	H1	NB	-	6	-	-	-	-	-	-	-
		SB	9	-	-	-	-	-	-	-	-
Connecticut Avenue	L1	NB	-	10	-	-	-	-	-	-	-
		SB	10	-	-	-	-	-	-	-	-
Massachusetts Avenue	N3	EB	5	-	-	-	-	-	-	-	-
		WB	-	4	-	-	-	-	-	-	-
Benning Road	X1	EB	-	7	-	-	-	-	-	-	-
		WB	10	-	-	-	-	-	-	-	-
TOTALS			196	238	16	103	169	15	78	140	12
						450			287		

MTA's Routes 901, 909, and 950 each provide service in the site vicinity, as shown in Table 8 and Figure 3. As shown on Table 10, a total of 105 bus-trips are operated on the MTA lines on a typical weekday. No weekend service is provided on these MTA lines.

Table 10
 MTA Bus Service – Number of Bus Trips

LINE			WEEKDAY SERVICE		
NAME	NUMBER	DIRECTION	AM Service	PM Service	After Midnight
			La Plata, Charles County, Maryland Waldorf, Charles County, Maryland Washington, D.C.	901	NB
	SB	-	29		-
California, St. Mary's County, Maryland Charlotte Hall, St. Mary's County, Maryland Washington, D.C.	909	NB	5	-	-
		SB	-	5	-
Kent Island, Queen Anne's County, Maryland Annapolis, Anne Arundel County, Maryland Washington, D.C.	950	EB	-	19	-
		WB	17	-	-
TOTALS			52	53	-
			105		

Additionally, the DC Circulator Georgetown – Union Station Line provides service in the study area as shown in Table 8 and Figure 3. The Circulator provides service daily from 7:00 AM to 9:00 PM with 10 minute headways for a total of 85 trips each for the eastbound and westbound directions. This Circulator line also provides additional night service between Whitehaven Parkway and the McPherson Square Metro Station from 9:00 PM to Midnight (19 additional trips per direction) Sunday through Thursday and from 9:00 PM to 2:00 AM (31 additional trips per direction) on Fridays and Saturdays.

The Kennedy Center Shuttle provides service from the Kennedy Center (at the Main Entrance) to the Foggy Bottom-GWU Metrorail Station. The shuttle is free and departs every 15 minutes from 9:45 AM to midnight on Monday through Friday, from 10:00 AM to midnight on Saturdays, and from noon to midnight on Sundays. On federal holidays, the shuttle operates from 4:00 PM to midnight.

The University provides three inter-campus bus services: the Colonial Express, the Vern Express, and the VSTC Shuttle.

The Vern Express is a free bus service that provides transportation for students, faculty/staff, and visitors between the Foggy Bottom and Mount Vernon campuses. The three-mile trip between the two campuses takes between 10 and 13 minutes during non-rush hours. During the academic year, the Vern

Express runs 24 hours a day, seven days a week, providing an easy and efficient link between the campuses. During the summer and semester breaks, the Vern Express provides more limited service.

On weekdays during the academic year, the Vern Express operates with departures from both campuses every five minutes from 8:00 AM to 7:00 PM and every 15 minutes at all other times of day. On weekends during the academic year, the Vern Express operates with departures from both campuses every 15 minutes at all times.

The Vern Express route and stops are shown on Figure 4. Stops are located on the Foggy Bottom Campus at the following locations:

1. G Street between 22nd and 23rd Streets (Funger Hall) (*primary location*)
2. 2025 E Street, NW (Red Cross Building), and
3. 2601 Virginia Avenue in front of the Hall on Virginia Avenue (across from the Watergate), except on weekdays between 6:00 AM and 10:00 AM.

Colonial Express is a shuttle bus service that operates on two routes shown on Figure 5. The northern route operates as a clockwise loop with stops at Marvin Center, the Aston residence hall, 19th Street at L Street, Connecticut Avenue at L Street, and 20th Street at I Street. The southern route, as shown on Figure 5, also serves five stops at the following locations: Marvin Center, Thurston Hall, Health and Wellness Center, the HOVA residence hall, and Columbia Plaza. Both routes operate between 7:00 PM and approximately 3:00 AM. The northern route generally has headways of 23 minutes while the southern route has headways ranging from 19 minutes to 49 minutes.

GW VSTC Shuttle runs between the VSTC and the Foggy Bottom Campus. A second shuttle provided by Virginia Regional Transit also is available between the VSTC and the West Falls Church Metro Station. Both shuttle services are free for GW faculty, staff, and students.

Service between the VSTC and the Foggy Bottom Campus is provided between 8:35 AM and 11:00 PM, Monday through Thursday. Friday service is provided between 8:35 AM and 9:00 PM. The shuttle makes five to six stops daily (Monday through Friday) at the Foggy Bottom Campus. Saturday service is limited to three trips between the campuses. The Foggy Bottom Campus stop is located at Funger Hall on G Street between 22nd and 23rd Streets.

The Vern Express, and the GW VSTC Shuttle are equipped with GPS systems that provide real-time updates on shuttle locations and arrival times. Riders of each shuttle service may track shuttles online in real time at www.gwshuttles.com. Riders of Vern Express may also send a text message to “41411” to find information about a specific shuttle stop and when a bus will service that location. The GW Mobile Application, available at <http://acadtech.gwu.edu/pages/gwmobile>, also offers shuttle updates for the Vern Express.

CAR SHARING SERVICES

Zipcar is an automated car rental or car sharing system in the Washington, D.C. area. Zipcar users must fill out an application online and then will receive a Zipcard, which enables them to reserve Zipcars at any of the locations. Users pay either an hourly or daily rental fee to utilize the car for their reserved time slot. Cars must be returned to the same designated parking space at which they were picked up.

The nearest Zipcar location is at 2200 Pennsylvania Avenue on the southwest corner of the 22nd Street and Pennsylvania Avenue intersection, approximately 850 feet walking distance from the site (or approximately three minute walk based on a walking speed of three miles per hour). Two vehicles are stationed at this location. Additional Zipcars are located within walking distance of the site, as shown on Figure 3.

In addition to Zipcar, Car2Go and Hertz on Demand have begun operating car-sharing services in the District. Car2Go requires a one-time application fee. Once registered, a member card is issued, which enables members to access any available car. No reservation is required and car usage is charged by the minute, with hourly and daily maximum fees. Unlike Zipcar, a Car2Go vehicle does not have to be returned to its original location; a Car2Go vehicle can be returned to any approved parking location. Car2Go currently has 300 vehicles in the District.

Hertz on Demand has no annual fee. Cars can be reserved by the hour or day (hourly and daily fees are charged per usage). In the District, cars must be returned to their original location. Two Hertz on Demand locations are present within an approximate three block radius of the site, as shown in Figure 3. The nearest Hertz on Demand location is on 21st Street between Pennsylvania Avenue and I Street.

BICYCLE FACILITIES

Bicycle Master Plan

The District of Columbia Bicycle Master Plan seeks to create a more bicycle-friendly city by establishing high quality bicycle facilities and programs that are safe and convenient. The Bicycle Master Plan presents bicycle levels of service (BLOS) for roadways in the District. The BLOS represents the level of comfort a “typical” bicyclist experiences on a particular roadway. Specifically, the BLOS reflects “the effect on bicycling suitability or ‘compatibility’ due to factors such as roadway width, bike lane widths and striping combinations, traffic volume, pavement surface condition, motor vehicle speed and type, and on-street parking.” BLOS range from BLOS “A” (roadway is highly suitable for bicyclists to have a comfortable experience) to BLOS “F” (roadway is not suitable for bicyclists to have a comfortable experience).

Currently, no designated bicycle lanes or routes exist within the site vicinity. Bicyclists must share the roads with vehicular and pedestrian traffic. According to the Bicycle Master Plan, under the existing conditions (i.e., bicyclists sharing the road), the majority of the roadways operate at a BLOS “D” or BLOS “E” in the site vicinity, as shown in Figure 6.

Additionally, the Plan reports the number of bicycle crashes that occurred between the year 2000 and 2002. No bicycle crashes were reported in the Bicycle Master Plan at the four intersections bordering Square 77. However, a few intersections within a one to two block a radius of the site have experienced bicycle crashes according to the Plan, as shown in Figure 6.

Finally, the Bicycle Master Plan identifies areas and corridors that are barriers to cyclists. These barriers include “freeways, railroad and highway grade separations, neighborhoods with heavy traffic, and other impediments to bicycle travel.” No barrier areas or corridors identified in the DCBMP fall within the study area of the subject redevelopment site.

Capital Bikeshare

Capital Bikeshare(CaBi) is an automated bicycle rental or bicycle sharing system now available in the Washington, D.C. area. Nearly 1,700 bicycles are available at 175 locations in Washington D.C., Arlington, VA, and Alexandria, VA. Currently, three CaBi docking stations are located within an approximate two block radius of the site, as shown in Figure 6. The closest CaBi docking station is located in very close proximity to Site 77A on the northwest corner of the 21st Street/I Street intersection.

Proposed On-Site Bicycle Parking

The proposed Site 77A redevelopment will include bicycle parking both interior to the building and along the H Street and I Street frontages. As shown on Figure 2A, the ground floor level will include an indoor, secure room that will accommodate approximately 40 bicycles. Additionally, eight GW standard u-shaped bicycle racks, each able to accommodate two parked bicycles, will be provided along each of the site frontages on H Street and I Street for a total of 32 outdoor bicycle parking spaces.

PEDESTRIAN FACILITIES

Overview

As agreed upon with DDOT during the scoping process (see Attachment A), the following intersections were included in the pedestrian study area:

1. 23rd Street/I Street,
2. 22nd Street/I Street,
3. 21st Street/I Street,
4. 22nd Street/H Street, and
5. 21st Street/H Street.

In addition, the mid-block crosswalk on H Street between 21st and 22nd Streets was included in the pedestrian study area.

Pedestrian Master Plan

The District of Columbia Pedestrian Master Plan strives to make Washington, D.C. safer and more walkable by improving sidewalks, roadway crossings, and the quality of the pedestrian environment as well as by ensuring that the District's policies and procedures support walking. The Pedestrian Master Plan provides an overview of existing pedestrian conditions, recommends new pedestrian projects and programs, establishes performance measures, and provides a plan for implementation through 2018.

The Pedestrian Master Plan estimates areas of pedestrian activity and deficiency. At the study intersections and along the roadways within this study area, the Plan indicates moderate to moderately high pedestrian activity and deficiencies, as shown on Figure 7.

The Pedestrian Master Plan provides pedestrian crash data for the years 2000 through 2006. According to the Plan, the 23rd Street/I Street, 22nd Street/I Street, and 21st Street/H Street intersections experienced one pedestrian injury crash in the six year time period. Two to four pedestrian injury

crashes occurred at the 22nd Street/H Street intersection in that time period according to the Pedestrian Master Plan. No pedestrian injury crashes were reported in the Plan at the 21st Street/H Street intersection. These pedestrian crash locations, as well as those at other nearby intersections, are shown on Figure 7.

As part of the Pedestrian Master Plan, eight priority corridors (one in each ward) were identified based on areas of heavy pedestrian traffic and deficient walking conditions. The priority corridor in Ward 2 is New York Avenue from 15th Street NW to Penn Street NE and, therefore, is outside of the study area.

Existing Pedestrian Facilities

As shown in Figure 7, sidewalks are present along all roadways in the study area; however, some sidewalks bordering Square 55 currently are not accessible due to the on-going construction of GW's Science and Engineering Hall. Crosswalks are present at each of the study intersections and pedestrian signals with countdown heads are present at both of the signalized intersections in the study area (i.e., 21st Street/G Street and 23rd Street/I Street). Figures 8 through 13 graphically depict each of the study intersections and the H Street mid-block crosswalk and show crosswalks and pedestrian signals at each location.

DDOT's Design and Engineering Manual (DEM) outlines various requirements for pedestrian facilities. Specifically, the following DEM requirements were assessed at each of the study intersections:

- Section 43.3.1 (Size and Dimension of Pavement Markings): Crosswalks shall be 10 feet wide on local streets, 15 feet wide on collector streets, and 20 feet wide on major arterials, unless otherwise noted.
- Section 43.3.2 (Special Pavement Marking Areas): All crosswalks shall have a minimum 20 foot width whenever possible within the Downtown Central Business District (CBD), including the Downtown Streetscapes Area. This area is currently bounded on the east by 3rd Street, NW, on the south by Independence Avenue, SW, on the west by 23rd Street, NW and on the north by Massachusetts Avenue, NW and includes the full width of the boundary streets.
- Section 39.2.4 (Pedestrian Safety): All mid-block crossing require advance pedestrian signing. Signs must be placed a minimum of 150 feet before a mid-block crosswalk.
- Section 43.7 (Crosswalks): High visibility crosswalks are required at all uncontrolled crosswalks and all crosswalks (including signalized or stop-controlled crosswalks) leading to a block with a school, within a designated school zone area, along a designated school walking route, or on blocks adjacent to a Metro station.
- Section 43.7 (Crosswalks): Handicap ramps must be included within a crosswalk at all times. Handicap ramps must be installed in pairs of two, one for each pedestrian travel direction. Any corner and/or mid-block crosswalk having handicap ramps [sic].
- Section 39.2.4 (Pedestrian Safety): All handicap ramps shall be located within the crosswalk. At least one of the ramp's side flares must align, as close as possible to the back edge line of the crosswalks. Handicap ramps must be installed for each travel direction at a corner.
- Section 29.5 (Curb Ramps): Detectable warning surfaces shall extend 24 inches minimum in the direction of travel and the full width of the curb ramp (exclusive of flares), the landing, or the blended transition.

- Section 43.8.1 (Minimum Parking Distance from a Crosswalk – General Restrictions): In general, parking is restricted 40 feet toward intersection (measured for approaching point of intersection) and 25 feet away from intersection (measured from departure point of intersection).

As shown on Figure 8, crosswalks are present on each of the three approaches to the 23rd Street/I Street intersection; however, only the north/south crosswalk across I Street meets the 20-foot width requirement outlined for the CBD per DEM Section 43.3.2. All three crosswalks at the 23rd Street/I Street intersection are striped as high visibility crosswalks, which is required per DEM Section 43.7 since this intersection is adjacent to a Metro station. Only the handicap ramps on the northeast corner of the intersection meet the DEM standards since the remaining ramps do not have detectable warning surfaces. Additionally, the ramp on the southeast corner of the intersection, which provides access to the 23rd Street crosswalk, does not align with the crosswalk. Finally, parking on each approach to and each departure from the 23rd Street/I Street intersection is set back acceptable distances, in accordance with DEM Section 43.8.1.

As shown on Figure 9, crosswalks are present on three of the four approaches to the 22nd Street/I Street intersection but none of them meet the 20-foot width requirement outlined for the CBD per DEM Section 43.3.2. A fourth crosswalk, on the southern leg of the intersection, was present prior to the on-going construction on Square 55, which resulted in the closure of the sidewalk on the southwest corner of the intersection. All three existing crosswalks at the 22nd Street/I Street intersection are striped as high visibility crosswalks, although it is not required per the DEM. Both handicap ramps on the northwest corner, the 22nd Street ramp on the northeast corner, and the 22nd Street ramp on the southeast corner meet the DEM standards. Due to the construction on Square 55, no ramps currently are accessible on the southwest intersection. No ramps are present on the eastern leg of the 22nd Street/I Street intersection, likely due to the metal grate where the crosswalk meets the curb on the northeast and southeast corners. Finally, parking on each approach to and each exit from the 22nd Street/I Street intersection is set back acceptable distances, in accordance with DEM Section 43.8.1, although these measurements could not be taken on the southwest corner due to the Square 55 construction.

As shown on Figure 10, crosswalks are present on each of the four approaches to the 21st Street/I Street intersection; however, none of them meet the 20-foot width requirement outlined for the CBD per DEM Section 43.3.2. All four crosswalks at the 21st Street/I Street intersection are striped as high visibility crosswalks, although it is not required per the DEM. None of the handicap ramps at the intersection meet the DEM standards since they do not have detectable warning surfaces. Finally, parking on the eastern, western, and southern legs approaching and departing the 21st Street/I Street intersection is set back at acceptable distances, in accordance with DEM Section 43.8.1. On the northern leg, parking should be set back 40 feet from the approaching point of intersection on both sides of the street since the 21st Street is one-way southbound (currently the 40 foot setback is not met on either side).

As shown on Figure 11, crosswalks are present on each of the four approaches to the 22nd Street/H Street intersection; however, none of them meet the 20-foot width requirement outlined for the CBD per DEM Section 43.3.2. The crosswalks on the northern and southern legs of the intersection are striped as high visibility crosswalks, although it is not required per the DEM. The handicap ramps on the southeast and southwest corners of the intersection meet the DEM standards. The ramps on the northeast corner of the 22nd Street/H Street intersection do not have detectable warning surfaces and,

therefore, do not meet the DEM standards. Due to the construction on Square 55, no ramps currently are accessible on the northwest corner of the intersection. Finally, parking on each approach to and each exit from the 22nd Street/H Street intersection is set back acceptable distances, in accordance with DEM Section 43.8.1, although these measurements could not be taken on the northwest corner due to the Square 55 construction.

As shown on Figure 12, crosswalks are present on each of the four approaches to the 21st Street/H Street intersection; however, none of them meet the 20-foot width requirement outlined for the CBD per DEM Section 43.3.2. All four crosswalks at the 21st Street/I Street intersection are striped as high visibility crosswalks, although it is not required per the DEM. None of the handicap ramps at the intersection meet the DEM standards since they do not have detectable warning surfaces. Finally, parking on each leg departing the 21st Street/H Street intersection is set back at acceptable distances, in accordance with DEM Section 43.8.1. However, none of the approaches to the intersection meet the required setback. On the northern leg, parking should be set back 40 feet from the approaching point of intersection on both sides of the street since the 21st Street is one-way southbound. Similarly, on the western leg and the eastern leg of the 21st Street/H Street intersection, parking should be set back 40 feet from the approaching point of intersection.

Finally, as shown on Figure 13, a mid-block crosswalk is present on H Street between 21st and 22nd Streets. The width of the mid-block crosswalk meets the 20-foot width requirement outlined for the CBD per DEM Section 43.3.2. However, no handicap ramps are present where the crosswalk meets the curb and, as shown on Figure 13, tree boxes are located in the area where the crosswalk meets the sidewalk. Finally, parking approaching and departing the mid-block crosswalk is set back at acceptable distances.

As documented above and in Figures 8 through 13, several existing deficiencies, including handicap ramps, on-street parking near intersections, and sidewalk widths, were identified at each of the study intersections and at the H Street mid-block crosswalk between 21st and 22nd Streets. However, these deficiencies exist today and will not be exacerbated by the Site 77A redevelopment and, therefore, should not be the responsibility of GW.

Pedestrian Level of Service

As agreed upon with DDOT during the scoping process (see Attachment A), the pedestrian delay at signalized intersections was determined in accordance with the Highway Capacity Manual (HCM) 2000 methodologies outlined in Chapter 18. In the HCM 2000, pedestrian level of service is determined based on the average delay per pedestrian (i.e., wait time). Pedestrian delay is calculated using two parameters: cycle length and effective green time for pedestrians. In the absence of field data, the HCM 2000 recommends estimating effective green time for pedestrians by taking the walk interval and adding four seconds of the flashing don't walk interval to account for pedestrians who depart the curb after the start of flashing don't walk.

The average delay per pedestrian for a crosswalk is determined from the following equation:

$$d_p = \frac{0.5(C - g)^2}{C}$$

where

- d_p = average pedestrian delay (seconds),
- g = effective green time for pedestrians (seconds), and
- C = cycle length (seconds)

The calculated delay is then used to determine the pedestrian level of service for the pedestrian crossing based on the thresholds shown in Table 11.

Table 11
Pedestrian Level of Service Criteria

LOS	Pedestrian Delay (seconds/pedestrian)
A	< 10
B	≥ 10-20
C	≥ 20-30
D	≥ 30-40
E	≥ 40-60
F	≥ 60

The study area included two signalized intersections: the 23rd Street/I Street intersection and the 21st Street/H Street intersection. Using the HCM 2000 equation, the average pedestrian delay was calculated for the east/west and north/south pedestrian crosswalks at each signalized intersection. The results are shown in Table 12 and the calculations are included in Attachment F.

Table 12
 Average Pedestrian Delays and Levels of Service at Signalized Intersections

Intersection	Crossings	AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS
23 rd Street/I Street	North/South	8.0	A	8.0	A
	East/West	32.0	D	32.0	D
21 st Street/H Street	North/South	9.6	A	7.8	A
	East/West	9.6	A	11.6	B

As shown in Table 12, each of the crosswalks at the two signalized study intersections operates at an acceptable level of service (LOS “D” or better) during the AM and PM peaks. It should be noted, though, that the HCM 2000 methodology for calculating pedestrian levels of service does not incorporate the volume of pedestrian traffic, vehicular conflicts, or geometrics of the pedestrian facilities. Therefore, high volume pedestrian areas (such as the northern crosswalk at the 23rd Street/I Street intersection) may experience additional delay that is not quantified by the HCM 2000 pedestrian level of service equation.

STREETSCAPE ALONG SITE FRONTAGES

Ayers Saint Gross, the architects for the Site 77A redevelopment, has developed detailed streetscape plans along the site frontages for the existing and proposed conditions. The proposed streetscape conditions are consistent with the University’s Foggy Bottom Campus Streetscape Guidelines. Figures 14 and 15, which show the existing streetscape along the H Street and I Street frontages, respectively, display existing obstructions, landscaped areas, sidewalk widths, and clearway widths. DDOT’s preferred minimum clear width is ten feet; however, a minimum of six feet will be accepted in areas where sidewalks cannot physically be widened. As shown on Figures 14 and 15, DDOT’s minimum clear width of six feet is met along all portions of the site frontage under existing conditions. Currently, the clear width varies from 6 feet, 10 inches to 11 feet, 4 inches along H Street and from 7 feet, 10 inches feet to 11 feet, two inches along I Street.

Due to the fact that the façades of the existing residence halls on Site 77A must be retained for historic preservation, the existing steps, ramps, and open space related to those façades must be maintained; therefore, the ability of the proposed redevelopment to widen the sidewalks on H and I Streets is limited. Additionally, Site 77A occupies only a portion of Square 77. As such, other buildings (namely, Marvin Center and the Academic Center) will remain and preclude altering the sidewalks beyond the Site 77A frontage. Given these physical constraints it is not possible to achieve the preferred ten foot width. Under proposed conditions, the clear width will vary from 9 feet to 14 feet along H Street and I Street, as shown on Figures 14 and 15.

Additionally, the minimum clear widths along both site frontages will increase compared to existing conditions. Specifically, along H Street, the existing minimum clear width is less than seven feet while under proposed conditions it will increase to nine feet. Similarly, along I Street, the existing minimum clear width along the site frontage is less than eight feet but under proposed conditions it will increase to nine feet.

The increases in minimum clear widths on H and I Streets coupled with the various landscape/streetscape improvements will improve the pedestrian experience in the site vicinity.

SAFETY EVALUATION

Traffic Volumes

Turning movement, bicycle, and pedestrian counts were conducted at the following locations on Thursday, September 13, 2012 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM:

1. 22nd Street/H Street,
2. 21st Street/H Street, and
3. The H Street mid-block crosswalk.

Additionally, counts were conducted at the 23rd Street/I Street intersection on Wednesday, January 9, 2013 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM.

Finally, the I Street intersections with 21st Street and 22nd Street were counted on Wednesday, November 16, 2011 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM.

The peak hour volumes for each of the study locations are shown on Figures 16A, 16B, and 16C and the data for these counts is included in Attachment G.

Potential Additional Signalized Intersection Signage

As requested by DDOT during the scoping process, the appropriateness of installing “No Turn on Red” (NTOR) signs or “Turning Vehicles Yield to Pedestrians” (TVYP) signs was evaluated based on pedestrian and vehicular volumes at the study intersections and in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, 2009 Edition.

The MUTCD indicates that a NTOR sign (R10-11, R10-11a, or R10-11b) should be considered when an engineering study finds that one or more of the following conditions exists:

- A. Inadequate sight distance to vehicles approaching from the left (or right, if applicable);
- B. Geometrics or operational characteristics of the intersection that might result in unexpected conflicts;
- C. An exclusive pedestrian phase;
- D. An unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities;
- E. More than three right-turn-on-red accidents reported in a 12-month period for the particular approach; or
- F. The skew angle of the intersecting roadways creates difficulty for drivers to see traffic approaching from their left.

Under existing conditions, the northbound approach at the 23rd Street/I Street intersection has a NTOR sign that applies from 7:00 AM to 7:00 PM. Today, approximately 200 pedestrians use the I Street crosswalk during the AM peak hour and nearly 400 pedestrians use the I Street crosswalk during the PM peak hour. The northbound vehicle right turn volume (from 23rd Street onto I Street) is 264 vehicles per hour (vph) during the AM peak hour and 49 vph during the PM peak hour.

By way of comparison, approximately 1,300 pedestrians use the northern 23rd Street crosswalk during the AM peak hour and approximately 1,600 pedestrians use this crosswalk during the PM peak hour. The westbound right turn volume from I Street onto 23rd Street is minimal during the AM peak hour (just 4 vph). During the PM peak hour, the westbound right turn volume is 34 vph, which is comparable to the northbound right turn volume.

Although the MUTCD and DDOT do not provide specific volume thresholds for NTOR signs, based on this comparison, it may be appropriate to install a NTOR sign for westbound vehicles at the 23rd Street/I Street intersection. The same time restrictions (i.e., 7:00 AM to 7:00 PM) as the northbound NTOR could be implemented for the westbound approach.

Currently, the southbound approach at the 21st Street/H Street intersection has a NTOR sign that applies at all times. The existing pedestrian volume crossing H Street on the west side of the intersection is 236 pedestrians per hour (pph) during the AM peak hour and 598 pph during the PM peak hour. The conflicting southbound right turn volume is 25 vph during the AM peak hour and 94 vph during the PM peak hour.

The number of eastbound right turns is comparable to the southbound right turn volume, which is prohibited from making a right turn on red (32 vph during the AM peak hour; 99 vph during the PM peak hour). The pedestrian volume on the south leg of the intersection is slightly lower than the pedestrian volume on the west leg of the intersection (186 pph during the AM peak hour; 427 pph during the PM peak hour). Based on this comparison, it may be appropriate to install a NTOR sign for the eastbound right turn.

According to the MUTCD the TVYP sign (R10-15) may be used at signalized intersections “to remind drivers who are making turns to yield to pedestrians.” The MUTCD does not offer specific guidance on when to install the TVYP sign (R10-15). It could be considered as an alternative to the NTOR signs discussed above. Additionally, the TVYP signs can be installed for left turning traffic and, therefore, should be considered for applicable approaches at both the 23rd Street/I Street intersection and 21st Street/H Street intersection.

Signage Along Site Frontages

Per DDOT’s request during the scoping process (see Attachment A), signage along Site 77A’s H Street and I Street frontages was inventoried to determine compliance with MUTCD standards. Figure 17 graphically depicts the signage along the Site 77A frontages and pictures of each of the signs are included in Attachment H. As shown on Figure 17, all signage along the site frontages relates to parking restrictions. All signs were found to be in good condition and meet the MUTCD standards with the exception of the “No Standing or Parking Anytime” sign along H Street, west of the alley. Note, however, that this sign and the “No Standing or Parking Anytime” sign east of the alley would be removed with the closure of the alley, as noted on Figure 17.

H Street Mid-Block Crosswalk

Upon completing the inventory of signage along the Site 77A frontage on H Street, it was observed that no signage is present on H Street to warn motorists of the mid-block crosswalk between 21st Street and 22nd Street. The MUTCD indicates: “Because non-intersection pedestrian crossings are generally unexpected by the road user, warning signs **should** be installed for all marked crosswalks at non-intersection locations.” Additionally, DDOT’s Design and Engineering Manual states that advanced pedestrian signs must be placed a minimum of 150 feet before a mid-block crosswalk.

Exhibit I illustrates the the MUTCD signage. The MUTCD indicates that the non-vehicular warning Pedestrian Crossing sign (W11-2) may be used to alert road users in advance of locations where shared use of the roadway by pedestrians might occur.

Exhibit I
MUTCD Signage for Crosswalks



If a W11-2 sign is used in advance of a pedestrian crossing, the sign should be supplemented with plaques with the legend “AHEAD” (W16-9, as shown in Exhibit I) or “XX FEET” (W16-2P, as shown in Exhibit I) to inform road users that they are approaching a point where crossing activity might occur.

According to the MUTCD, the “YIELD HERE TO PEDESTRIANS” sign (RI-5) “shall be used if yield (stop) lines are used in advance of a marked crosswalk that crosses an uncontrolled multilane approach.” The “STOP HERE FOR PEDESTRIANS” (RI-5b) is used only where state law specifically requires the driver to stop for a pedestrian in the crosswalk.

Based on the guidance in the MUTCD and the Design and Engineering Manual, the Pedestrian Crossing sign (W11-2) should be installed on H Street, on the eastbound approach, 150 feet in advance of the mid-block crosswalk. The placards with the legend “AHEAD” (W16-9) and “150 FEET” (W16-2P) should be installed with the sign. Since the crosswalk is located within 150 feet of the H Street/21st

Street intersection to the west, the Pedestrian Crossing sign and placards on the westbound approach to the intersection should be installed as far east of the crosswalk as possible.

Crash Evaluation

Crash data for each of the study intersections were requested from DDOT on January 7, 2013; however, at the time this memorandum was drafted, crash data had not yet been received for the 22nd Street/H Street intersection or the 21st Street/H Street intersection. This information will be included under separate cover once it has been received from DDOT.

The information provided by DDOT, for the remaining intersections, included the total number of crashes over the latest three years of available data (i.e. 2008, 2009, and 2010) at each intersection and was further categorized by type of crash.

The total number of crashes at each intersection over the latest three years of available data is summarized in Table 13. The table also provides a calculated crash rate for each intersection. The crash rates, which are expressed in number of crashes per million entering vehicles (MEV), were calculated by using the following equation:

$$R = \frac{C \times 1,000,000}{V \times N \times 365}$$

where:

- R = Crash rate per year per million vehicles
- C = Total number of crashes in the study period
- V = Intersection daily approach volumes
(calculated using PM peak volumes and a K factor of 0.1)
- N = Number of years of data

The crash information provided by DDOT does not give specific details of the crashes at each intersection; therefore, it is not possible to determine any specific trends or patterns, the specific causal factors for any of the crashes, or make recommendations to improve safety at the study intersections. The crash data received from DDOT and the calculation of the crash rates are included in Attachment I.

Table 13
Crash Data Summary

Intersection	Number of Crashes*	Crash Rate
21 st Street/I Street	16	1.206
22 nd Street/I Street	10	1.602
23 rd Street/I Street	42	2.206

* Number of crashes presented in the table is the number of crashes that occurred in 2008, 2009, and 2010 combined. The crash rate presented in the table is expressed in number of crashes per MEV.

LOADING OPERATIONS

OVERVIEW - EXISTING CIRCULATION

Square 77 currently is served by six curb cuts (three on I Street, one on 21st Street, and two on H Street) as shown on Figure 18. A 30-foot interior alley currently serves as a loading area for the entire square. Access to the interior alley is provided from H Street via a 15-foot alley located between Schenley and Crawford Halls and from I Street by a 9.5-foot alley located between West End Hall and the Academic Center parking garage ramp. The 9.5-foot alley currently operates and is signed one-way southbound (into the square) and is mainly used by maintenance and University vehicles. Under current conditions, trucks enter the Square 77 loading area by entering via the H Street alley front-first. Once in the interior alley, trucks can access the loading areas for Marvin Center, the Academic Center, and the residence halls and then exit onto H Street front-first.

Under existing conditions, the Marvin Center loading area is non-traditional in nature as trucks angle in between two disposal containers to access the loading dock. This method leaves the front end of the larger trucks projecting out into the interior alley.

Additional loading for the square occurs on I Street for the GW Bookstore at a 19-foot curb cut located between West End Hall and the Marvin Center. Most trucks accessing the Bookstore currently back into the loading zone from I Street and exit front-first onto I Street. An occasional delivery vehicle has been observed to pull into the loading zone front-first from I Street and back out onto I Street.

The western-most curb cut on I Street is located adjacent to 837 22nd Street (the Women's Studies Department) and is approximately 14 feet wide; however, the curb cut does not provide access to the building itself and ends near the back of the sidewalk. This curb cut is not affected by the proposed redevelopment of Site 77A.

The curb cut on 21st Street is approximately 15 feet wide and provides access to a service/delivery space between the rear of Lafayette Hall and the Marvin Center. This curb cut is not affected by the proposed redevelopment of Site 77A.

The eastern curb cut on H Street is 25 feet wide and provides access to the Marvin Center parking garage. This curb cut also would not be impacted by the proposed Site 77A redevelopment.

The existing loading circulation and curb cuts for the square are shown on Figure 18.

OVERVIEW – PROPOSED CIRCULATION

In conjunction with the redevelopment of Site 77A, the existing H Street alley, which currently provides truck access to the internal loading operations, will be closed, reducing the number of curb cuts on Square 77 to five. Under the proposed plan, a portion of the Marvin Center building that houses the Bookstore loading will be razed so that the curb cut on I Street that currently serves the Bookstore loading can provide access to and egress from the interior alley and the square's internal loading operations. Importantly, this modification will eliminate the back-in loading that currently occurs with the Bookstore and will allow for front-in/front-out truck access for all uses on the square.

The existing curb cut width of 19 feet will adequately accommodate the re-routed truck traffic for the square (with the restriction of WB-50 trucks, as discussed in detail below).

With the redevelopment of Site 77A, the maintenance and University vehicles that currently park in the Square will be relocated to other locations on campus. The existing 9.5-foot alley adjacent to the Academic Center parking garage ramp will be widened to 11-feet, would be converted to two-way operation, and would provide access to and egress from the Academic Center loading dock for 30-foot trucks or smaller and trash trucks (also 30-foot or smaller) only. These vehicles will access the loading area via the 11-foot alley front-first and exit front-first from the same curb cut.

The remaining curb cuts on the square will continue to operate as they do under existing conditions.

The proposed loading circulation and curb cuts for the square are shown on Figure 19.

SITE 77A LOADING OPERATIONS

Loading Dock Access

Loading activity for the redeveloped Site 77A will be accommodated by two loading berths (both 40-foot bays), two roll-off dumpsters, and two service/delivery spaces for the building and its associated services. See Figure 19 for the proposed loading dock layout for the redeveloped Site 77A.

The building's below-grade food service venue and Mail Services will use the two loading berths and will be able to enter the internal alley front-first from I Street, back into the desired loading bay, and then exit to I Street front-first.

The roll-off dumpsters typically require space in front of the dumpster in order for the roll-off dumpster trucks to fully lift them onto the back of the truck. Due to the constraints at the proposed trash/recycling dumpster locations; the dumpsters for the new building will be placed on an elevated platform, above the ground level, so that the trucks do not require the additional space (i.e., the dumpsters can be pulled straight from the platform onto the truck without the bed of the truck having to tilt). The roll-off dumpster trucks will then be capable of entering the alley front-first from I Street, backing to the necessary dumpster, and then exiting front-first onto I Street.

The two service/delivery spaces will be used by much smaller vehicles that can more easily maneuver in the internal alley even when other loading operations are on-going in the alley.

In addition to the two service/delivery spaces accessed via the alley, certain service/delivery vehicles on Square 77 will have access to designated spaces in the Marvin Center parking garage. Specifically, vehicles such as catering vans, campus mail vans, and service vehicles that do not need access to the loading dock and that are small enough to fit in the garage, would be required to park in the garage when their vehicles are left unattended for lengthy periods of time. Requiring unattended smaller vehicles to use the Marvin Center parking garage will provide additional maneuvering room for the larger trucks that must use the alley system.

The truck turning templates for the redeveloped Site 77A loading operations are included in Attachment J.

Frequency of Trucks

The proposed new residence hall will house student residences, a food service venue, and the relocated Mail Services. As such, the Site 77A loading area is expected to receive food and mail deliveries as well as trash/recycle trucks. Table 14 summarizes the anticipated deliveries for the new Site 77A building.

Table 14
 Summary of Site 77A Deliveries

Component	Number of Daily Weekday Deliveries			Percent Tractor Trailers
	Min	Max	Average	
Food Services	5	9	10.2	31.4%
Mail Services*	3	11	5.5	0%
Trash	0	2	1.2	0%
Total	8	22	16.9	N/A

* Excludes Campus Mail Van Deliveries

In order to estimate the frequency of food service deliveries to Site 77A under future conditions, data from the nearby Ivory Tower Residence Hall and food service venue was evaluated. Ivory Tower, which currently houses Dunkin’ Donuts, Gallery Café, Gallery Market, Pita Pit, and Potbelly is expected to be similar to the food service venue in the proposed residence hall.

Based on the Ivory Tower delivery frequency information, the food services in Site 77A are anticipated to require approximately 51 total trucks per week with daily truck trips ranging from five to 19 trucks per day.

Based on 2011 data for Mail Services at its existing location, an average of five to six deliveries are expected per day and with a range of a minimum of three to maximum of eleven deliveries per day. Note that this estimation of daily deliveries does not include campus mail vans, which distribute some mail to specific campus locations after the US Mail truck deliveries mail to the Mail Services facility; however, most campus deliveries are made on foot. There are expected to be four campus mail vans that would access the Mail Services facility throughout each day; however, the number of times each van would access the alley varies from day-to-day.

The redeveloped Site 77A loading area also will contain two roll-off dumpsters (one trash and one recycling), which are anticipated to be changed out three times a week.⁴ According to the University, the trash for Square 77 is and will continue to be, picked up by the University (i.e. it will not be sub-contracted). Therefore, the University trash services can schedule the trash/recycling pick-ups during times when the Square 77 loading area is least busy. Square 77 is located within 300 feet of a residential zone and District of Columbia Municipal Regulations (20-2806.1 and 20-2806.2) prohibit trash collection by private haulers between the hours of 9:00 PM and 7:00 AM in or within 300 feet of residential zones. Therefore, trash/recycle removal cannot be scheduled during these times.

⁴ Each time the dumpsters are exchanged, a roll-off truck enters the alley, removes the filled dumpster, and exits the alley. Then, another roll-off truck enters the alley with an empty dumpster, places it, and exits the alley. This results in six weekly roll-off dumpster trucks per dumpster for Site 77A.

Size of Trucks

From the data collected from the Ivory Tower food venues, approximately one-third of the deliveries are made in tractor trailers; the remainder of the deliveries are made in 30-foot trucks or smaller.

Incoming Mail Services deliveries arrive in approximately 24-foot single unit trucks while the outgoing mail deliveries to the campus are made by foot or with the aforementioned campus mail vans.

The trash/recycle roll-off dumpsters for Site 77A will be serviced via roll-off dumpster trucks.

Relevant details regarding truck frequency and sizes for Site 77A are contained in Attachment K.

MARVIN CENTER LOADING OPERATIONS

Loading Dock Access

Existing loading operations for the Marvin Center, which will be impacted by the Site 77A redevelopment, are contained within two separate areas. The campus bookstore loading dock is accessed via the I Street curb cut between West End Hall and the Marvin Center. Delivery trucks currently back into this loading bay from I Street and then exit front-first or enter front-first and back-out. The internal loading operations for the Marvin Center (waste removal and general Marvin Center loading dock) are accessed via the H Street curb cut and the internal alley. Once within the internal alley, trucks are able to maneuver as necessary to back to the Marvin Center loading dock or to the necessary waste dumpster. The internal loading area currently consists of an informal loading zone, three roll-off dumpsters (general waste, recycling, and trash), and a grease receptacle, as shown on Figure 18.

The proposed redevelopment of Site 77A will reorganize and formalize the Marvin Center loading area. The new layout will consist of three loading bays: one for the bookstore (40-foot bay) and two for the remainder of the Marvin Center (one 40-foot bay and one 30-foot bay). The building also will be served by two roll-off dumpsters (one trash dumpster and one recycling dumpster), one smaller dumpster that can be picked up with 22-foot long trash trucks, and a grease receptacle. See Figure 19 for the proposed loading operations for the Marvin Center.

Each of the loading areas can be accessed by turning into the alley front-first from I Street and then backing into the desired loading zone. The trucks will then be able to pull front-first out of the alley, onto I Street. Although the Marvin Center loading area will improved, due to the incorporation of the Site 77A loading area and the projected increase in the number of deliveries, the redevelopment of Site 77A will necessitate a dedicated dock manager for the square to coordinate delivery schedules and ensure safe and efficient loading operations.

The truck turning templates for the Marvin Center loading operations are included in Attachment J.

Frequency of Trucks

The Marvin Center loading operations include several components: food services, the campus bookstore, waste removal, and deliveries for special events. Attachment K includes detailed information from Marvin Center representatives, which outlines the existing delivery schedules for the food services and campus bookstore. Note that the data provided in Attachment K represents all possible deliveries on each day of the week. The deliveries listed under each day of the week in Attachment K do not necessarily occur every week.

As shown in Attachment K, the food service venue at Marvin Center is served primarily by SU-30 trucks throughout the week with several WB-40 trucks and an occasional WB-50 truck each week. The campus bookstore, which is housed at the Marvin Center, also is served primarily by SU-30 trucks with several WB-40 trucks and a couple WB-50 trucks each week.

Trash/recycle removal for the Marvin Center is conducted three times per week⁵ by roll-off dumpster trucks. The Marvin Center also requires various deliveries for special events, freshmen orientation, and building renovations. These events occur at various times and require various truck sizes (WB-50 trucks or smaller).

As previously noted, the University collects the trash and recycling for the Marvin Center. Therefore, the University trash services can schedule the trash/recycling pick-ups during times when the Marvin Center dock is least busy. Square 77 is located in a residential zone and District of Columbia Municipal Regulations (20-2806.1 and 20-2806.2) prohibit trash collection by private haulers between the hours of 9:00 PM and 7:00 AM in residential zones. Therefore, trash/recycle removal cannot be scheduled during these times.

Based on discussions with Marvin Center representatives, the maximum number of trucks in the loading area at any one time ranges from three to four trucks during the busiest times. The Marvin Center representatives also have indicated that occasionally one to two trucks that plan to arrive during the busiest time make the decision to instead finish their route and return when the loading dock is less busy.

Since there are no changes to the internal operations of the Marvin Center, it is expected that the frequency of delivery trucks should remain consistent between existing and proposed conditions.

Size of Trucks

As mentioned previously, the Marvin Center currently uses a variety of truck sizes from SU-30 trucks to WB-50 trucks. However, with the Site 77A redevelopment, space constraints within the proposed interior alley layout will require the restriction of WB-50 trucks to ensure safe and efficient loading operations for the square. Therefore, deliveries to the Marvin Center that currently are made in WB-50 trucks will be required to be made in WB-40 trucks or smaller trucks.

⁵ Each time the dumpsters are exchanged, a roll-off truck enters the alley, removes the filled dumpster, and exits the alley. Then, another roll-off truck enters the alley with an empty dumpster, places it, and exits the alley. This results in six weekly roll-off dumpster trucks per dumpster for the Marvin Center.

Of note, the restriction of WB-50 trucks will allow for deliveries to be made to the square without any impacts to the on-street parking on I Street. Additionally, restricting WB-50 trucks will allow for the easternmost curb cut on I Street (i.e., the existing bookstore curb cut) to remain at its current 19-foot width.

ACADEMIC CENTER LOADING OPERATIONS

Loading Dock Access

Under existing conditions, the Academic Center loading operations are accessed via the H Street curb cut and the internal 30-foot alley (front-first entry and exit). The delivery trucks are then able to maneuver in the internal alley to back into the existing loading dock. The roll-off dumpster trucks also enter from the H Street curb cut and are then able to maneuver in the internal alley to load and unload the dumpsters. The current Academic Center loading area consists of one loading dock at the northernmost portion of the loading dock and three roll-off dumpsters located south of the bay situated at an angle as shown in Figure 18.

Since the proposed redevelopment will close the H Street curb cut and alley, thereby eliminating access to the Academic Center from the internal alley, under proposed conditions, trucks destined for the Academic Center will be required to access the loading dock via the existing curb cut between the Academic Center parking garage ramp and West End Hall. The Academic Center alley will be widened to 11 feet and converted to two-way operation. Note that DDOT requested that the Academic Center alley be widened to the extent possible (recognizing that the façade of West End Hall will be retained). Under future conditions, the loading berth for the Academic Center will be relocated to the southern portion of the loading dock and the dumpsters relocated to the northern portion of the dock, as shown on Figure 19, to provide the most efficient operations.

Due to the width of the Academic Center alley, the roll-off dumpsters will be replaced with the smaller dumpsters that can be picked up with smaller, 22-foot long trash trucks. Additionally, deliveries will be limited to SU-30 trucks or smaller. Under these conditions, trucks will be able to access the loading dock and trash receptacles by turning front-first into the alley from I Street, backing into the loading dock or up to the dumpsters, and then exiting front-first onto I Street.

Due to the tight constraints in this area, the loading operations must be carefully scheduled to avoid conflicts. A dock manager who coordinates the deliveries and loading operations for the Academic Center (who could be the same person designated as the Marvin Center dock manager) will be essential to ensure safe and efficient operations in the limited space available.

The truck turning templates for the Academic Center loading operations are shown in Attachment L.

Frequency of Trucks

Truck inventory surveys were conducted to determine the extent of the existing loading operations for the buildings within Square 77. The departments housed within the Academic Center do not necessitate large delivery trucks, nor were large trucks indicated to be used based on the responses received for the truck inventory survey. Therefore, the vast majority of the deliveries to the Academic Center are made and would continue to be made via SU-30 trucks or smaller. Based on data provided

by the departments within the Academic Center, the Academic Center currently experiences an estimated 15 to 40 SU-30 trucks per week and one WB-40 truck per week.

Currently, the Academic Center's trash and recycle dumpsters are estimated to be changed out three times per week. Each time the dumpsters are exchanged, a roll-off truck enters the alley, removes the filled dumpster, and exits the alley. Then, another roll-off truck enters the alley with an empty dumpster, places it, and exits the alley, resulting in six weekly roll-off dumpster trucks per dumpster for the Academic Center. With the reconfigured access for the Academic Center loading area, it will be necessary to use smaller dumpsters rather than the roll-off dumpsters. While the smaller dumpsters may need to be emptied more frequently (likely on a daily basis, or seven times per week), these dumpsters are emptied on site, thus requiring only one truck. Therefore, the number of trash trucks is not expected to substantially change.

As previously noted, the University collects the trash and recycling for the Academic Center. Therefore, the University trash services can schedule the trash/recycling pick-ups during times when the Academic Center dock is less busy. Square 77 is located in a residential zone and District of Columbia Municipal Regulations (20-2806.1 and 20-2806.2) prohibit trash collection by private haulers between the hours of 9:00 PM and 7:00 AM in residential zones. Therefore, trash/recycle removal cannot be scheduled during these times.

Size of Trucks

The Academic Center currently is served primarily by SU-30 trucks with the occasional WB-40 truck and roll-off dumpster trucks. The roll-off dumpster trucks are larger than the more traditional trash trucks that lift and dump the trash receptacles. The roll-off trucks must back up to the dumpsters, connect the dumpster to a mechanical system, and move the dumpster from the loading bay onto the back of the truck. Due to restraints with the proposed redevelopment, the roll-off dumpsters will no longer be feasible under future conditions. Instead, the smaller trash receptacles and trash trucks will be used for the waste removal process.

Additionally, the occasional WB-40 truck will not be capable of traversing the narrow alley and, therefore, will be prohibited. The deliveries currently made with WB-40 trucks will be required to be made in an SU-30 truck or smaller.

Relevant details regarding truck frequency and sizes for the Academic Center are contained in Attachment K.

ON-STREET SERVICE/DELIVERY SPACE

In addition to the loading facilities proposed on-site, GW is exploring the possibility of providing an on-street service/delivery space on either H Street or 21st Street. Locating the service/delivery space on H Street would not impact the on-street parking supply since the existing 15-foot alley between Schenley and Crawford Halls will be closed with the Site 77A redevelopment. The closure of the alley on H Street would result in additional on-street parking area. Note that currently no parking is allowed on either side of the alley ("No Parking – Entrance" signs are posted for the areas in front of Crawford and Schenley Halls). The "No Parking – Entrance" area west of the existing alley would be maintained for the building entrance to the new residence hall. However, the "No Parking – Entrance" area east of the existing alley could be removed (since two existing buildings are being replaced with one building).

Therefore, the area adjacent to the existing curb cut (which will be removed) and the “No Parking – Entrance” area to the east, could be used as a loading/delivery space and would not require the removal of existing on-street parking spaces.

Locating the service/delivery space on 21st Street likely would require the removal of at least one on-street parking space. Additionally, there is an existing curb cut on 21st Street that provides access to a service/delivery space between the rear of Lafayette Hall and the Marvin Center.

Since the Marvin Center and Lafayette Hall already have access to a service/delivery space from 21st Street and because an on-street service/delivery space on 21st Street would require the removal of parking, we recommend that the proposed service/delivery space be provided on H Street at the approximate location of the H Street curb cut that will be closed.

LOADING MANAGEMENT PLAN

The University intends to implement the following loading management plan for the proposed redevelopment of Site 77A:

- Dock Manager – A member of the University staff will be designated to serve as the on-site dock manager for the square. The dock manager also will be responsible for disseminating information to tenants, vendors, suppliers, and service providers of the square regarding rules and regulations, preferred truck routes, and hours of operation. The dock manager will be responsible for coordinating the schedule of deliveries to the extent possible. The dock manager may assume other duties when needed; however, the loading operations should be the primary task.
- Truck Sizes – Trucks longer than a WB-40 will be prohibited in the Square 77 alley. In the rare event that a truck longer than a WB-40 is required to make a delivery to Square 77, a temporary no parking zone should be established on an adjacent street to allow for curb-side loading or unloading adjacent to the appropriate building. In these circumstances, the dock manager shall be notified at least four weeks in advance so proper permits can be obtained from DDOT and Emergency No Parking signs issued. The following information shall be provided to the dock manager: 1) time and date that the truck is anticipated to arrive, 2) size of truck being used, and 3) name of the delivery service. Additionally, permits are required by DDOT for oversize and overweight vehicles in the District (e.g., trucks longer than 40 feet long or wider than 8½ feet). The dock manager will provide assistance in obtaining appropriate permits; however, issuance of permits is at the discretion of DDOT.
- Truck Route Designation – Preferred truck routes will be established in consultation with DDOT. The dock manager for the new building will direct all deliveries and trash disposal services to use the preferred truck routes established in consultation with DDOT. The proposed truck routing shown in Figure 20.
- Operation of Trucks – All trucks on the square must obey all traffic control devices including signs, markings, and signals. Trucks must yield to pedestrians upon entering and exiting the loading area. Truck idling will not be permitted on the premises.
- The dock manager will notify the trash service provider(s) for the redeveloped site that District of Columbia Municipal Regulations (20-2806.1 and 20-2806.2) prohibit trash collection by private haulers between the hours of 9:00 PM and 7:00 AM at this site.

CONCLUSIONS

As documented in this transportation assessment, the Site 77A redevelopment will generate very few new vehicle trips to/from Square 77 and to/from the Campus. The University's extensive TMP and the specific TDM measures proposed for Site 77A will further reduce vehicle trips to/from the site and will encourage students and employees to use the many alternate modes of transportation available in the site vicinity. In general, major safety concerns, such as high crash rates, were not identified at the intersections in the study area; however, several existing deficiencies (i.e., handicap ramps, on-street parking near intersections, and sidewalk widths) were identified at each of the study intersections and at the H Street mid-block crosswalk between 21st and 22nd Streets. These deficiencies exist today and will not be exacerbated by the Site 77A redevelopment and, therefore, should not be the responsibility of GW.

The redevelopment of Site 77A will create two separate loading areas on Square 77: one for the Academic Center with access from the alley adjacent to the Academic Center and one for the Marvin Center and Site 77A with access from the existing Bookstore loading curb cut. The restriction of WB-50 trucks in the Square 77 alley, as proposed, will result in no impact to on-street parking and will not require widening of the easternmost (i.e., the existing bookstore curb cut) curb cut on I Street, which will provide access to the Marvin Center and Site 77A loading areas. The proposed loading operations for the Academic Center, the redeveloped Site 77A, and the Marvin Center will allow for front-first entry from and front-first exit onto public streets for every loading berth and service/delivery space within the Square 77 alley. A dock manager whose primary duty is to coordinate loading activities on the square is required due to the limited maneuvering space with the Square 77 alley system. Finally, the number of curb cuts on the square will be reduced from six to five with the proposed redevelopment.

We hope that this memorandum provides you with sufficient information regarding the Site 77A redevelopment. Should you require any additional information, please do not hesitate to contact Jami Milanovich at 202-556-1113 or jlmilanovich@mjwells.com.

FIGURES

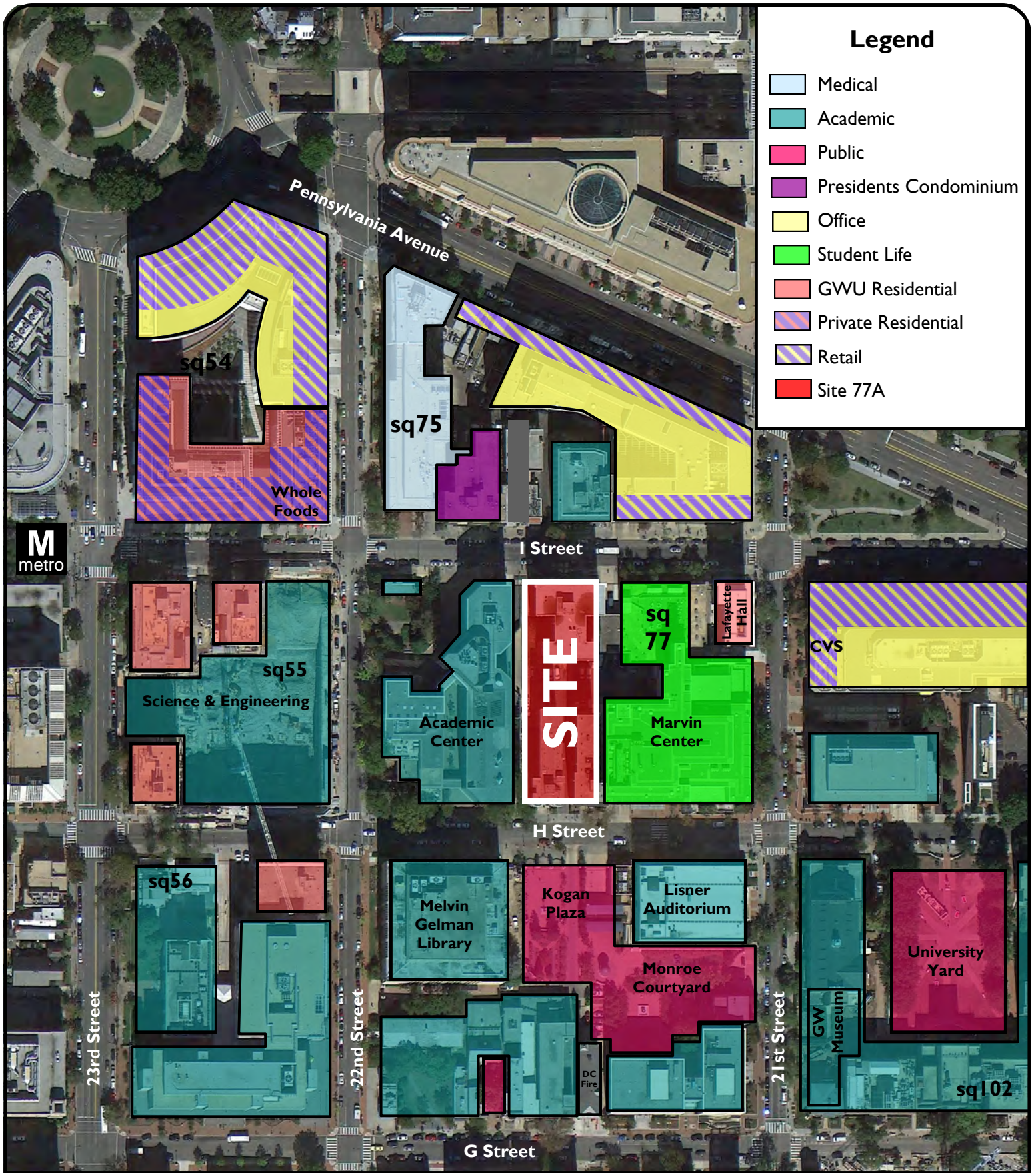
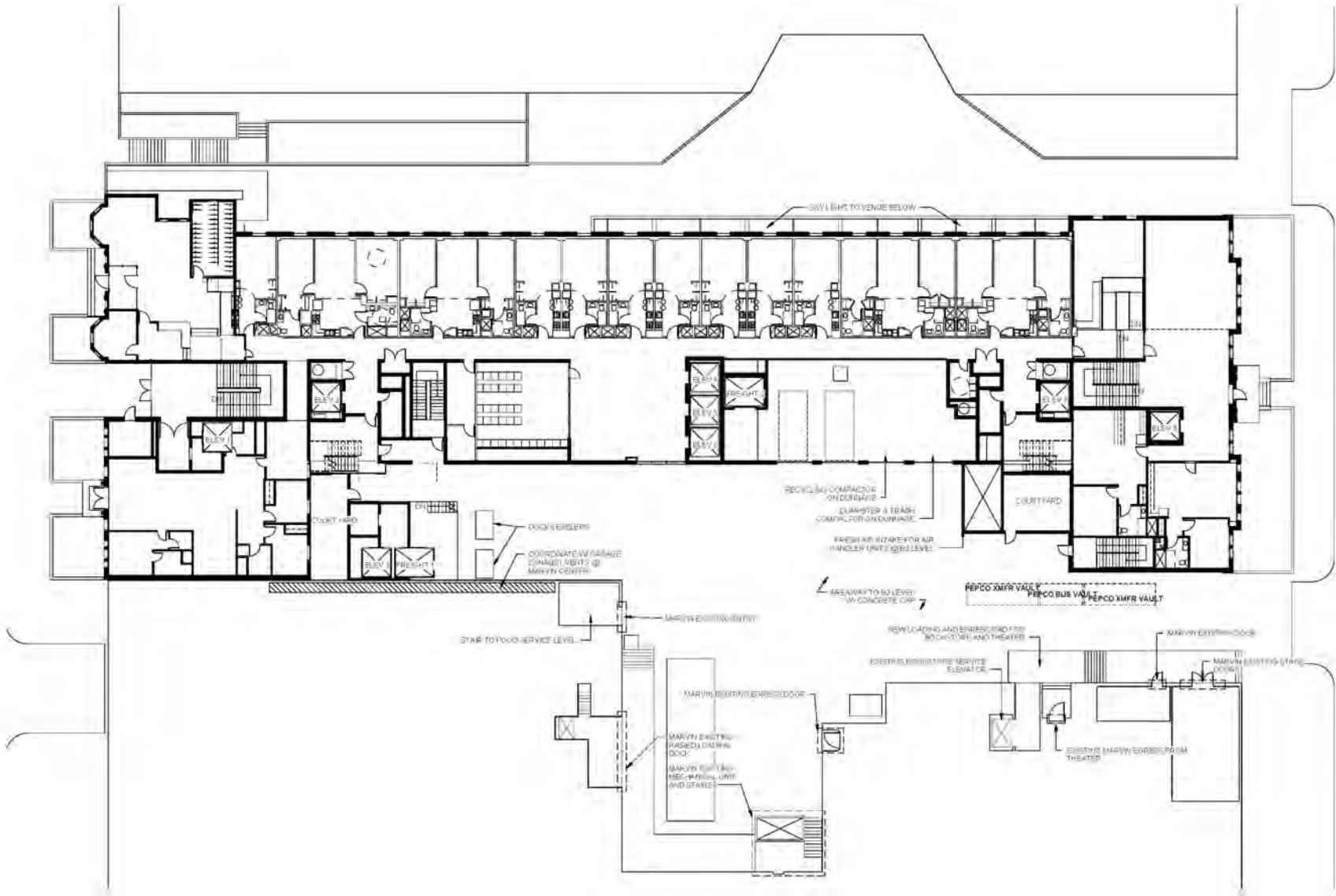


Figure 1
Site Location



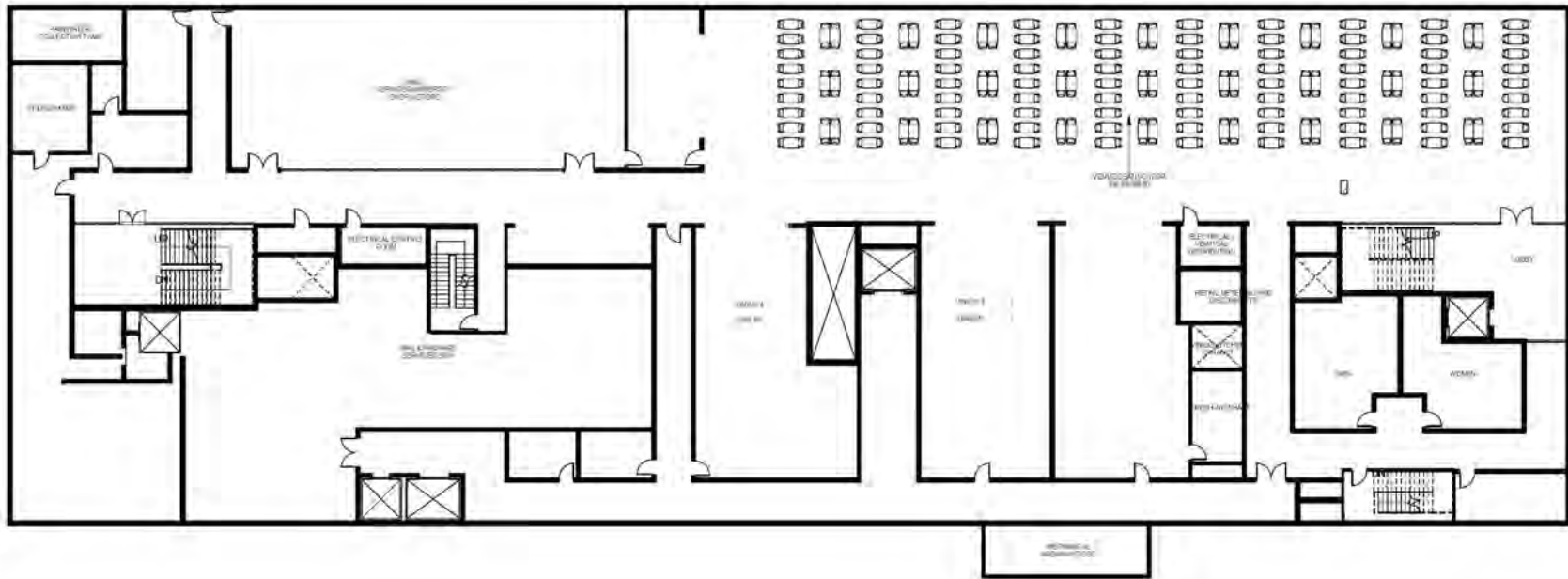


Source: ASG Architects

Figure 2A
Ground Level Floor Plan



North



Source: ASG Architects

Figure 2B
Level B1 Floor Plan



North



Source: ASG Architects

Figure 2C
Level B2 Floor Plan



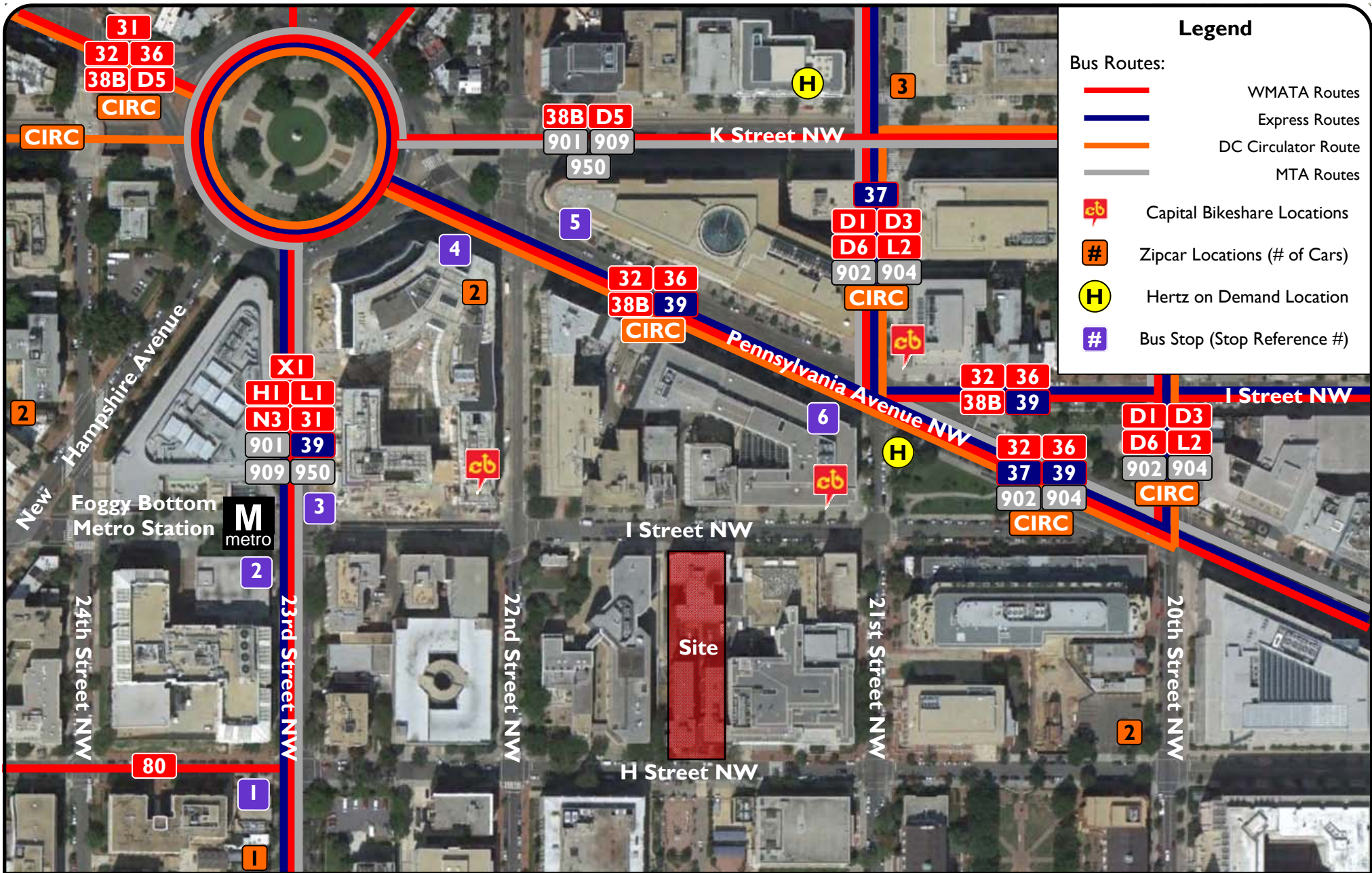


Figure 3
Public Transportation Facilities



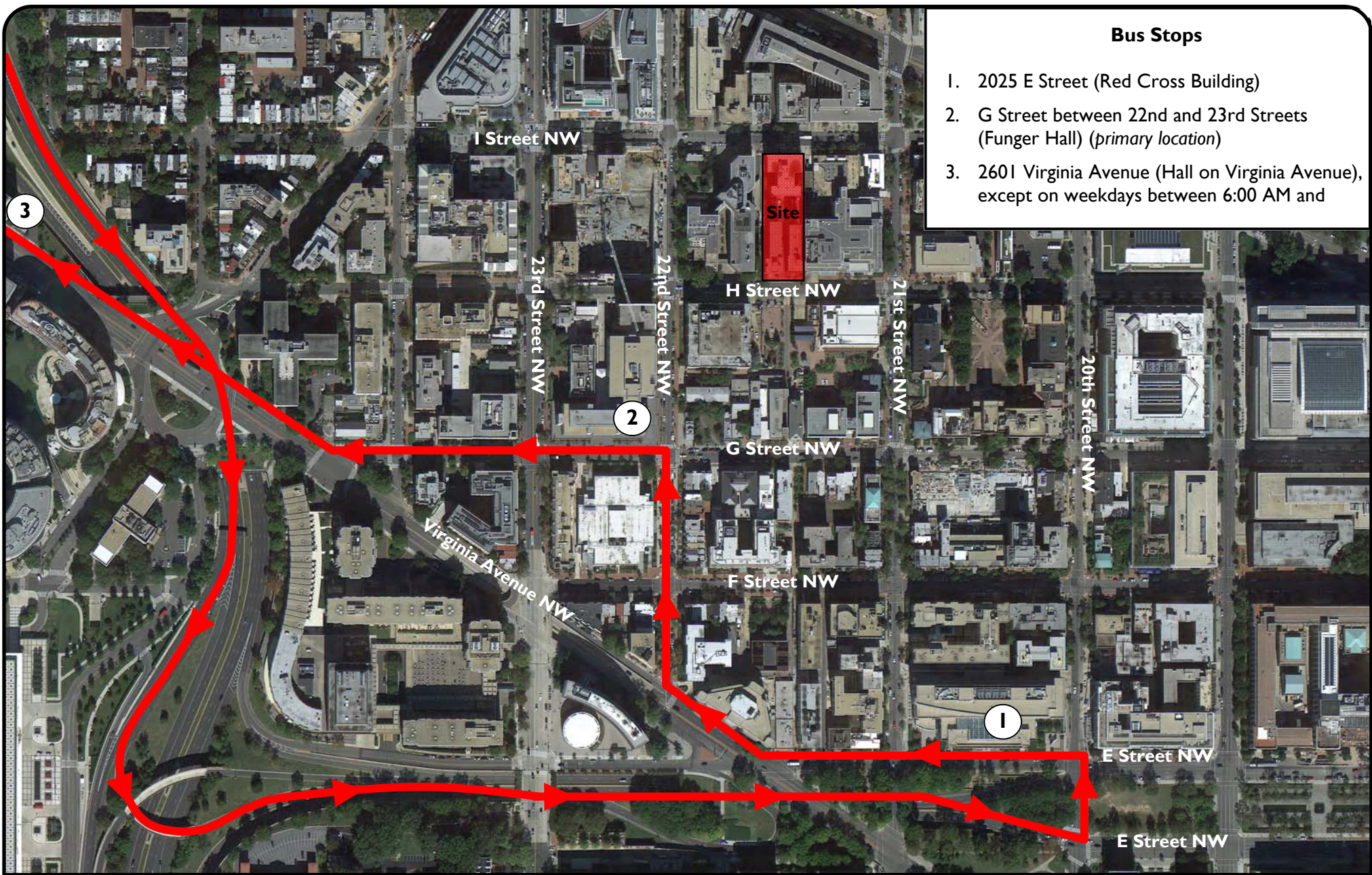


Figure 4
Vern Express Shuttle Bus Route and Stops



COLONIAL EXPRESS SHUTTLE BUS SERVICE ROUTES

Northern Route

- 1 MARVIN CENTER/GELMAN @ MCH ST
- 2 ASTON
- 3 CORNER OF 19TH & L ST
- 4 CORNER OF CONNECTICUT & L ST
- 5 CORNER OF 20TH & EYE ST



Southern Route

- 1 MARVIN CENTER/GELMAN @ MCH ST
- 2 THURSTON HALL
- 3 HEALTH AND WELLNESS
- 4 HOVA
- 5 COLUMBIA PLAZA @ CENTER DRIVEWAY

BLUE LIGHT EMERGENCY PHONE

Northern Route

1. Marvin Center/Gelman Library at the Marvin Center H Street Entrance
2. Aston
3. Corner of 19th Street and L Street
4. Corner of Connecticut Avenue and L Street
5. Corner of 20th Street and I Street

Southern Route

1. Marvin Center/Gelman Library at the Marvin Center H Street Entrance
2. Thurston Hall at the Main Entrance
3. Health and Wellness Center at the G Street Entrance
4. Hall on Virginia Avenue at the Main Entrance
5. Columbia Plaza at the driveway in the center of the complex

Source: <http://gwired.gwu.edu/upd/>

Figure 5
Colonial Express Shuttle Bus Service



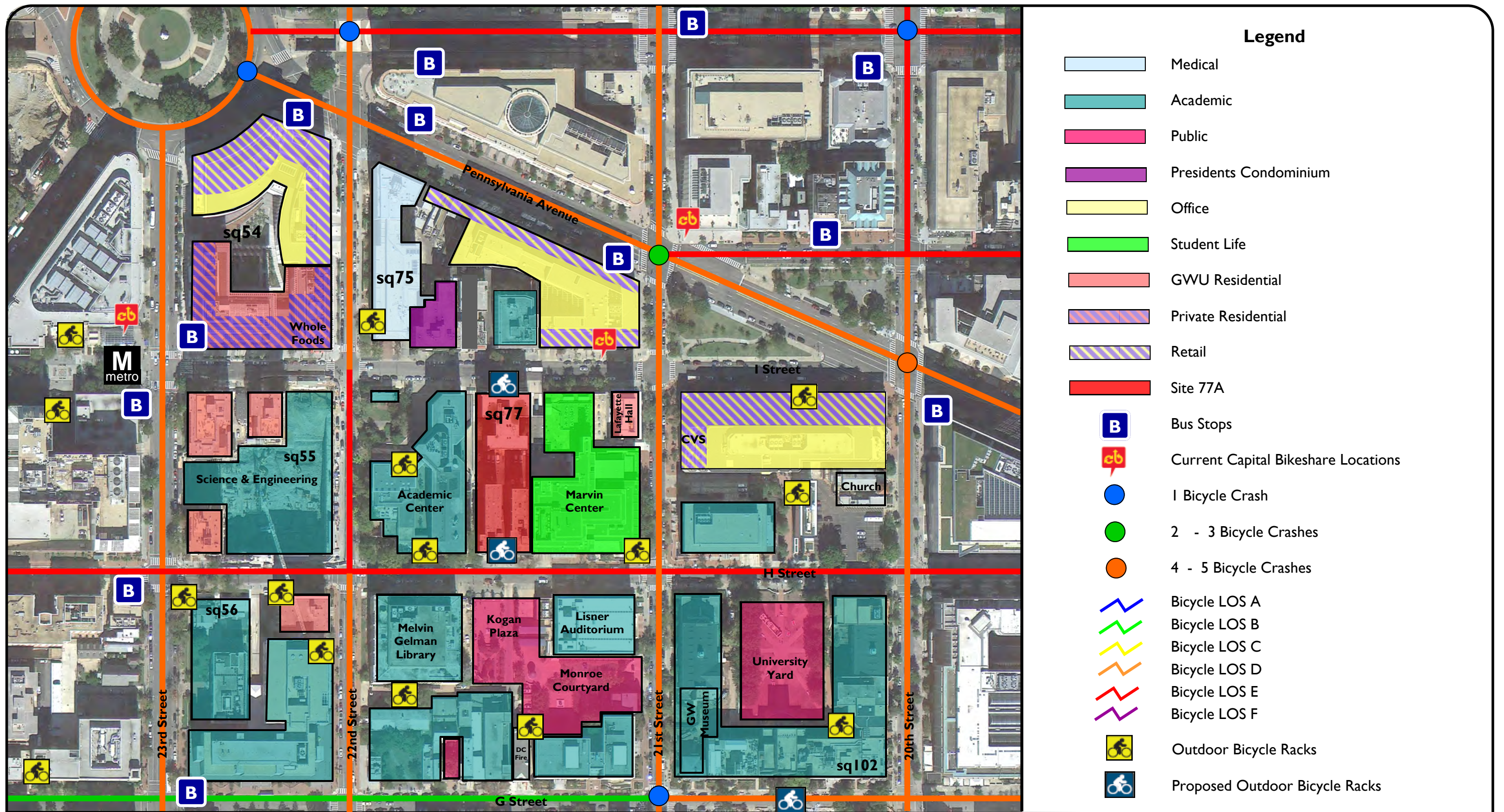


Figure 6
Bicycle Facilities



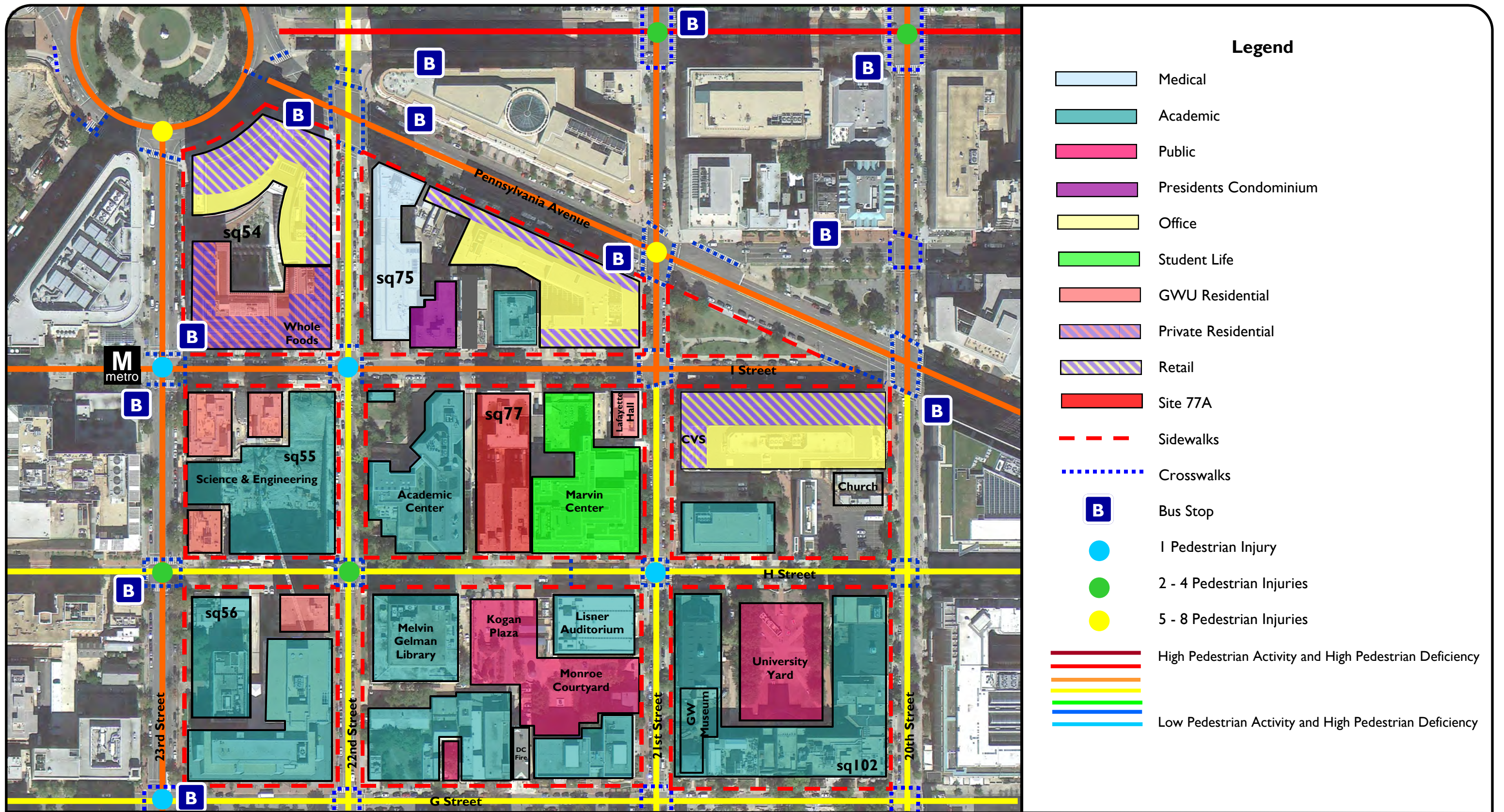


Figure 7
Pedestrian Facilities



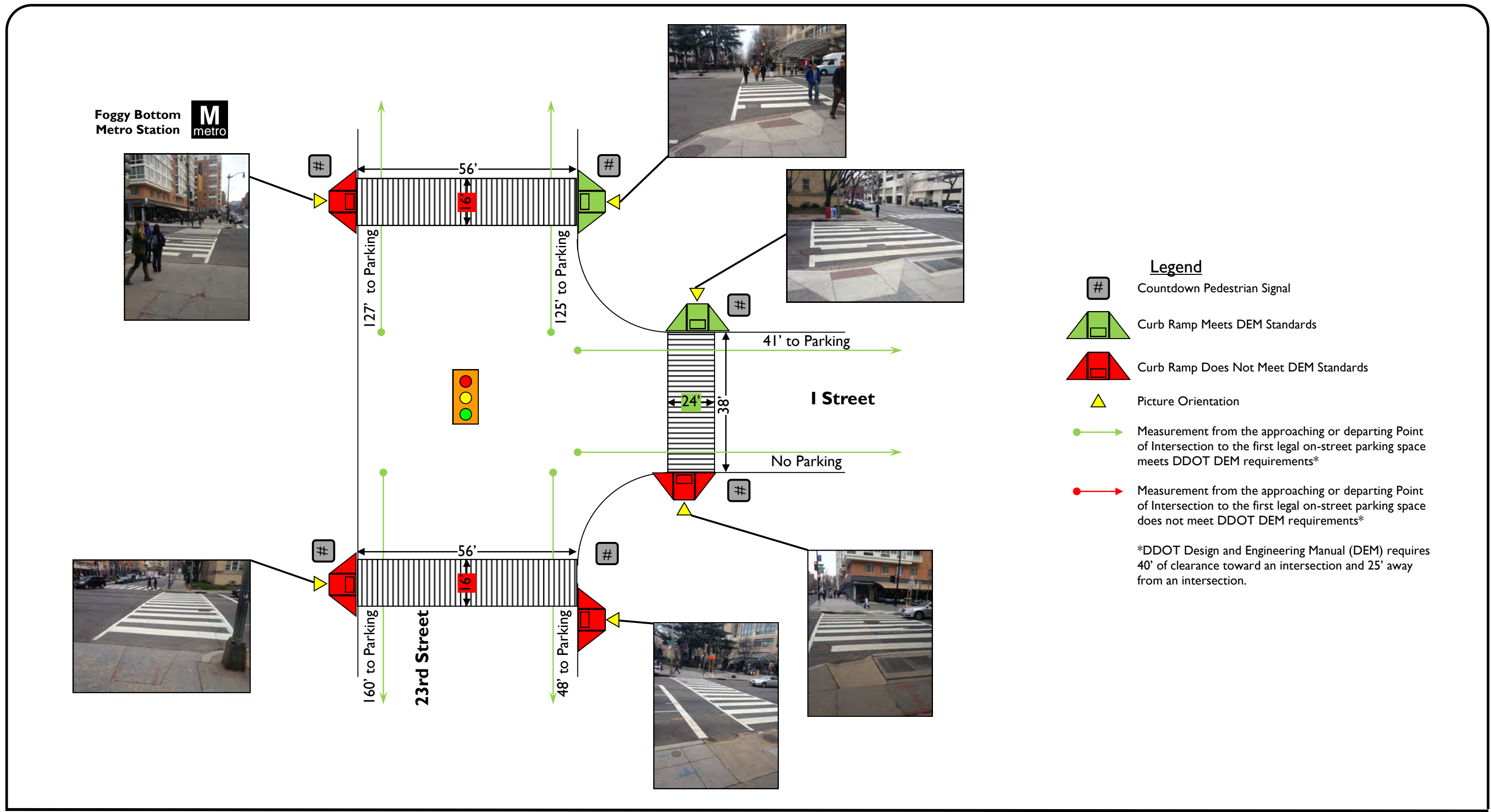


Figure 8
23rd Street/I Street Intersection Details

North
Not to Scale

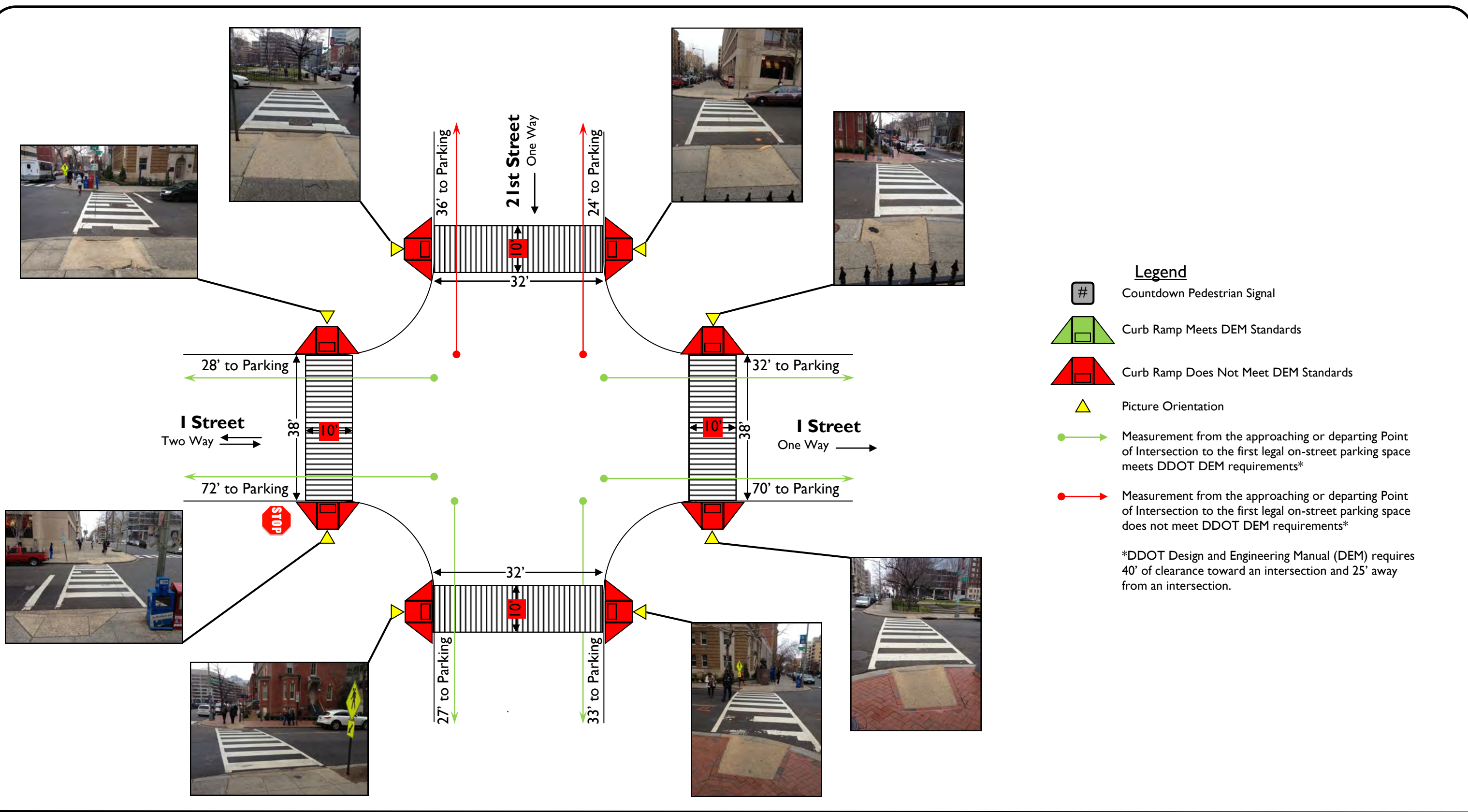


Figure 10
21st Street/I Street Intersection Details



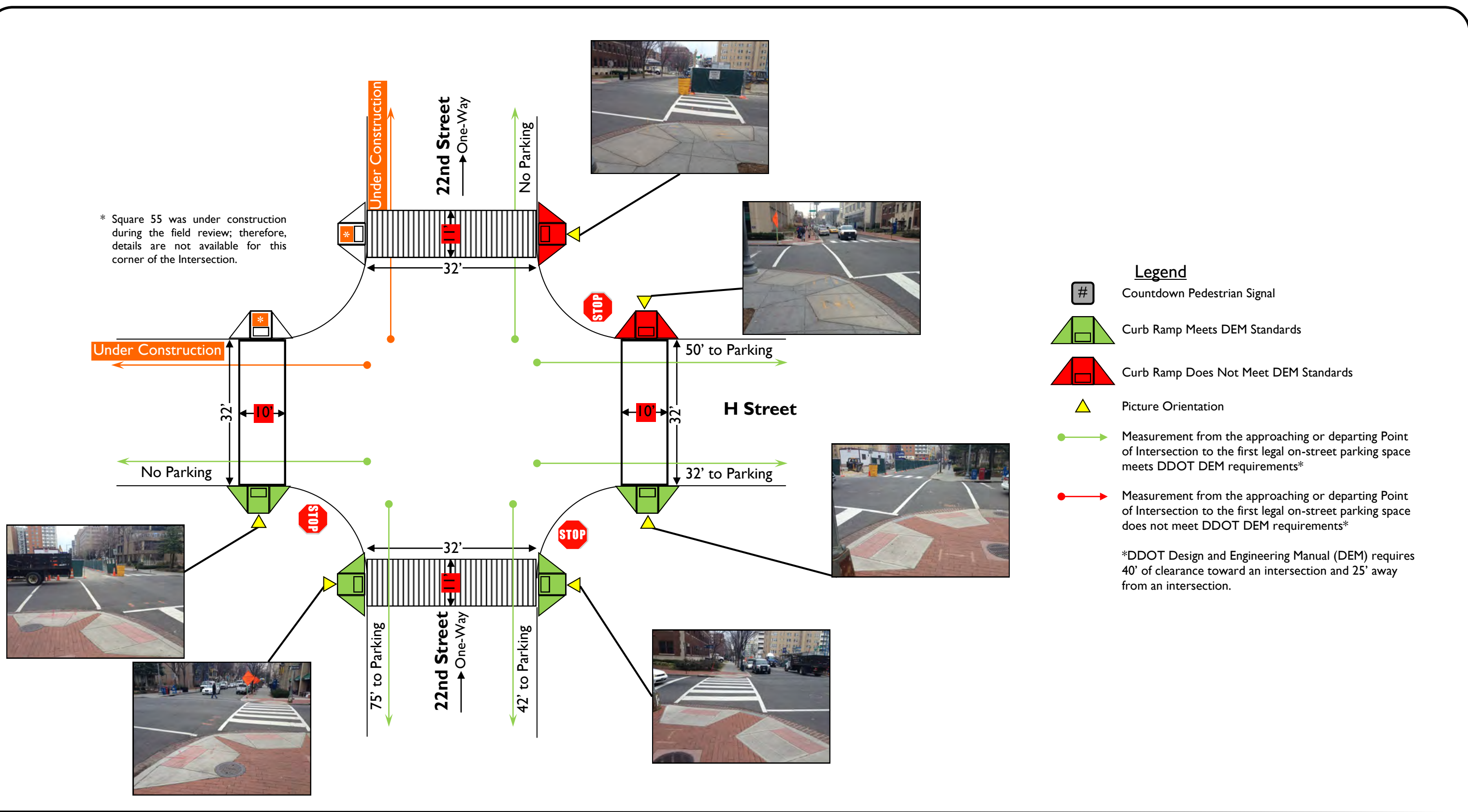
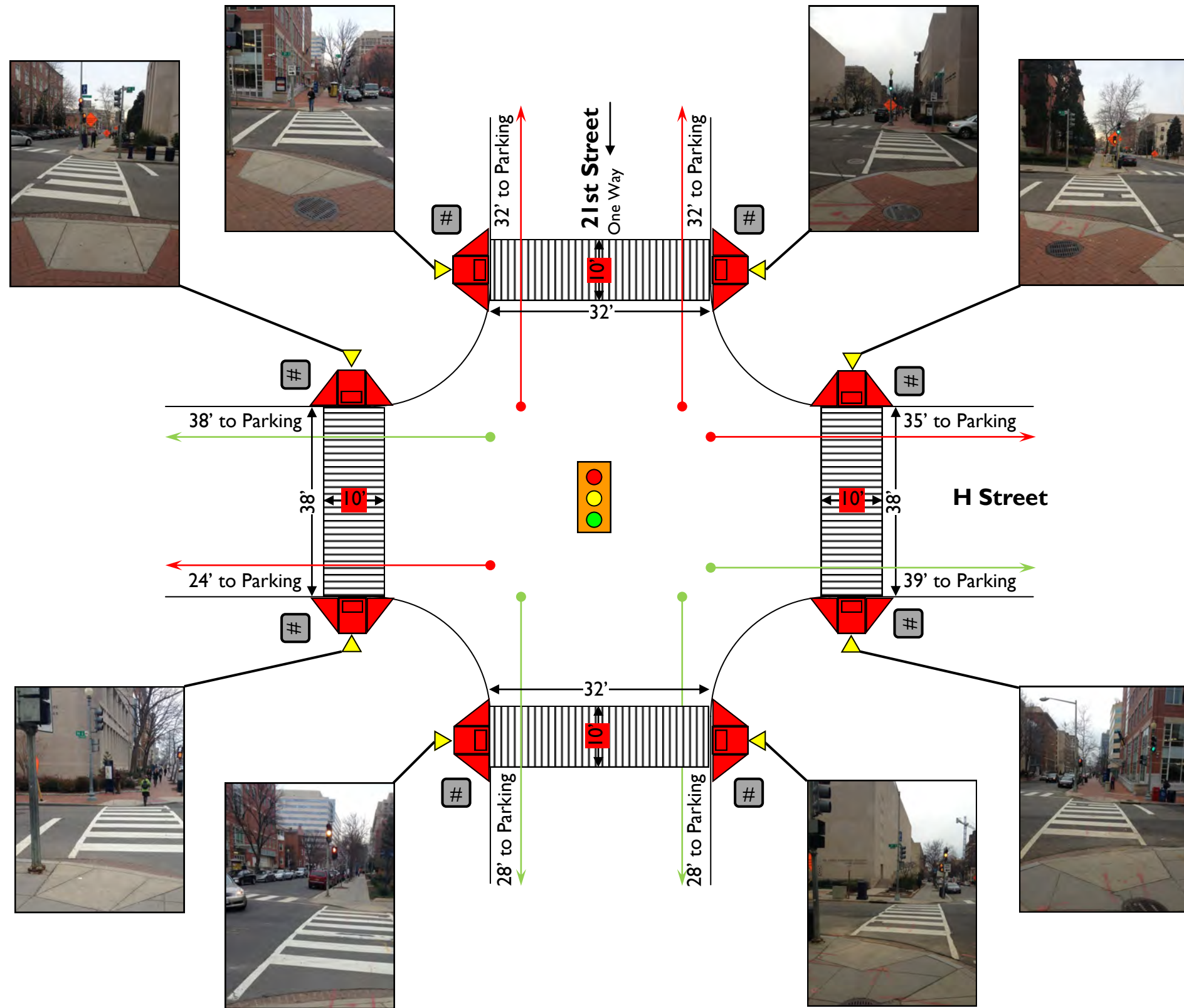


Figure 11
22nd Street/H Street Intersection Details





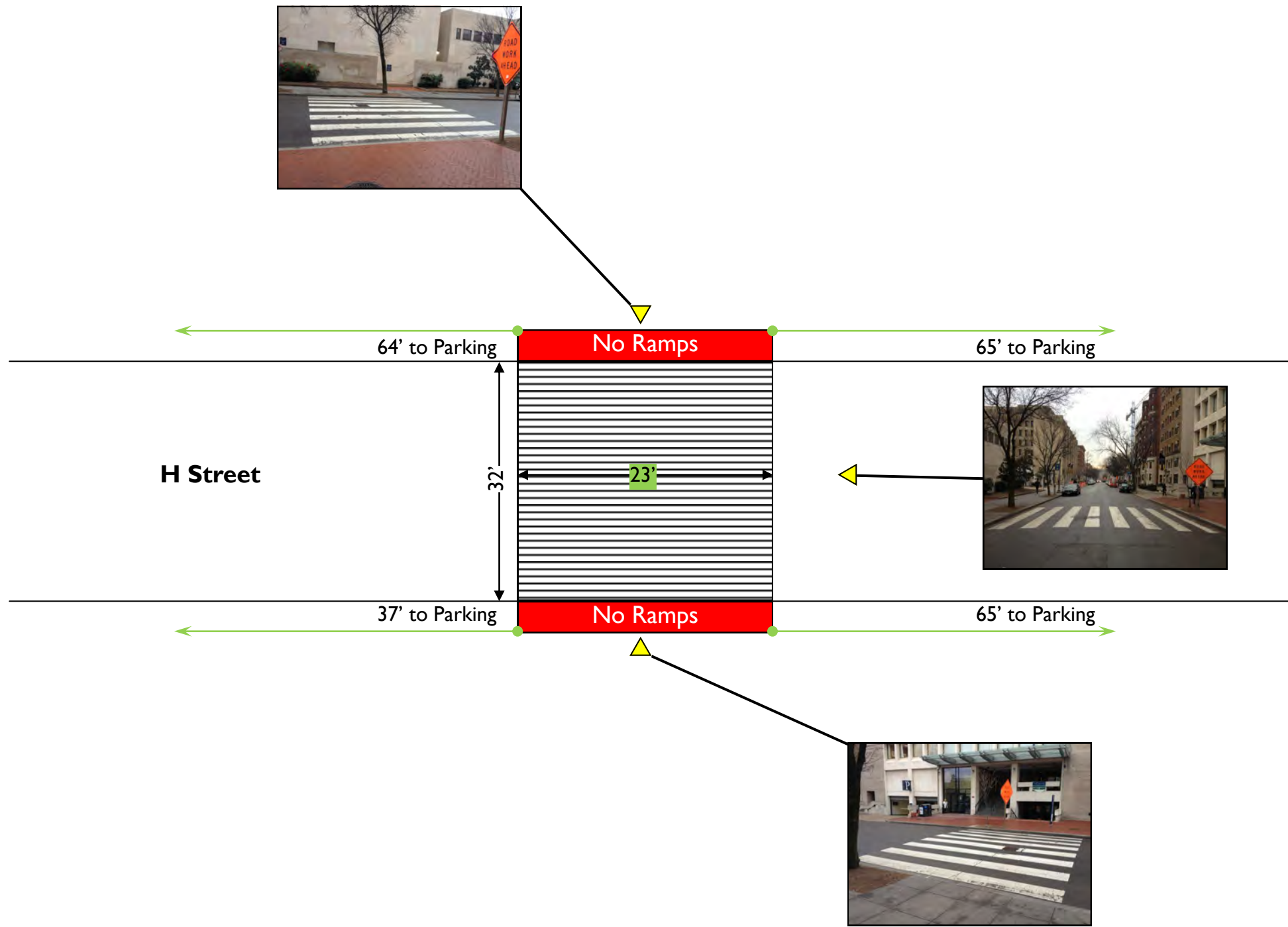
Legend

- # Countdown Pedestrian Signal
- Curb Ramp Meets DEM Standards
- Curb Ramp Does Not Meet DEM Standards
- Picture Orientation
- Measurement from the approaching or departing Point of Intersection to the first legal on-street parking space meets DDOT DEM requirements*
- Measurement from the approaching or departing Point of Intersection to the first legal on-street parking space does not meet DDOT DEM requirements*

*DDOT Design and Engineering Manual (DEM) requires 40' of clearance toward an intersection and 25' away from an intersection.

Figure 12
21st Street/H Street Intersection Details

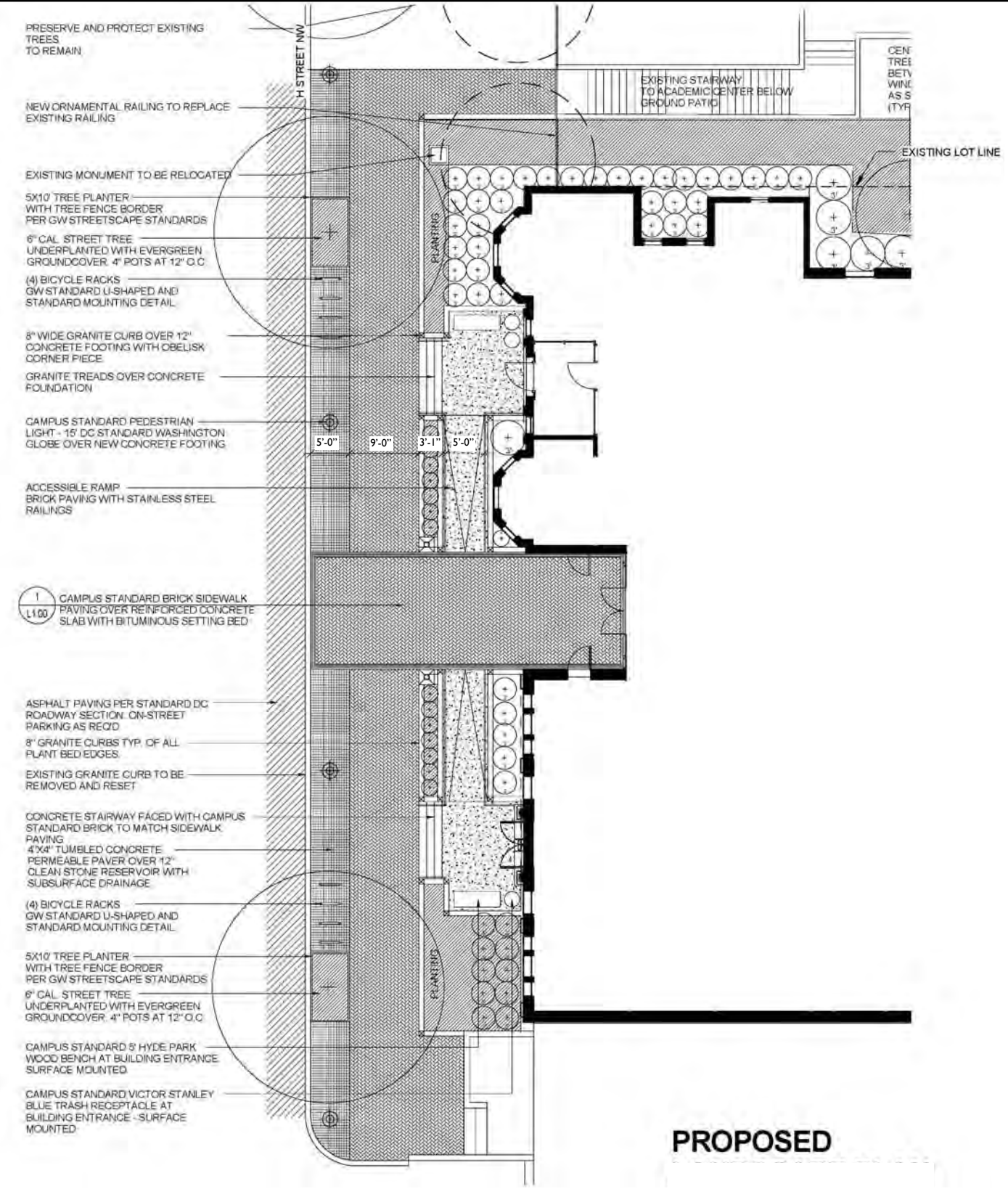
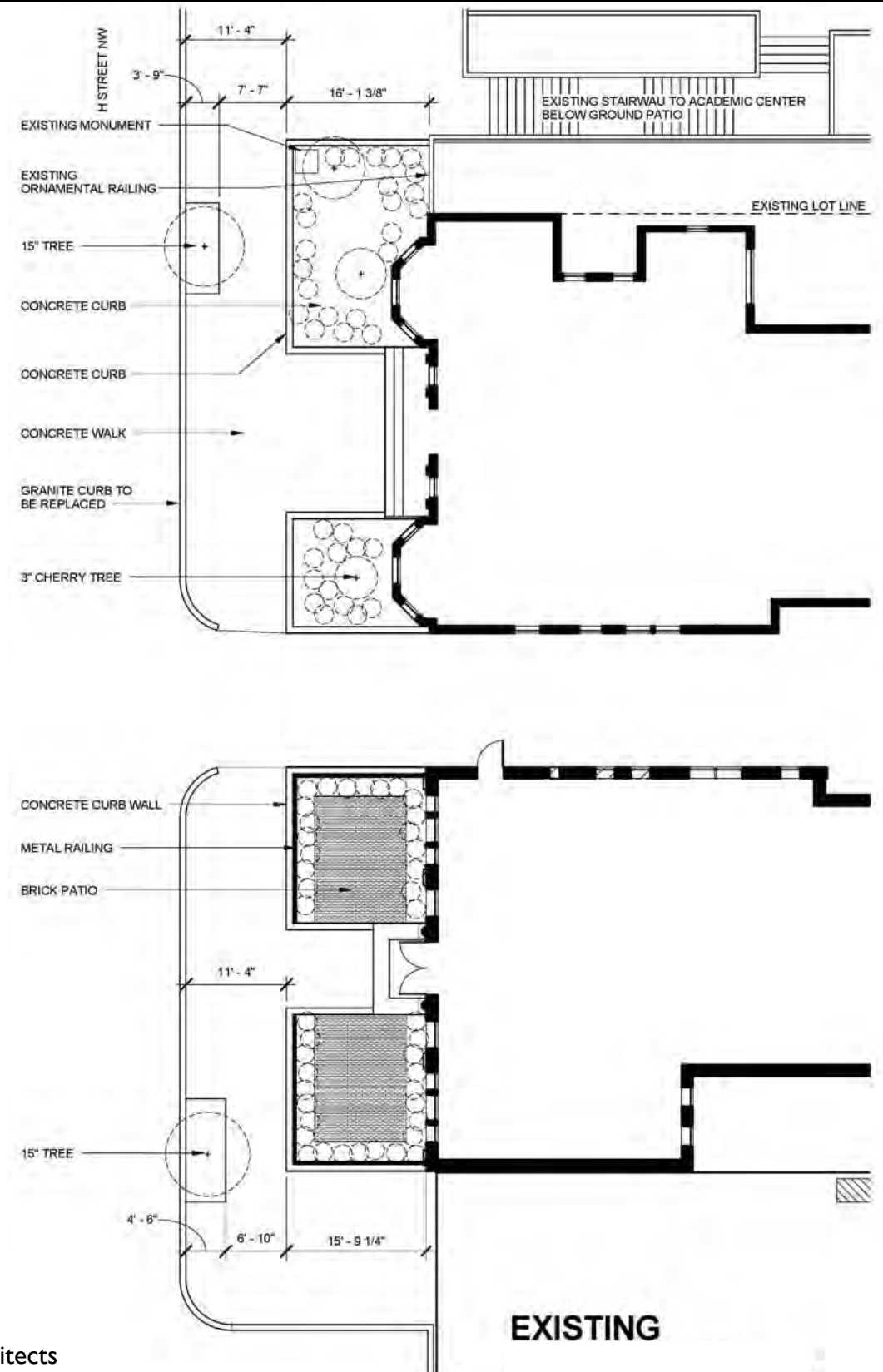
North
Not to Scale



- Legend**
- # Countdown Pedestrian Signal
 - Curb Ramp Meets DEM Standards
 - Curb Ramp Does Not Meet DEM Standards
 - Picture Orientation
 - Measurement from the approaching or departing Point of Intersection to the first legal on-street parking space meets DDOT DEM requirements*
 - Measurement from the approaching or departing Point of Intersection to the first legal on-street parking space does not meet DDOT DEM requirements*
- *DDOT Design and Engineering Manual (DEM) requires 40' of clearance toward an intersection and 25' away from an intersection.

Figure 13
H Street Mid-Block Crosswalk Details





Source: ASG Architects

Not To Scale

Figure 14
H Street Existing and Proposed Streetscapes



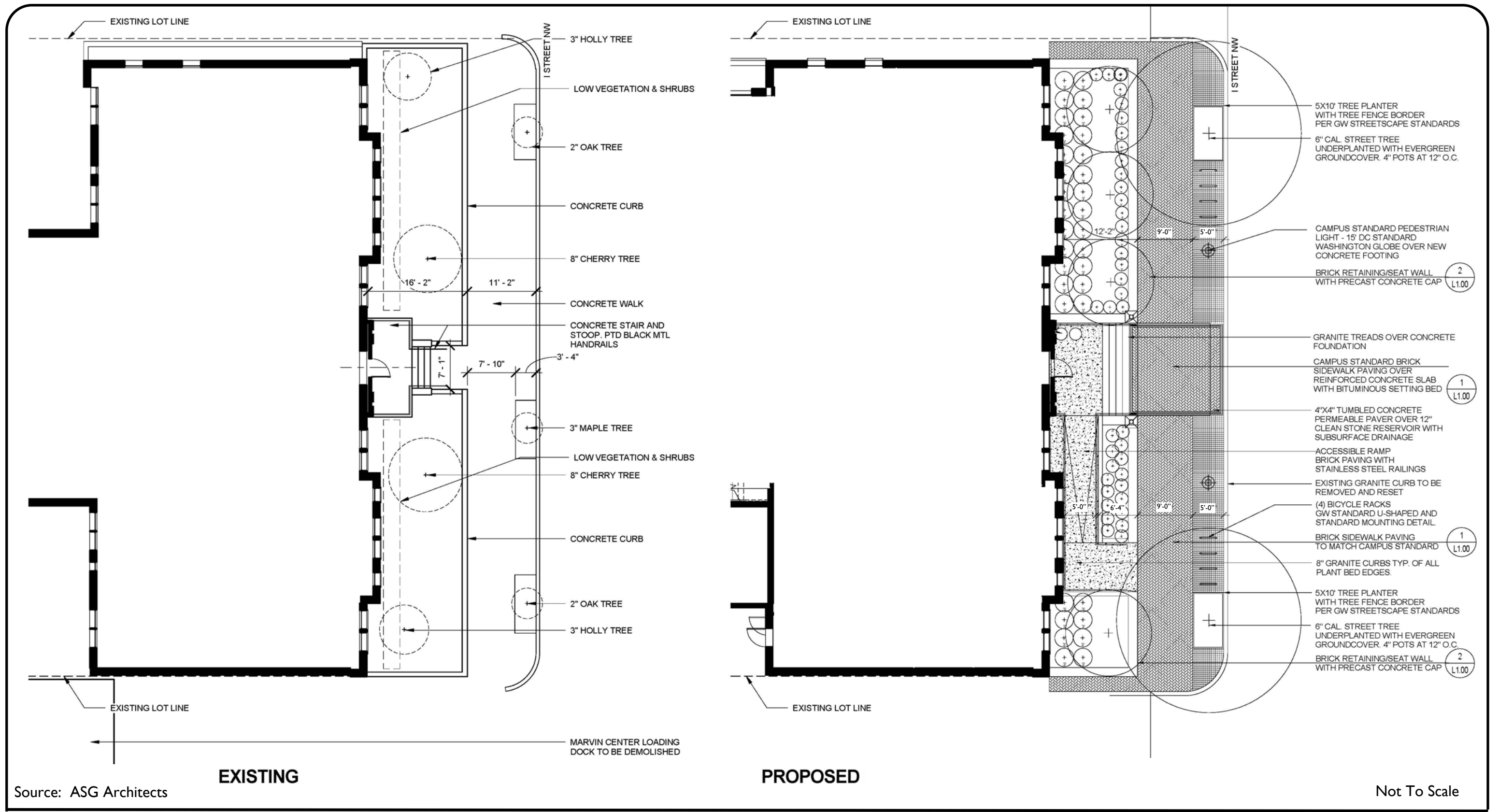
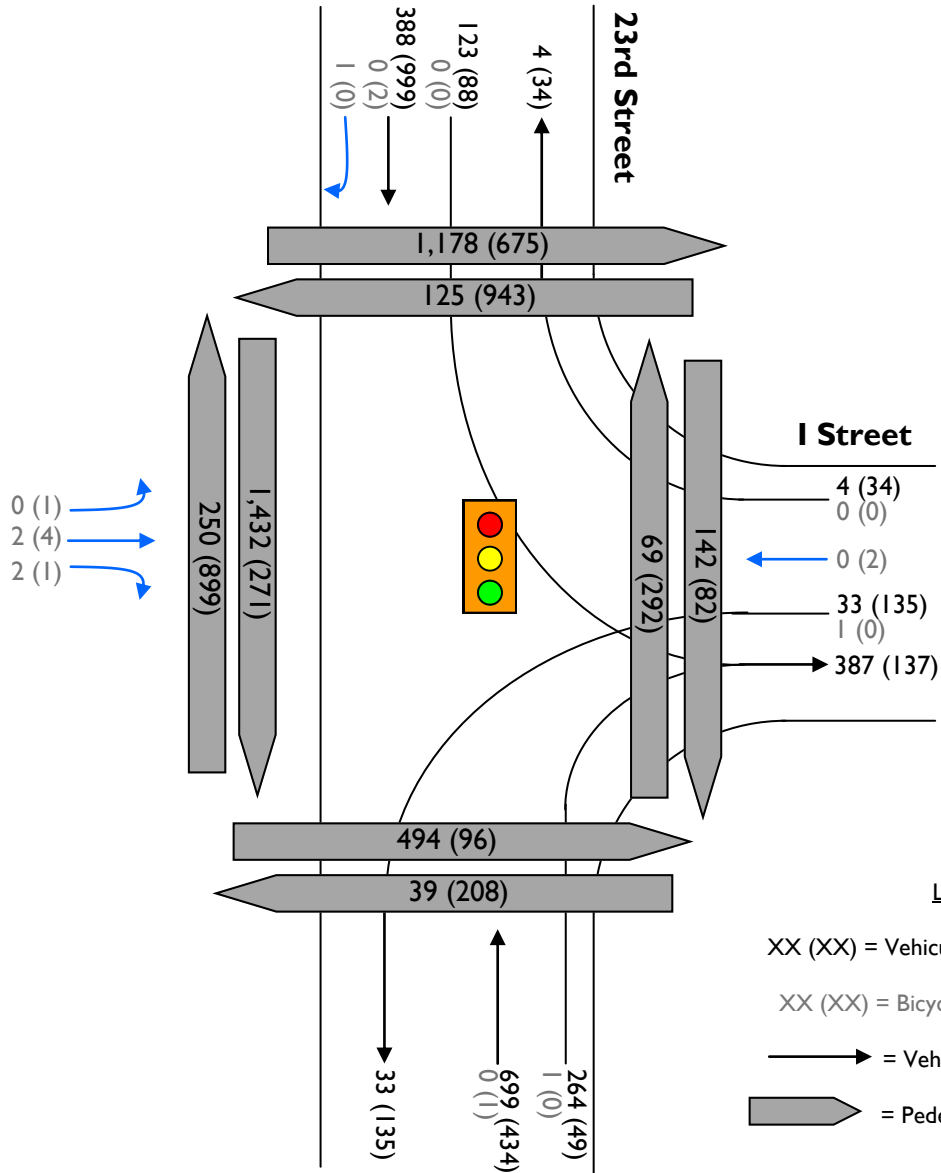


Figure 15
I Street Existing and Proposed Streetscapes



23rd Street & I Street (7:30 - 8:30 AM & 5:30 - 6:30 PM)



22nd Street & I Street (7:30 - 8:30 AM & 6:00 - 7:00 PM)

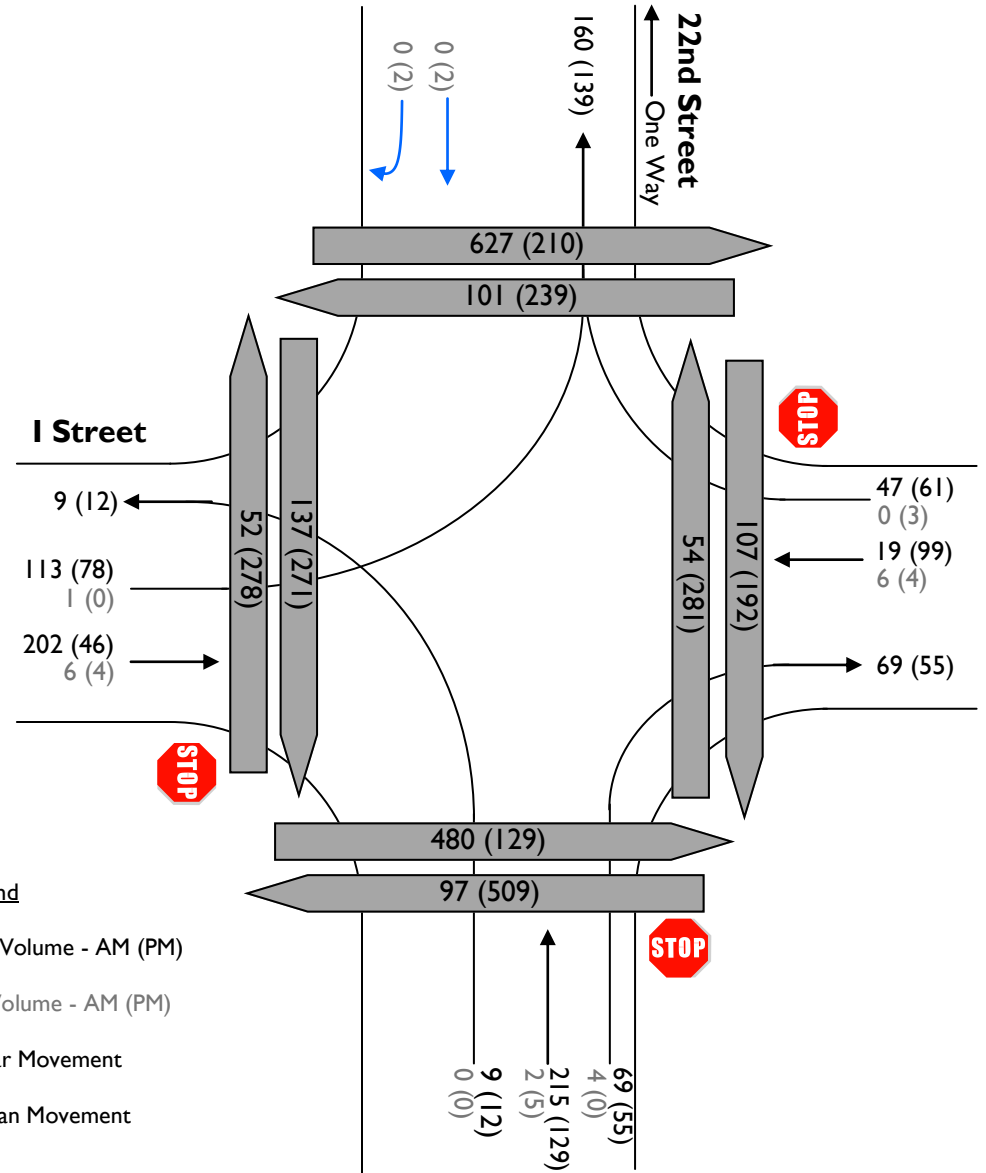
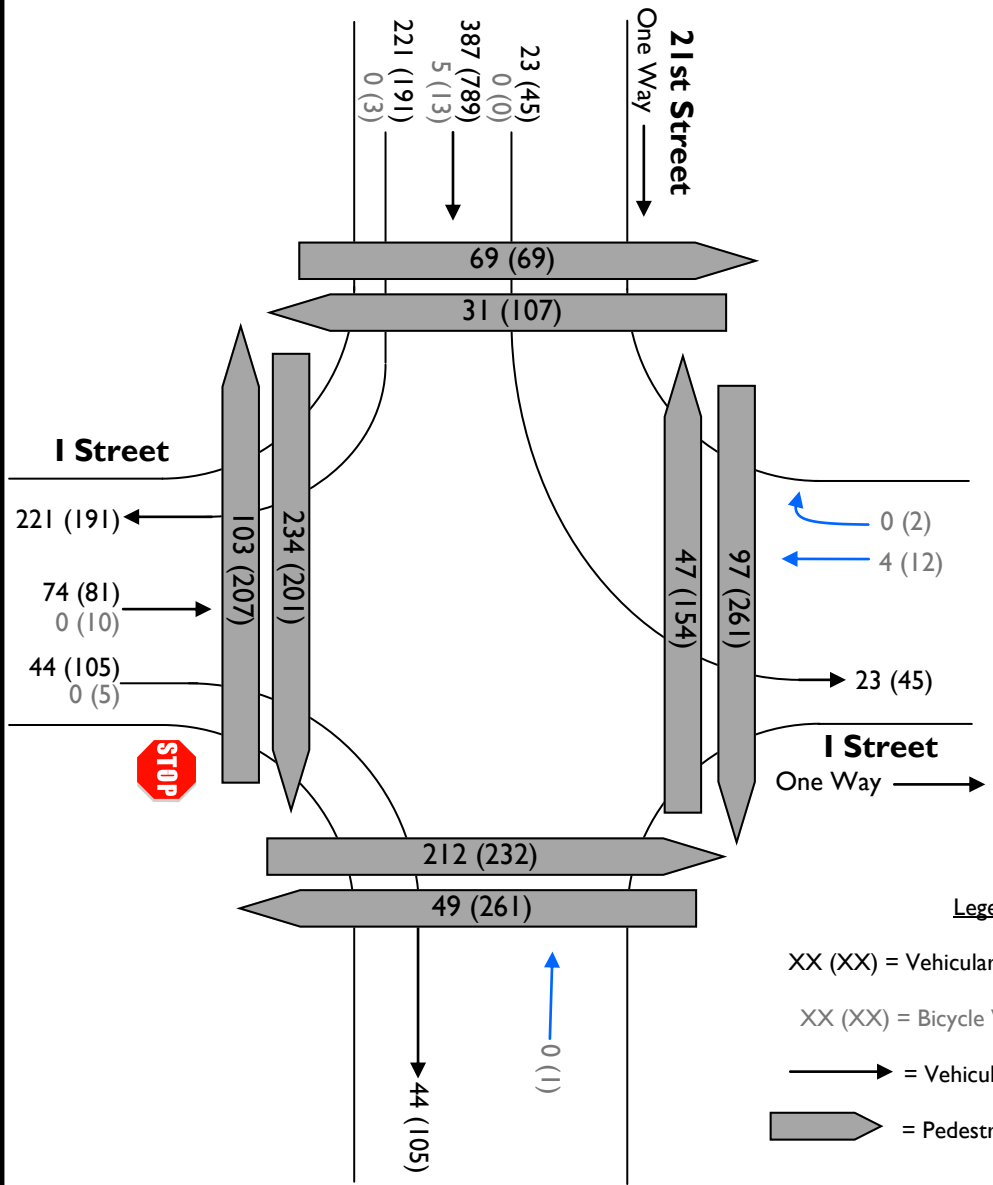


Figure 16A
Intersection Volumes #1



21st Street & I Street (8:15 - 9:15 AM & 5:30 - 6:30 PM)



22nd Street & H Street (8:00 - 9:00 AM & 6:00 - 7:00 PM)

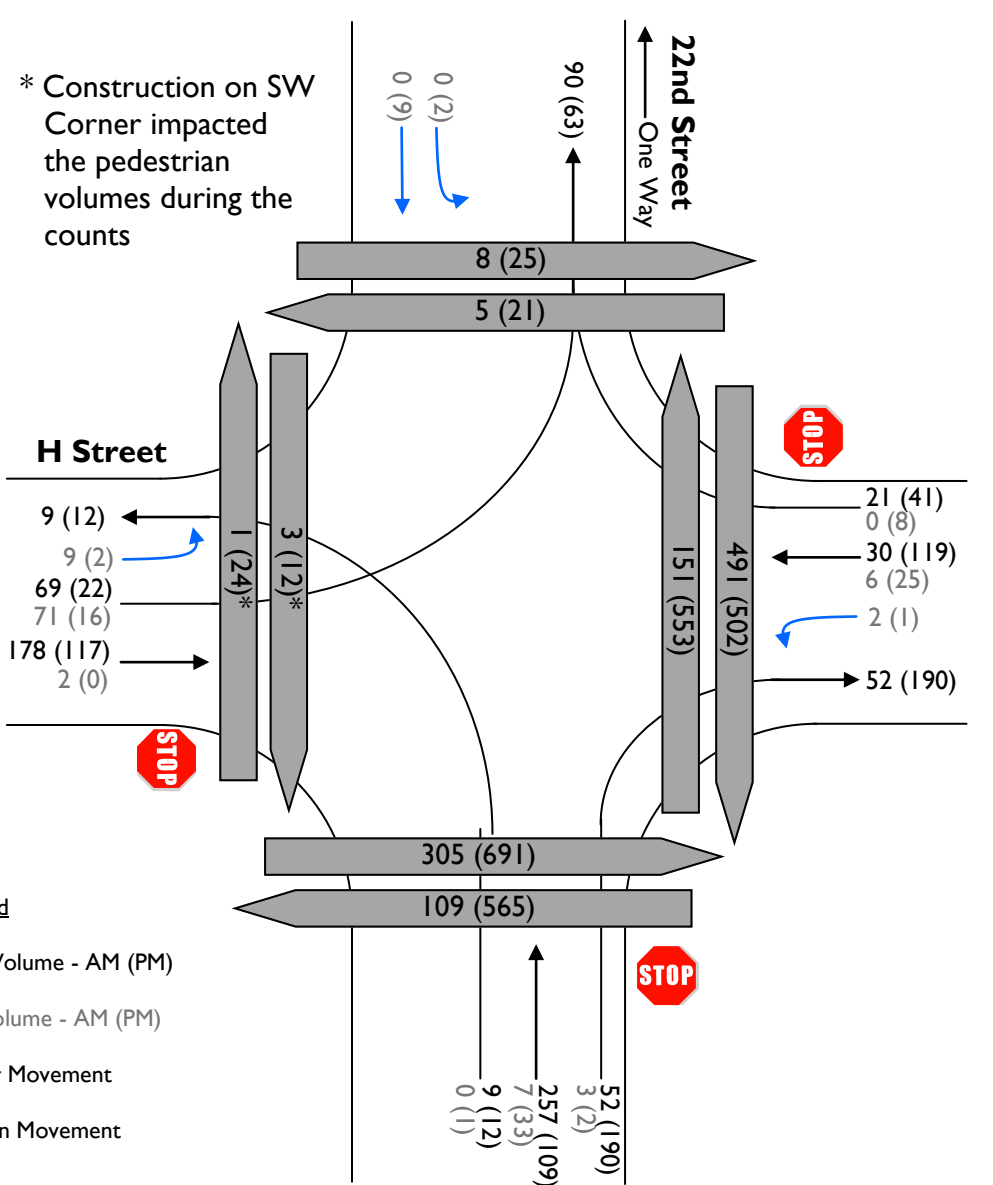
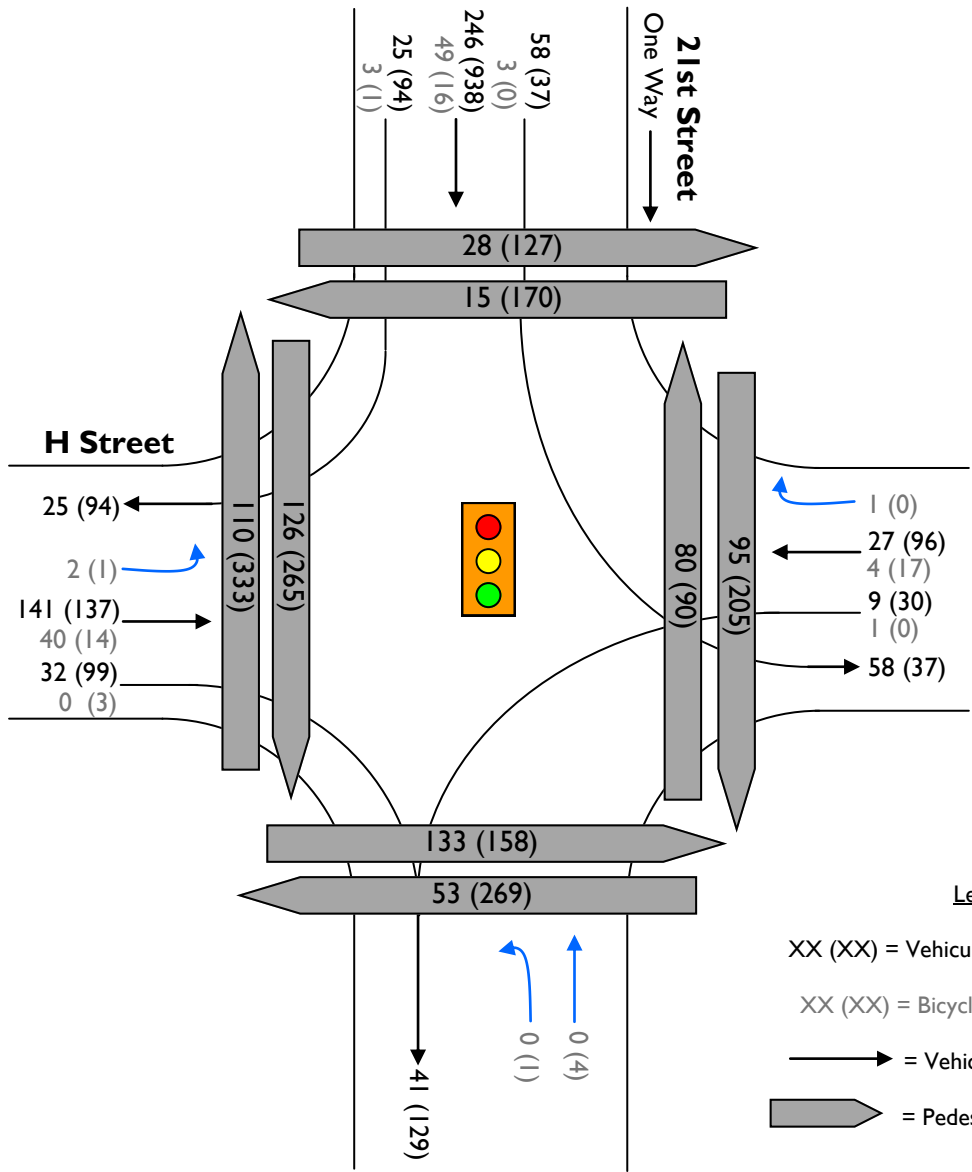


Figure 16B
Intersection Volumes #2



21st Street & H Street (8:00 - 9:00 AM & 5:15 - 6:15 PM)



H Street Mid-Block Crosswalk (8:45 - 9:45 AM & 5:45 - 6:45 PM)

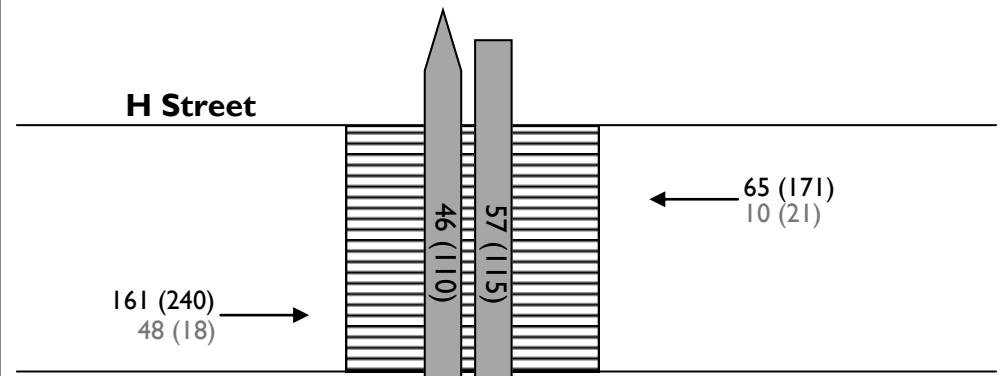


Figure 16C
Intersection Volumes #3



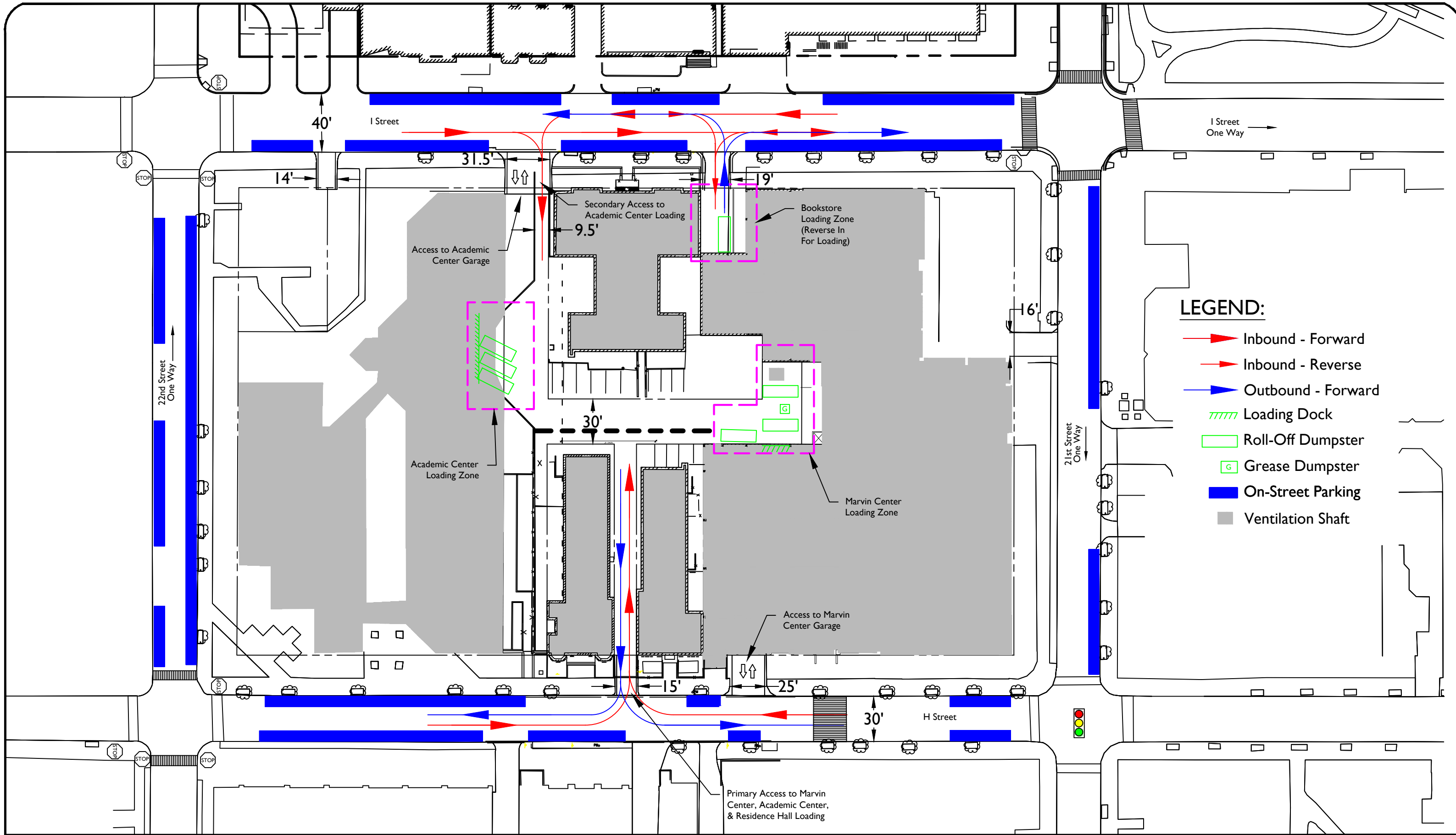


Figure 18
Existing Loading Circulation & Curb Cuts



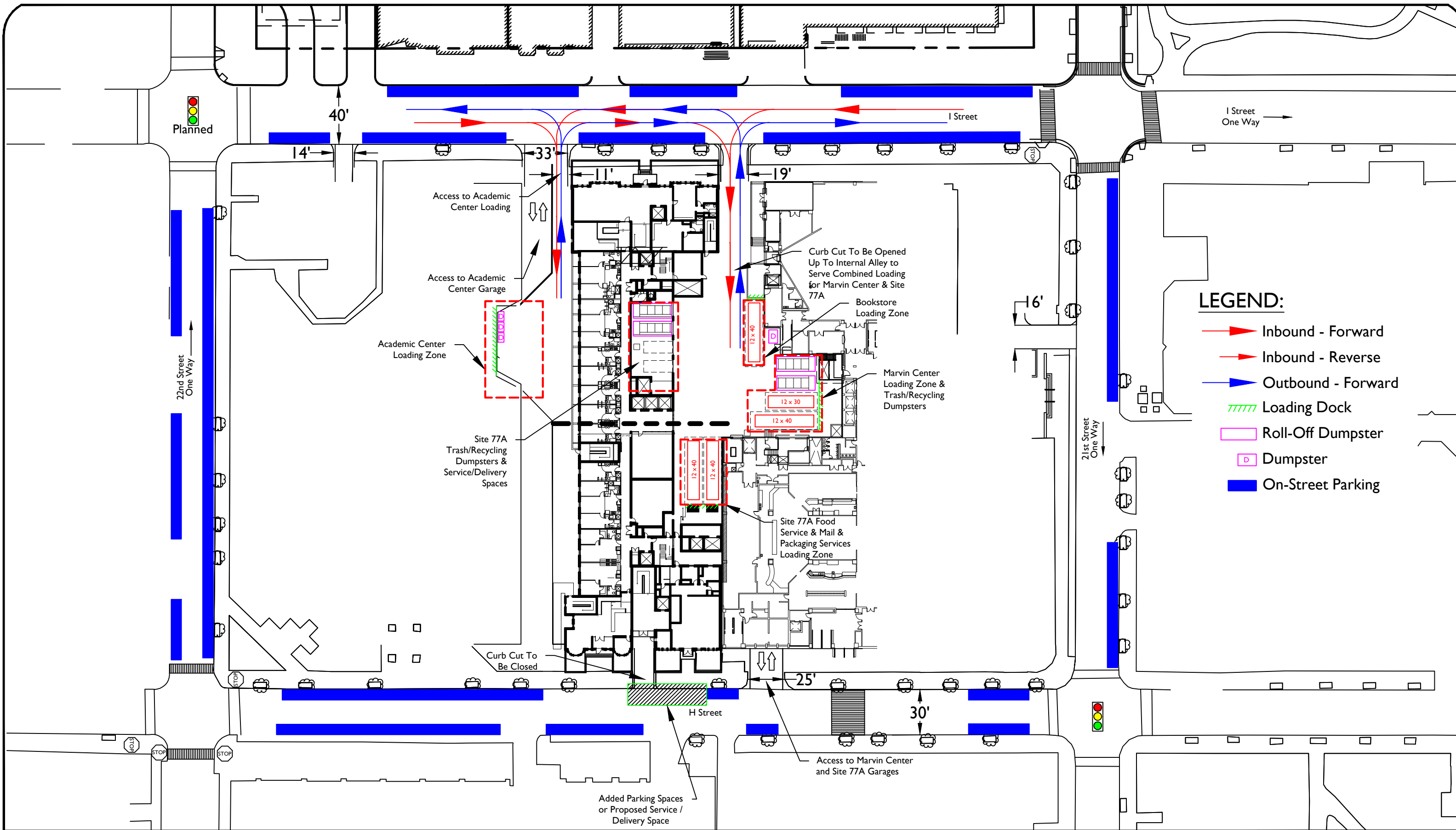


Figure 19
Proposed Loading Circulation & Curb Cuts



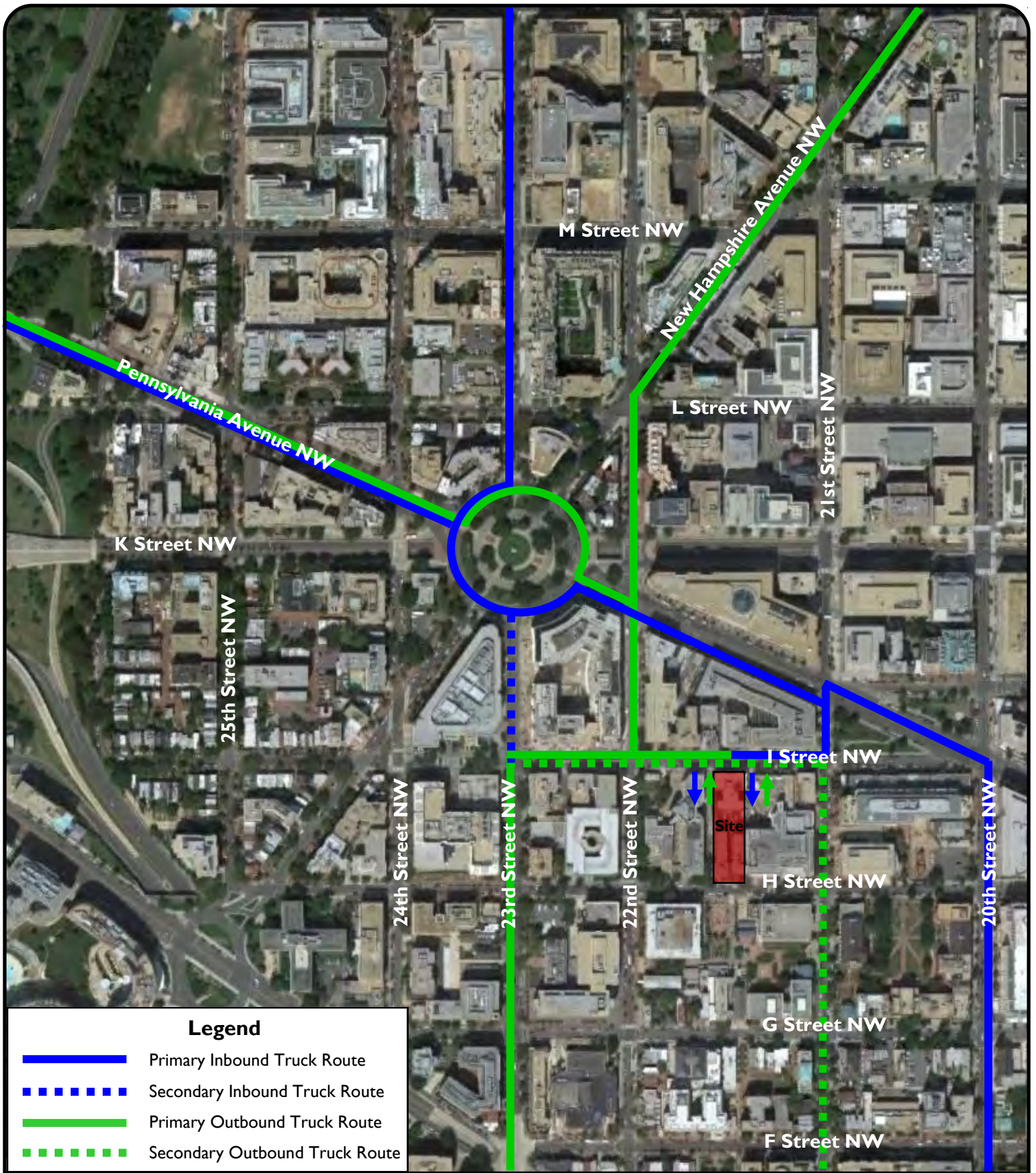


Figure 20
Preferred Truck Routes

