BROOKLAND-CUA STATION AREA ACCESS PLAN

Final Report

Brookland-CUA Metrorail Station
District of Columbia
January 2013

Washington Metropolitan Area Transit Authority

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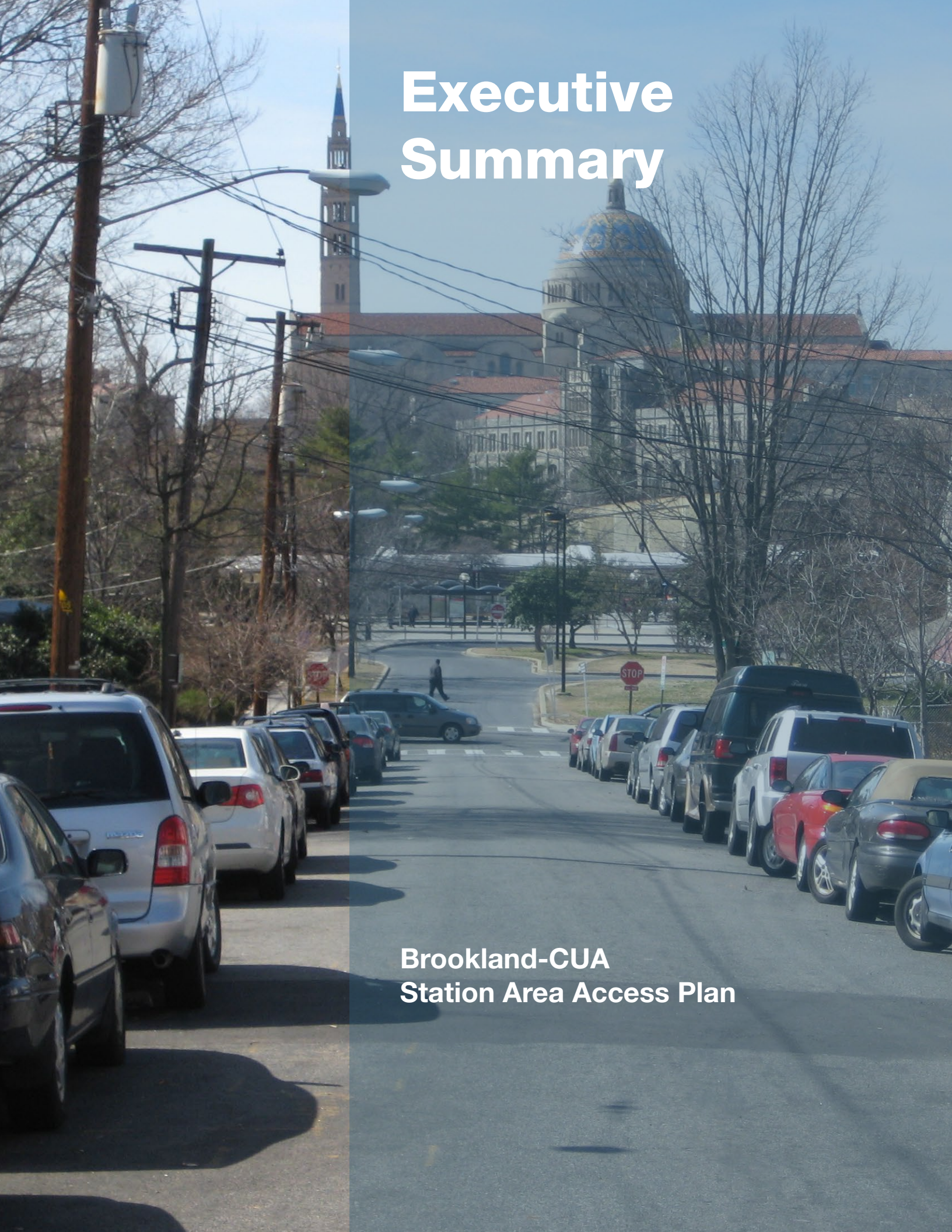

Executive Summary

Brookland-CUA
Station Area Access Plan

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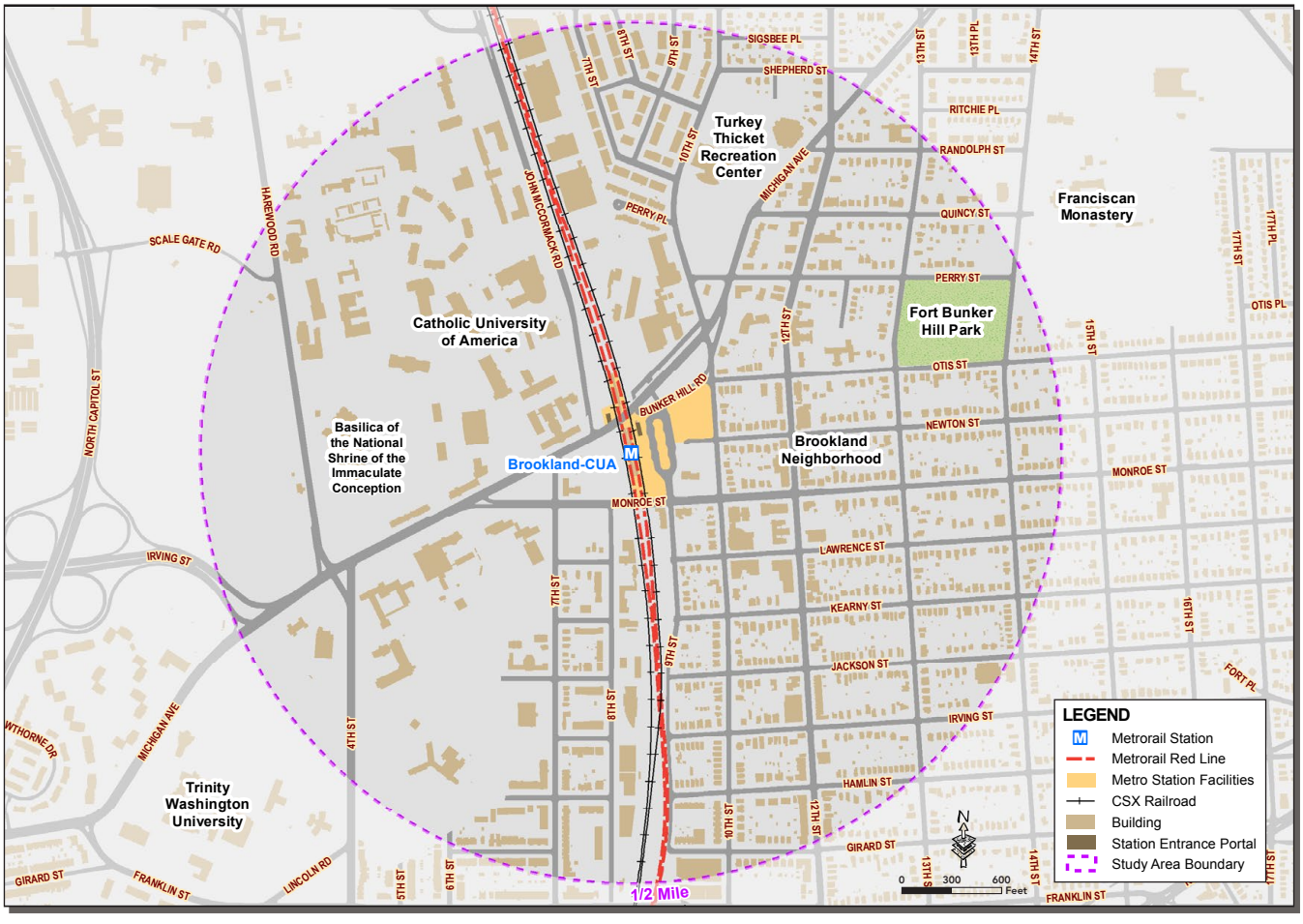
Executive Summary

The Washington Metropolitan Area Transit Authority (WMATA or "Metro") has developed the Brookland-CUA Station Area Access Plan to assess existing and future access needs of the Metrorail station, which is located between the Brookland neighborhood and Catholic University of America (CUA) in northeast District of Columbia. Specifically, the Station Area Access Plan further evaluates the feasibility of proposed changes to station access facilities recommended by the District of Columbia's *Brookland/CUA Metro Station Small Area Plan* (adopted 2009, referred to as "the Small Area Plan") and addresses other ongoing and planned development in the station area. **Figure ES-1** shows the station location and general ½-mile radius project study area.

The station access study evaluated the needs of station users both within the station site and accessing the station site by foot, bicycle, bus, private shuttle, taxi and private vehicles. A primary focus of the study was to examine ways that the existing station off-street bus facility could be replaced by on-street bus stops integrated into a new street grid and joint development proposed for the station site under the Small Area Plan. The station access plan developed several alternatives for bus facilities and operations, station entrances, and other access modes at the station. The options will be used by Metro to guide consideration of future joint development on the station site as well as to improve general station access.

Figure ES-1 Study Area

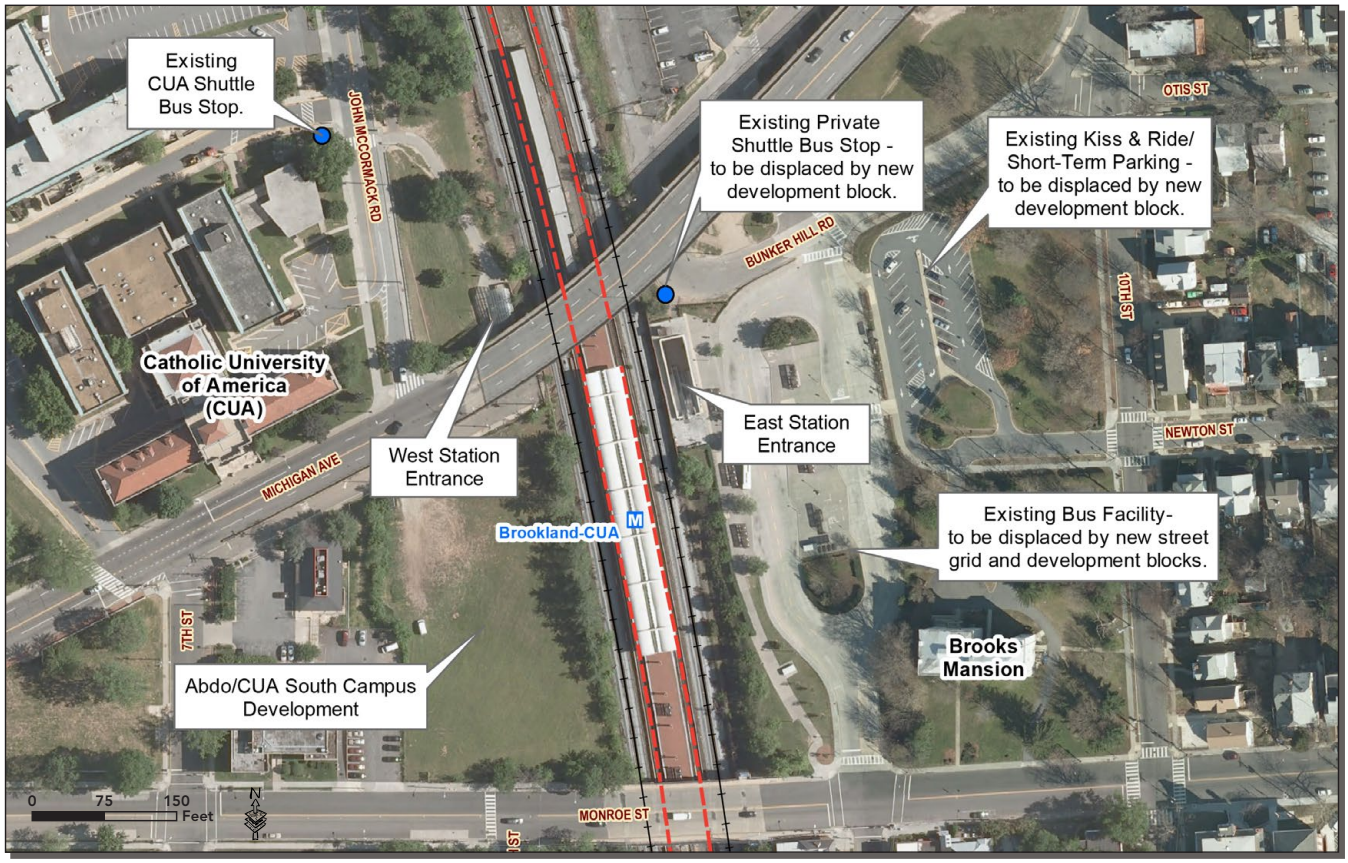


Station Area Development and Planning Context

New Development - Two major development projects are under construction or proposed in the immediate station vicinity. CUA and Abdo Development Corporation are currently redeveloping a nine-acre site immediately to the west of the station. The new "South Campus Development" is anticipated to be completed in phases from mid-2013 through 2014 and will consist of over 80,000 square feet of ground-level retail and approximately 725-825 residential units and townhomes, including artist studios, parking, and a public square. The development blocks immediately adjacent to the Metrorail station are currently under construction and will include a pedestrian plaza near the station west entrance and a pedestrian "Arts Walk" street through the development. In addition, the southeast corner of Monroe Street and 9th Street is the proposed redevelopment of the Colonel Brooks Tavern property, which will comprise approximately 13,000 square feet of retail and over 200 residential units.

***Brookland/CUA Metro Station Small Area Plan* (DC Office of Planning, 2009) -** The Small Area Plan (SAP) was prepared by the DC Office of Planning with extensive community input over an 18-month period and approved by the DC Council in March 2009. The plan envisions significant redevelopment at the Metrorail station, with a focus on the station becoming a mixed-use activity node and community gathering space for the neighborhood. The plan also covered areas beyond the immediate vicinity within the general ¼-mile radius of the station; it divided the station area into several sub-areas: the Metrorail station site and its immediate vicinity, the Monroe Street corridor (between Michigan Avenue and 12th Street), the 12th Street neighborhood business corridor, and commercial areas to the north and south.

Figure ES-2 Existing Station Site and Small Area Plan Proposed Changes



For the Metrorail station site and immediate vicinity, recommendations include reconnecting the street grid through the station site, thereby eliminating the existing bus facility, planning for residential and neighborhood-serving retail development in the new blocks adjacent to the station, creating entry plazas with relocated station entrances to align with planned streets, and relocating station bus stops, parking and Kiss & Ride functions along the new street grid (see **Figure ES-2**).

Station Access Needs and Redevelopment Impacts

The study assessed future access and facility needs at Brookland-CUA station based on projected transit ridership growth, plans for new/restructured transit services, and the recommendations of the Small Area Plan for replacing station vehicular access facilities with an urban street grid. These projected facility needs were used in developing station access alternatives for the different modes serving the station.

Metrorail - Weekday station boardings are projected to grow 21 percent from 6,576 daily boardings in 2011 to 7,925 daily boardings by the year 2030. Based on existing observations, the station has sufficient circulation capacity and is not likely to need additional fare gates or vertical circulation elements in the near term, with the exception of a new elevator at the west entrance. Also, because Brookland-CUA station experiences a larger share of off-peak ridership compared to many stations in the Metrorail system, station usage is more spread out over the course of the day, rather than being concentrated during the peak hours. However, as additional station area redevelopment occurs, facility utilization should be monitored to assess the potential for capacity deficiencies.

Bus - Currently, the Metrobus 80, G8, H1, H2, H3, H4, H6, H8, H9, and R4 routes serve the station, which also serves as a location for driver reliefs and layovers on several of the routes. Future bus operations and service needs at the station were projected to the year 2030, based on the following assumptions for future service:

- Average ridership growth rate of 2 percent per year on each Metrobus route;
- Average ridership growth rate of 2 percent per year on each Metrobus route[1];
- New “Metro Express” limited-stop bus route operating on the Metrobus Route 80 – North Capitol Street Line priority corridor; and
- New DC Circulator route originating/terminating at the Brookland-CUA Metrorail station and operating every ten minutes with service to Woodley Park.

Based on the service projections, ten additional bus trips will be added to the 18 trips currently using the Brookland-CUA Metrorail station during the peak 15 minutes of service, resulting in an estimated 28 bus trips serving the station during the peak 15 minutes of service in the year 2030.

To accommodate future peak service levels, it is recommended that the station incorporate following facilities:

- Nine bus bays (four for standard-sized buses, five for articulated buses); and
- Seven layover spaces (three for standard-sized buses, four for articulated buses.

The estimates assume that buses use separate layover areas[2] and provides an extra bus bay to allow for operational flexibility and possible schedule variations in the bus service. The recommended

1. WMATA bus planning estimate to account for planned redevelopment in Northeast District of Columbia.

2. The assumption is based on the Small Area Plan’s proposed relocation of the bus bays to on-street stops adjacent to new retail and residential development, which would not be suitable locations for bus layover activities.

number of bays is the same as currently exist at the facility, but without layover activity occurring in the bays (as in the current operations), the bays would be able to accommodate additional trips during peak periods. Although no articulated buses currently serve the station, approximately half of the bays and layover areas should be sized to accommodate articulated buses on key Metrobus corridors.

Streetcar - *The DC Streetcar System Plan* (DDOT 2009) proposes a cross-town streetcar corridor from the Woodley Park Metrorail station to Catholic University and the Brookland-CUA Metrorail station. The line is not planned until the final phase of the system plan, by the year 2030, and no alignment or exact terminus location has been identified for the streetcar line. It is anticipated that service to the station would be provided along an adjacent existing public roadway such as Monroe Street. Due to the long-term conceptual status of the streetcar corridor planning, no special provisions for a streetcar stop are included in the current station access plan.

Private Shuttles - *The Independent Shuttle Bus Consolidation Strategy Plan*, conducted by the Metropolitan Washington Council of Governments (MWCOG) in 2010, recommends space for up to five shuttles at a time. Shuttle buses can be up to 35 feet in length and require up to 50 feet for parking. Providing 250 feet of curb space for shuttle stops and layovers would accommodate passenger loading and unloading and layover functions by multiple shuttles and allow for future service growth based on the MWCOG study.

Shuttle operations could be accommodated on 9th Street near the east entrance. A shuttle stop on the west side of 9th Street would provide direct access for shuttle passengers to the station. Additional shuttle locations are explored in the report. Each location presents challenges and trade-offs as many of the shuttles service hospitals and medical arts facilities including Washington Hospital Center, Veteran's Administration Hospital and Children's Hospital. Ready access to elevator(s) and connecting transit service is desirable. Reducing impacts to future development is also desirable.

Private Shuttles Serving Brookland-CUA Station

Pedestrian and Bicycle Access - Implementation of joint development on the station site and construction of planned development projects and associated streetscape improvements in the station vicinity will address many of the existing gaps in the pedestrian network. As continued redevelopment occurs in the station vicinity, conditions for pedestrians and bicyclists accessing the station should be reviewed. Potential enhancements that would require further study include realignment of the Metropolitan Branch Trail (MBT) at the west entrance and the addition of secure bicycle parking within the station mezzanine.

Kiss & Ride - To provide adequate space for Kiss & Ride pick-up/drop-off activities, 100 linear feet of frontage (adequate length for five parallel parking spaces) should be designated for exclusive Kiss & Ride pick-up/drop-off use, with potentially an additional 100 linear feet reserved for future expansion. This arrangement would reserve a similar number of spaces for driver-attended pick-up/drop-off as the current Kiss & Ride facility. Depending on the locations of future bus and shuttle stops, Kiss & Ride areas could be located along both the west and east sides of 9th Street to provide options for drivers arriving from either direction. Newton Street between

10th Street and 9th Street could also be utilized for a portion of the weekday Kiss & Ride activity, but it would be closed to vehicles during weekend special events and activities under the recommendation of the Small Area Plan.

Taxis – Two to three dedicated spaces should be provided for taxis as demand increases with future development.

Carsharing - To provide adequate space for carshare parking by Zipcar or other providers, two dedicated spaces (approximately 30 linear feet) should be provided on Bunker Hill Road between 10th Street and 9th Street. The option to convert two additional on-street metered parking spots in the station vicinity to accommodate growth in carsharing demand should be reserved.

Short-Term Parking - Two ADA-accessible on-street spaces are required in the same or closer proximity to the east entrance elevator as existing spaces. General short-term parking needs will be accommodated by the new metered on-street parking spaces that will be provided along the new blocks of 9th Street, Newton Street, and Bunker Hill Road as part of the new joint development.

Station Access Alternatives

Alternatives for station improvements that address the following key facility and access needs at Brookland-CUA station were developed and evaluated:

- Locations for future bus and shuttle services, passenger pick-up/drop-off locations, and on-street parking on the proposed Small Area Plan street grid;
- East entrance plaza that integrates the existing escalator/stair and elevator; and
- New elevator at the station west entrance.

Bus and Shuttle Facility Locations

The alternatives have been designed to meet Metro guidelines, including the *Station Site and Access Planning Manual* (May 2008) and *Guidelines for the Design and Placement of Transit Stops* (December 2009). Specific requirements used in all alternatives include the following:

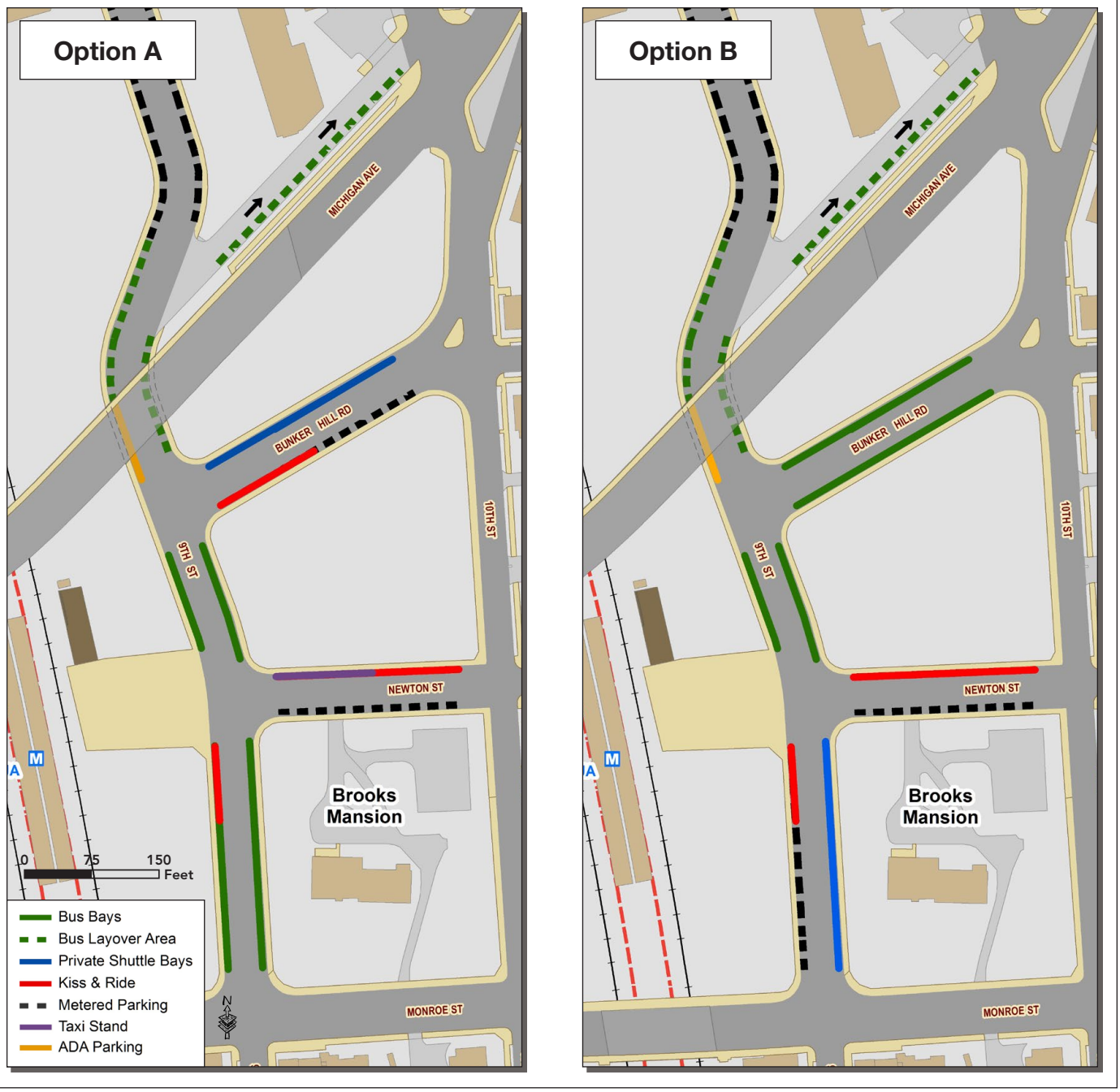
- Bus bays within 500 feet of station entrance;
- Bus bays within 500 feet of other bus bays, which is important for Brookland's significant number of bus-to-bus transfers;
- Shuttle services accommodated within a single area to make wayfinding easy for users;
- Replacement of ADA-accessible parking near the station east entrance;
- No bus or shuttle stops or circulation on Newton Street to allow for weekend street closures for community events; and
- No bus or shuttle circulation on 10th Street between Monroe Street and Bunker Hill Road to avoid adverse impacts on local residential streets.

Existing Off-Street Bus Facility at Station East Entrance

On-Street Bus Stops Alternative

As recommended in the Small Area Plan, the On-Street Alternative provides new bus stops on-street by the station east entrance along 9th Street and/or Bunker Hill Road. Bus layover areas are provided along the existing segment of Bunker Hill Road north of the Michigan Avenue bridge, between 9th Street and 10th Street. The Small Area Plan proposed eliminating this segment of Bunker Hill Road to provide additional space for redevelopment north of Michigan Avenue; however, it is recommended that this public right-of-way be retained as a bus-only driveway, operating with one-way bus traffic for use in circulation and layover activities. **Figure ES-3** shows two on-street bus stop options for locating on-street bus stops and other access modes:

Figure ES-3 On-Street Bus Stops Alternative – Options A and B



- Option A – locates all bus stops along 9th Street as proposed in the Small Area Plan; and
- Option B – locates some bus stops along Bunker Hill Road, as well as on 9th Street, to reduce potential adverse impacts to mixed-use development and plaza on 9th Street.

Bus Circulation - The biggest challenge to locating bus stops on the proposed new street grid at Brookland-CUA Metrorail station is accommodating bus circulation needs without a turn-around loop. To accommodate turn-around and layover circulation without using existing residential streets, the on-street alternative proposes using the existing segment of Bunker Hill Road north of the Michigan Avenue bridge as a one-way bus circulation area. After unloading passengers at the station on 9th Street, bus routes could continue north along 9th Street, turn into the bus-only driveway, turn right onto 10th Street to cross Michigan Avenue, and return to the station area via the existing segment of Bunker Hill Road on the south side of Michigan Avenue. A special signal phase at the intersection of 10th Street and Michigan Avenue would be required for buses to exit the driveway and proceed through the intersection.

Traffic and Bus Operations Impacts - A detailed traffic study would be needed to assess potential impacts to intersection levels of service and pedestrian crossings by the new signal phase, adjustments to stop bar locations, and other potential modifications to the intersection. Further study of the additional time required to access remote layover areas and return to the bus bays would also be needed to assess additional operating costs for non-revenue service and potential impacts to bus headways that may require additional vehicles in service.

Potential Bus Restructuring - Alternatively, the Metrobus 80 and G8 routes could be modified through the Brookland neighborhood so that they do not require a turn-around to return to Monroe Street. Some terminal bus routes could take layovers in their on-street bus bays, avoiding several blocks of circulation to a remote layover area; however, this arrangement could adversely impact adjacent proposed transit-oriented development.

Impacts on 9th Street Uses - The On-Street Bus Alternative also limits space for other vehicular access functions at the east entrance, such as on-street parking for new retail and other uses in the proposed joint development as well as curbside space for Kiss & Ride pick-ups and drop-offs. On-Street Option A, especially restricts space for other functions and may have adverse impacts on the new east entrance plaza area and storefront retail by dominating the streetscape with bus operations. Option B places some bus stops along Bunker Hill Road south of Michigan Avenue, in addition to along 9th Street, freeing up space for other access modes near the station entrance and lessening the impacts of bus operations on the new transit-oriented development and public plaza.

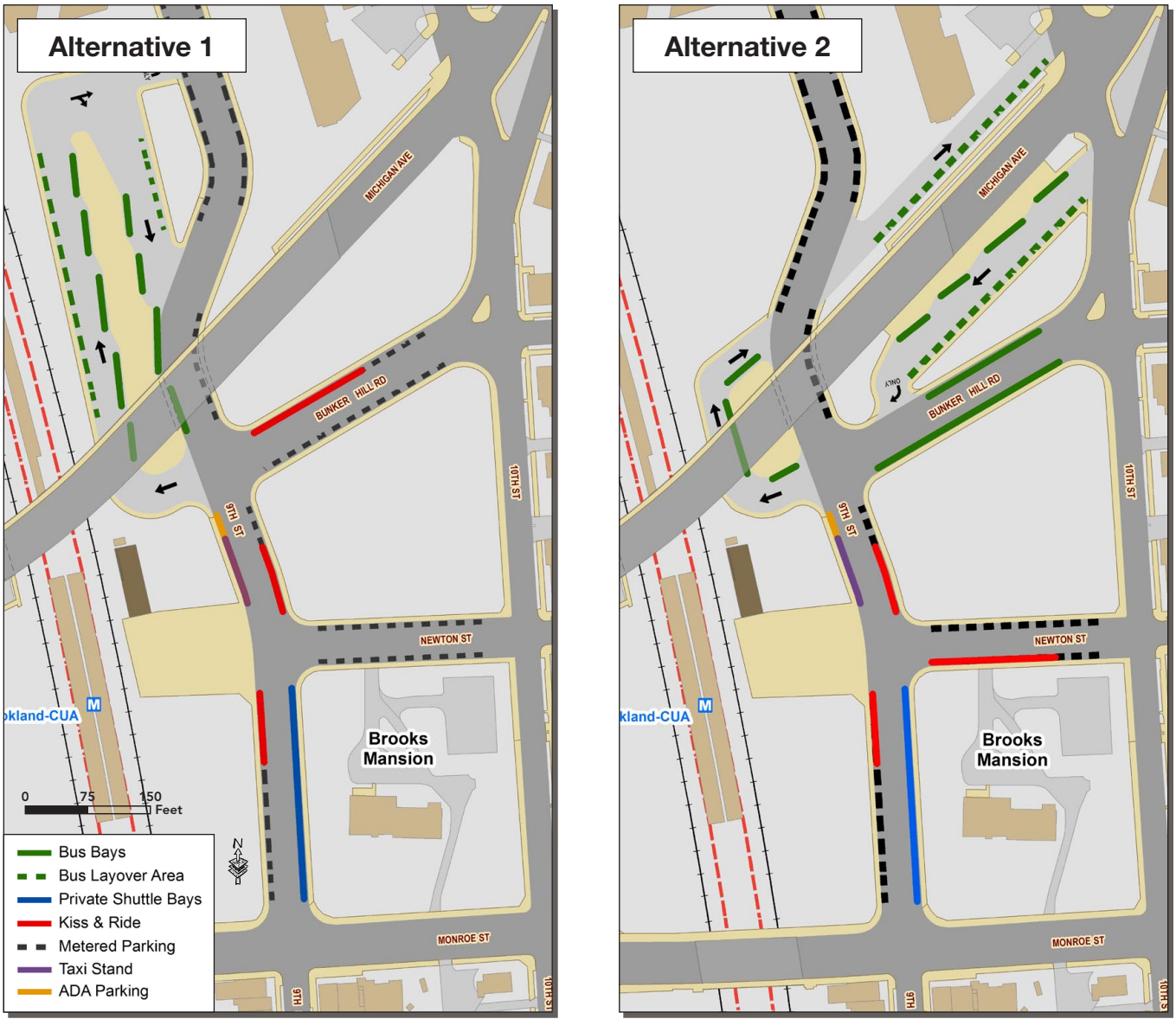
Existing Bus Layover Area Within the Off-Street Bus Facility at Brookland-CUA Station

Off-Street Bus Facility Alternatives

Three alternatives were developed that use off-street bus bay and layover facilities as potential ways to avoid negative impacts on the plaza and retail area and to provide more efficient bus circulation. Off-street bus facilities would also free up space along 9th Street for other station access modes and parking for retail uses. **Figures ES-4** and **ES-5** show the Off-street Alternatives.

- **Off-Street Alternative 1** replaces the existing bus loop with a new off-street bus facility north of the east entrance, extending north under the Michigan Avenue bridge along the east side of the Metrorail tracks and accessed from the proposed extension of 9th Street.
- **Off-Street Alternative 2** illustrates how existing Metro-owned property and public right-of-way could potentially be utilized for new bus facilities. The alternative replaces the existing bus loop with new off-street bus facilities as well as some on-street bus bays along Bunker Hill Road.

Figure ES-4 Off-Street Bus Facility Alternatives 1 and 2

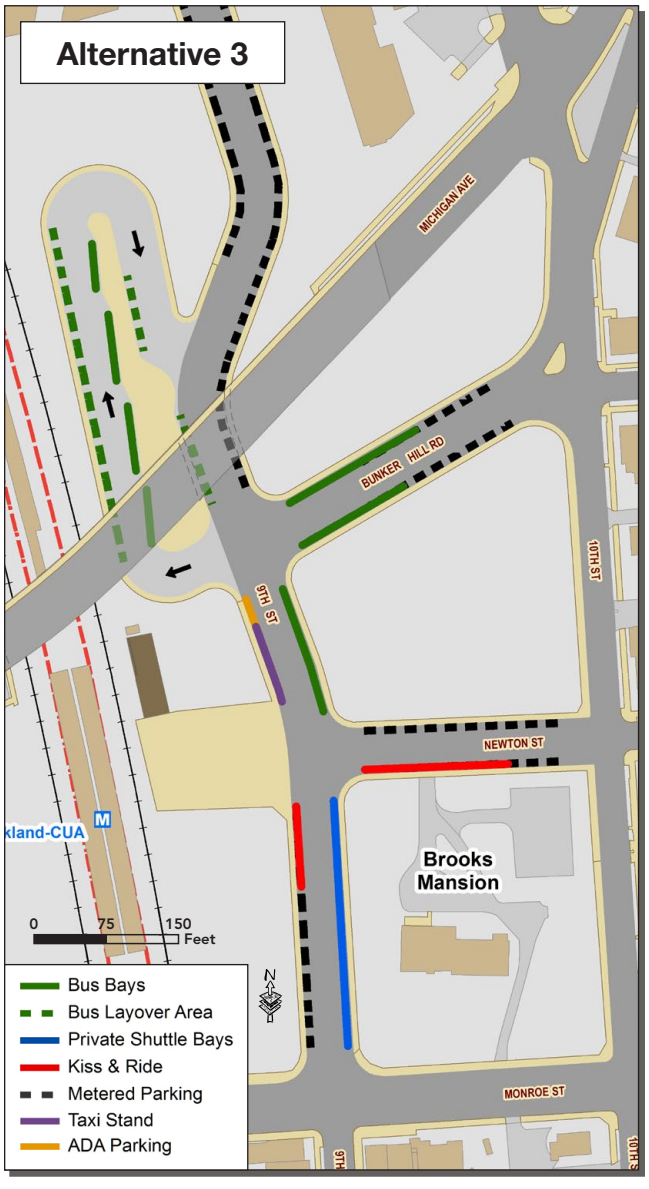


- **Off-Street Alternative 3** provides an off-street facility only for terminal routes that need to take layover at Brookland-CUA station; other routes would use on-street bus stops. The arrangement allows efficient circulation from bus bays to/from layover areas while reducing the size and property needed for an off-street bus facility.

Consistency with Small Area Plan - *The Brookland/CUA Metro Station Small Area Plan* did not recommend an off-street bus facility; however, due to the challenges of accommodating bus and other station access modes along 9th Street, while still fostering a pleasant and pedestrian-friendly urban environment, off-street bus alternatives were explored as an alternative way to accomplish the Small Area Plan goals. By shifting some of the bus operations away from curbside locations at the focal point of the new mixed-use development, an off-street bus facility could be consistent with Small Area Plan goals to enhance the streetscape environment and provide on-street metered parking for new development.

Property and Bus Circulation Requirements - Off-street Alternatives 1 and 3 would require acquisition of sites that are currently located on privately owned parcels but would enable efficient bus circulation and layovers. Off-street Alternative 2 would not require any private land but the small size of the off-street facility would require additional remote layover spaces, bus circulation north of Michigan Avenue, and introduction of a new driveway in close proximity to the 10th Street intersection with Michigan Avenue, which may have adverse traffic impacts. All three alternatives would require the use of portions of parcels for bus facilities targeted for mixed-use redevelopment by the Small Area Plan.

Figure ES-5 Off-Street Bus Facility Alternative 3



New Bus Facilities Should Be Able to Provide Convenient Access to the Metrorail Station East Entrance, Similar to Existing Bus Bays Shown Above

East Entrance Plaza

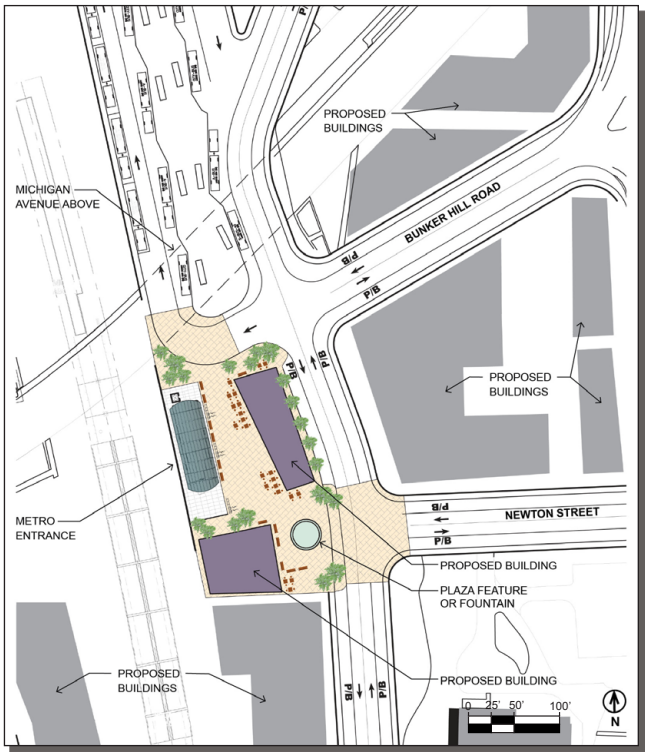
The Small Area Plan proposed moving and realigning the east station entrance to correspond with the axis of Newton Street. However, the new location would require either significant below grade construction and reconfiguration of the existing mezzanine or a long extension of the underground passageway, connecting the mezzanine to the escalators, which would have limited pedestrian sight lines.

An alternative to realigning the east entrance would be to maintain the existing location of the stair and escalator and to extend the entrance level plaza to align with the Newton Street axis. A building wing or feature object in the plaza could serve as a terminal focal point for the Newton Street axis, providing an identifiable entrance to the public plaza and the Metrorail station. This alternative would not require significant change to the station and would not introduce new safety concerns within the passageway.

Several design concepts were developed to address the east entrance in the new Small Area Plan development scheme and potential station access alternatives, using the following assumptions:

- The escalator/stair and elevator are retained in their existing locations;
- The escalator/stair portal is protected from the elements by a canopy structure or overhead building wing;
- Plaza layouts and proposed building massing can be adjusted to integrate different bus configurations; and
- Proposed building heights and height setbacks can be adjusted to improve views to the Basilica of the National Shrine of the Immaculate Conception.

Figure ES-6 East Entrance Plaza Option 1

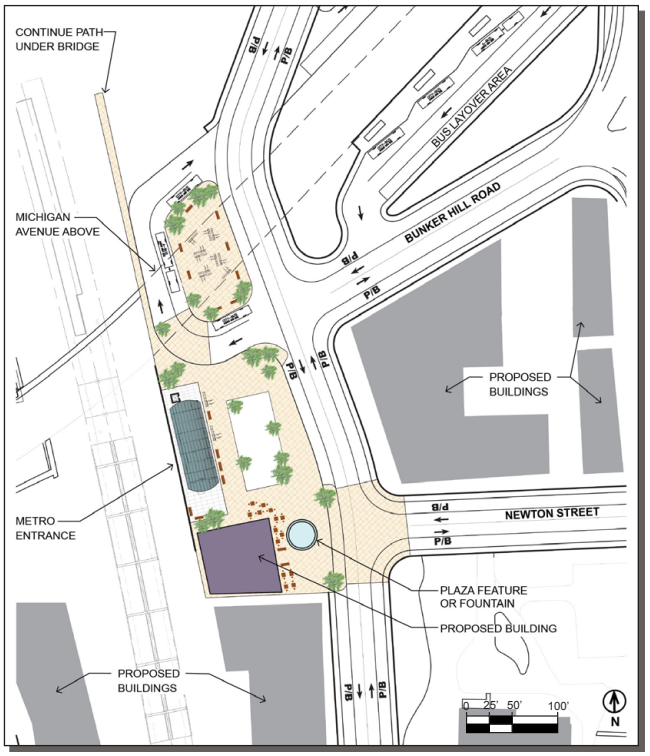


Figures ES-6 through **ES-9** show the four design options, which have the features described below.

- **Option 1** uses a building wing to terminate the Newton Street axis and frame the plaza area;
- **Option 2** incorporates an open plaza area at the corner of 9th Street and Bunker Hill Road, which would open up the entrance area to potential bus bay locations along Bunker Hill Road;
- **Option 3** places development over the escalator/ stair bay and elevator rather than along 9th Street, creating an open plaza area for potential bus stops along the adjacent block of 9th Street north of the intersection with Newton Street; and
- **Option 4** maintains the Small Area Plan concepts of an open axis at the terminus of Newton Street, by using a sculptural/landscape feature instead of a building, and locates the development block on the north side of the plaza along 9th Street.

View Toward Station East Entrance Along Existing Newton Street, from 10th Street, NE Intersection

Figure ES-7 East Entrance Plaza Option 2



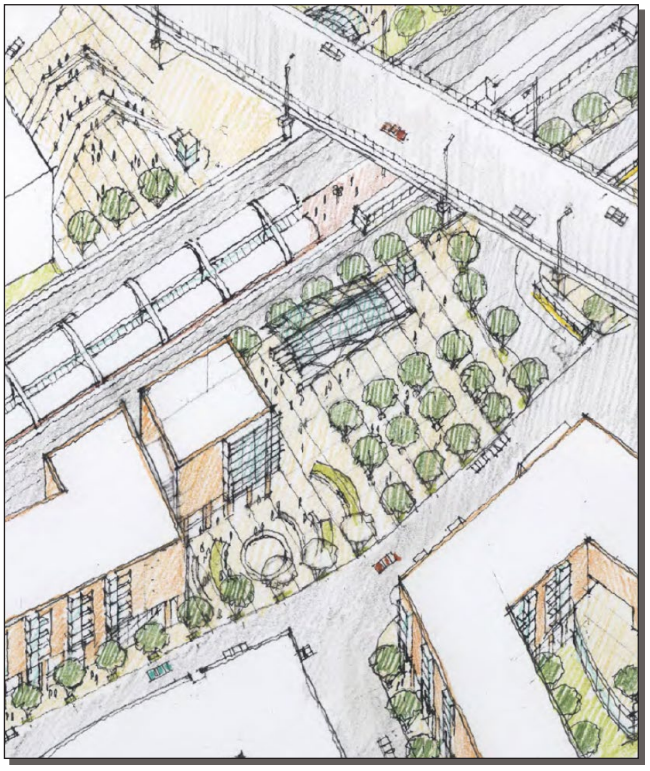


Figure ES-8 East Entrance Plaza Option 3

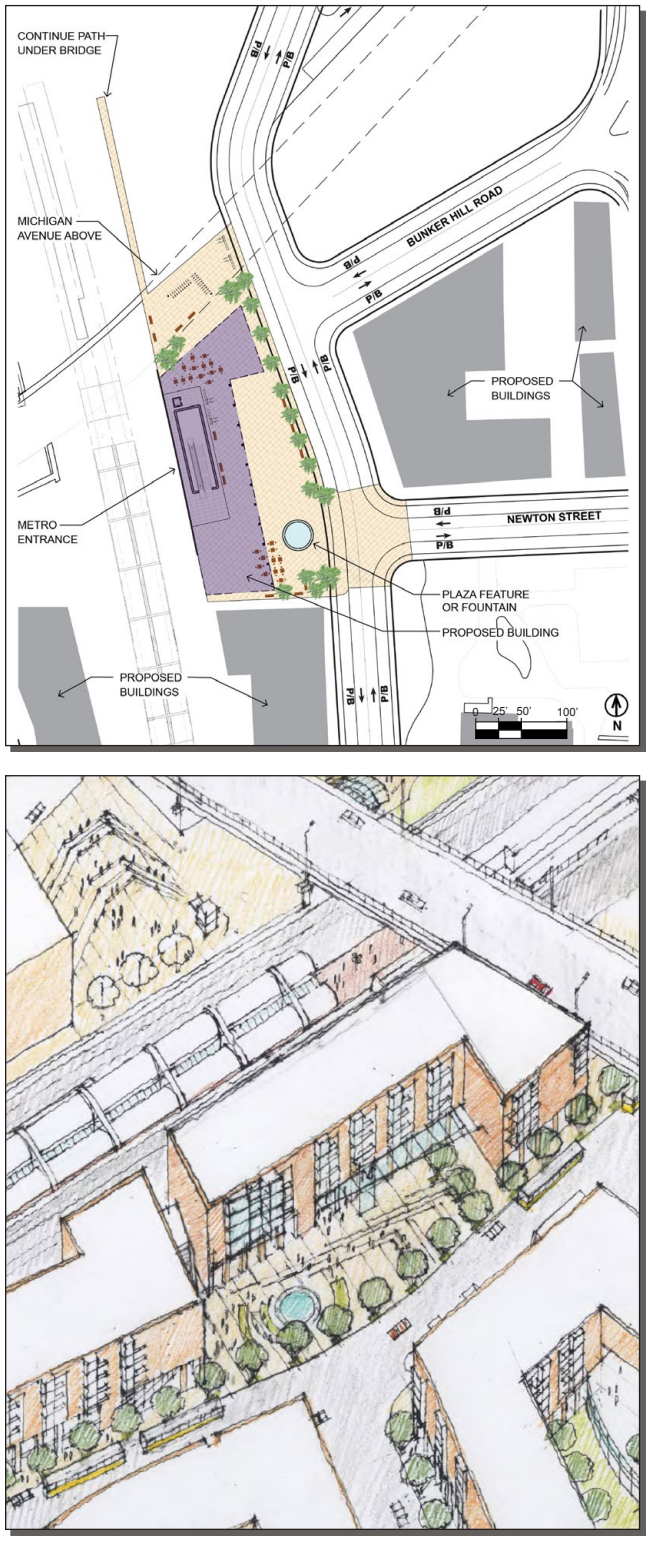
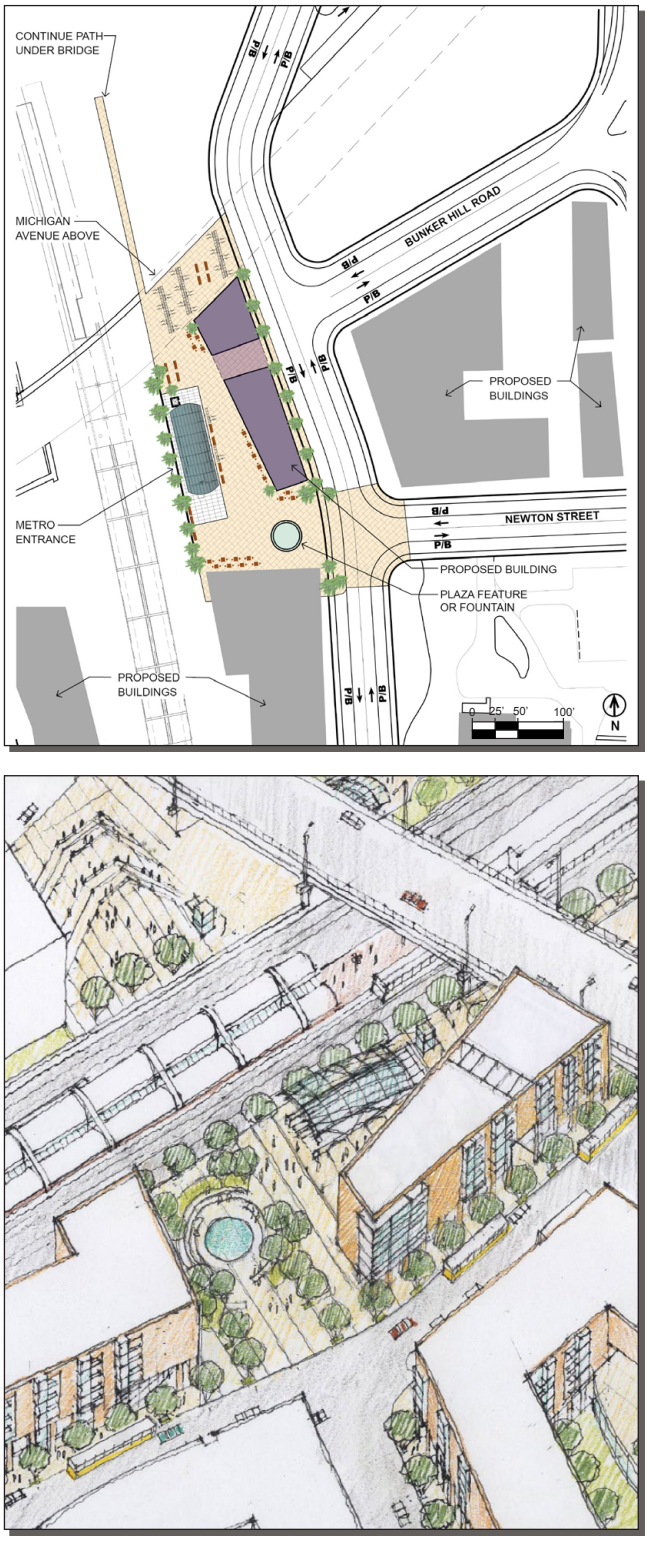


Figure ES-9 East Entrance Plaza Option 4



West Entrance Elevator

The Small Area Plan proposed moving and realigning the west station entrance to correspond with the axis of Newton Street, which would be in a location currently occupied by the Abdo/CUA South Campus Development. An alternative to moving the west entrance escalator that would take into account the site plan of the South Campus Development in this area, would be to maintain the existing location of the escalator and stair but to add an elevator, which the west entrance currently lacks. The station access plan developed several location options for a new elevator. **Figure ES-10** shows the elevator option locations, which are described below.

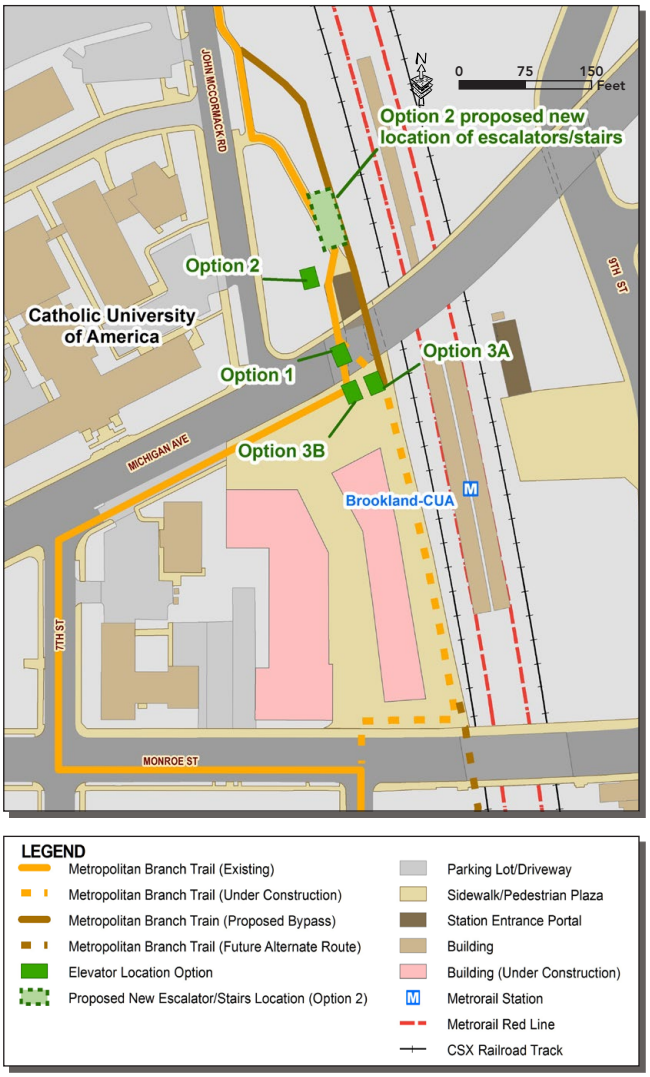
Option 1 places the elevator under the Michigan Avenue Bridge. At the mezzanine level, the elevator is located near the base of the stair/escalator. The location may restrict pedestrian circulation space at the surface level between the escalator and the bridge abutment.

Option 2 places the elevator to the north of the Michigan Avenue Bridge, with the assumption that the escalator bay would be moved further north of its existing location.

Option 3A places the elevator on just a portion of the mezzanine passageway curve to avoid additional cost associated with punching through curved wall as much as possible. At the entrance level, however, the location does not take account of the most recent landscape plan for the South Campus Development plaza area near the West Entrance to the Metrorail station. This location would partially block the plaza entrance to the MBT.

Option 3B responds to the most recent proposed landscape plan for the South Campus Development plaza area. It shifts the elevator location out of the way of the proposed entrance to the MBT from the plaza area. At the mezzanine level, the shift in location from Option 3A requires that the elevator access is on the curve of the pedestrian passageway.

Figure ES-10 West Entrance Elevator Option Locations



West Entrance – General Area Proposed for New Elevator

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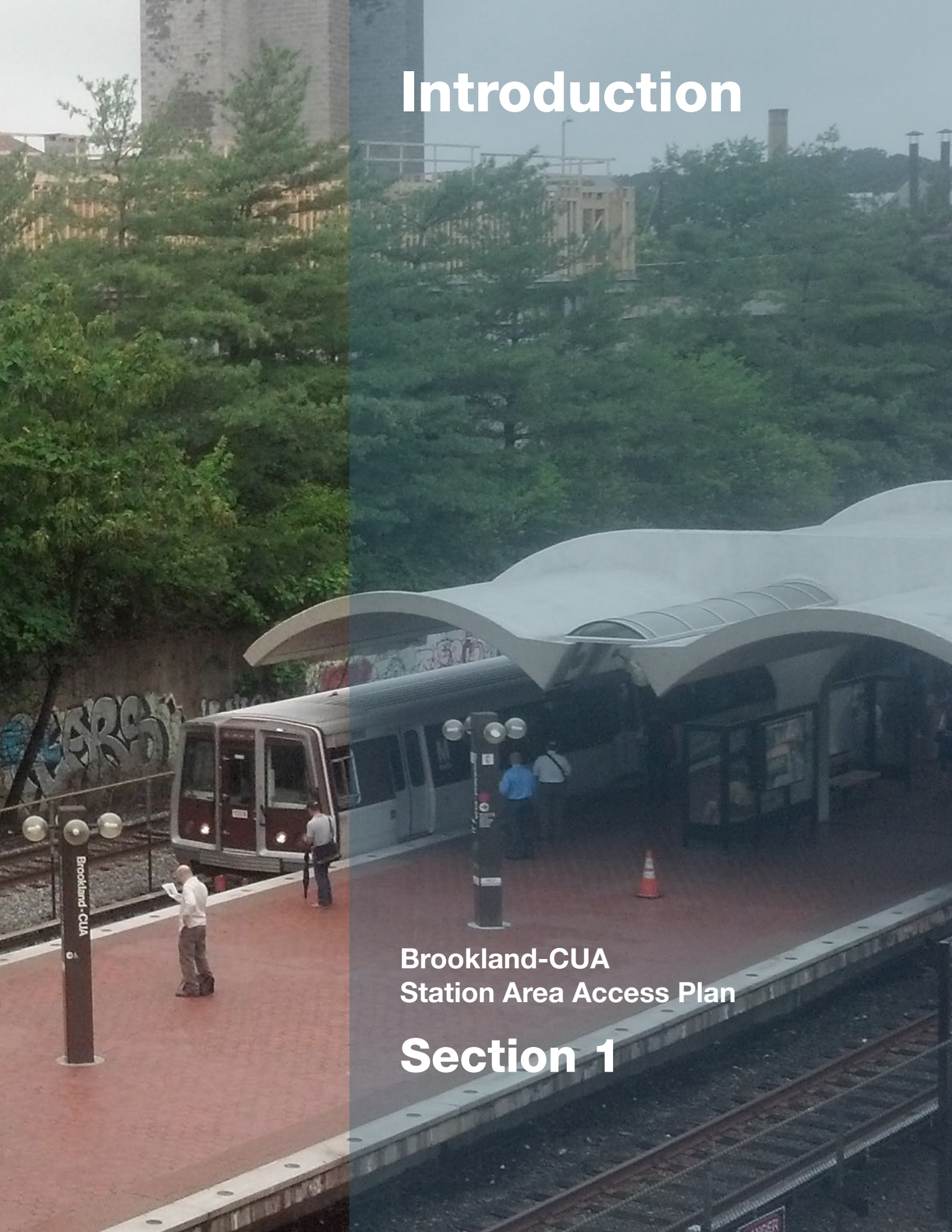
Introduction



Brookland-CUA
Station Area Access Plan

Section 1

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1.0 INTRODUCTION

The Washington Metropolitan Area Transit Authority (WMATA or "Metro") has developed the Brookland-CUA Station Area Access Plan to assess existing and future access needs of the Brookland-CUA Metrorail station. Specifically, the Station Area Access Plan further evaluates the feasibility of proposed changes to station access facilities recommended by the District of Columbia's *Brookland/CUA Metro Station Small Area Plan* (adopted 2009, referred to as "the Small Area Plan") and addresses other ongoing and planned development in the station area that has occurred since preparation of the Small Area Plan.

The station access study evaluated the needs of stations users both within the station site and accessing the station site by foot, bicycle, bus, private shuttle, taxi and private vehicles. A primary focus of the study was to examine ways that the existing station off-street bus facility could be replaced by on-street bus stops integrated into a new street grid and joint development proposed for the station site under the Small Area Plan. This report provides an overview of the study findings and recommendations, summarizing the existing conditions of the station and surrounding community, analyzing potential impacts of the Small Area Plan proposals to station operations and access, and proposes several alternatives for bus facilities and operations, station entrances, and other access modes at the station.

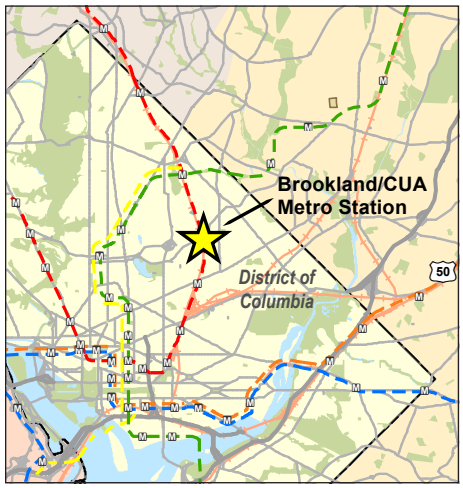
1.1 Station Overview

The Brookland-CUA Metrorail station is located in the northeast quadrant of the District of Columbia and serves the Metrorail Red Line. The station is located along the CSXT Transportation (CSXT) railroad tracks between Michigan Avenue, NE and Monroe Street, NE, major arterial roads for the area, and is adjacent to the Catholic University of America (CUA) campus (see **Figure 1-1**).

The station opened in 1978 on the Red Line and is located between the Rhode Island Avenue Metrorail station, to the south, and the Fort Totten Metrorail station a Yellow and Green Line transfer point, to the north. In addition to Metrorail, there is a Metrobus facility that has a significant number of bus-to-bus transfers. There is also a pick-up/drop-off point for multiple private shuttle services of area institutions. Metro owns approximately 5.3 acres of land at the station site, which includes a small surface parking lot with a total of 34 parking spaces, a bus loop with nine bus bays and additional bus layover spaces, a Kiss & Ride area with a pick-up/drop-off lane for vehicles and taxis, 16 bike racks, and 16 bike storage lockers.

1.2 Project Study Area

The study area for the project comprises the station site and the surrounding area within a ½-mile radius (see **Figure 1-2**). The area includes the Brookland-CUA Metrorail station, surrounding residential blocks of the Brookland neighborhood, commercial/industrial areas north and south of the station along the Metro and CSXT railroad tracks, Michigan Avenue, the 12th Street, NE neighborhood commercial corridor, portions of Catholic University of America and other institutional land uses to the west.



Location Map

Figure 1-1 Existing Station Site and Facilities

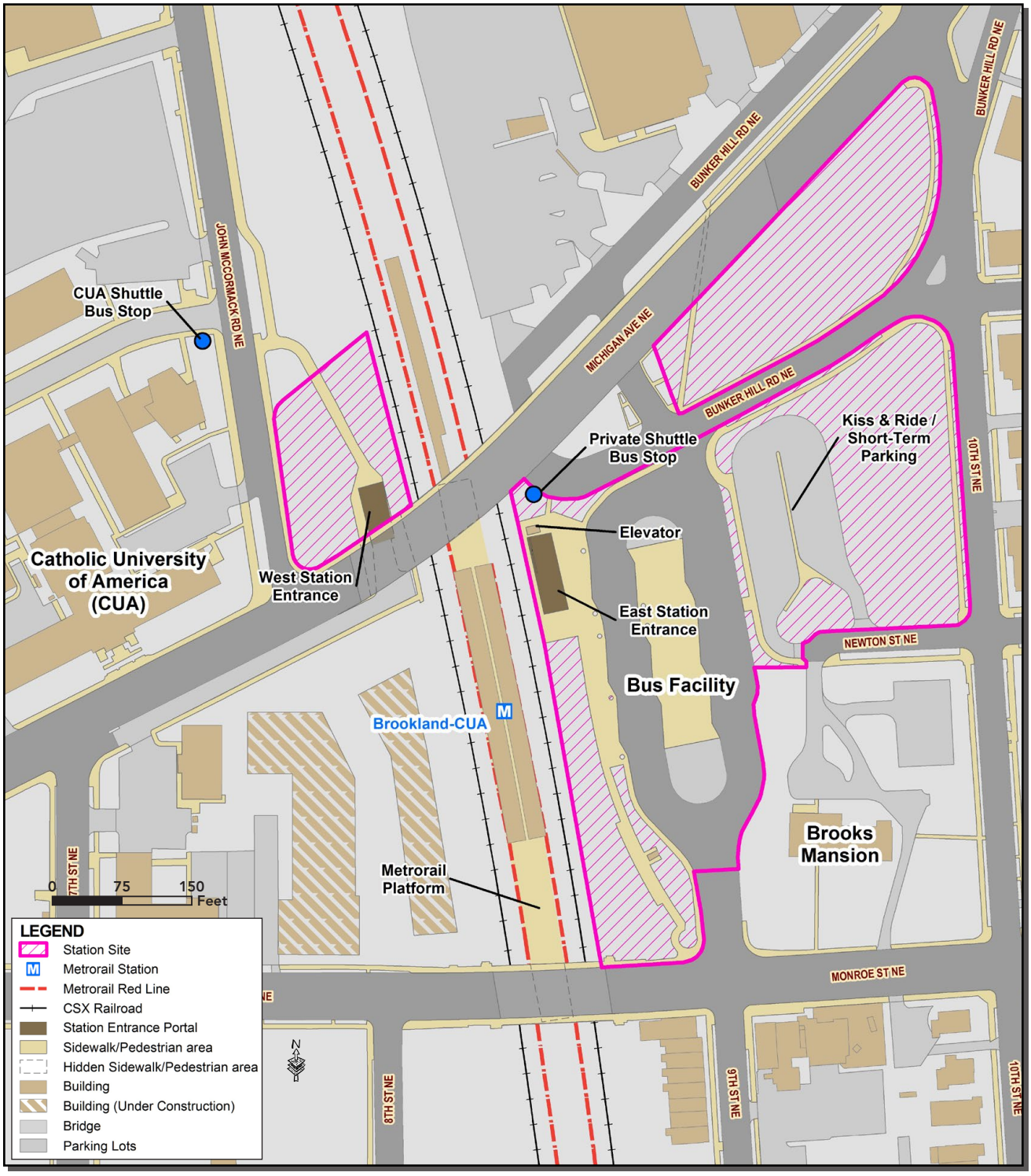


Figure 1-2 Study Area

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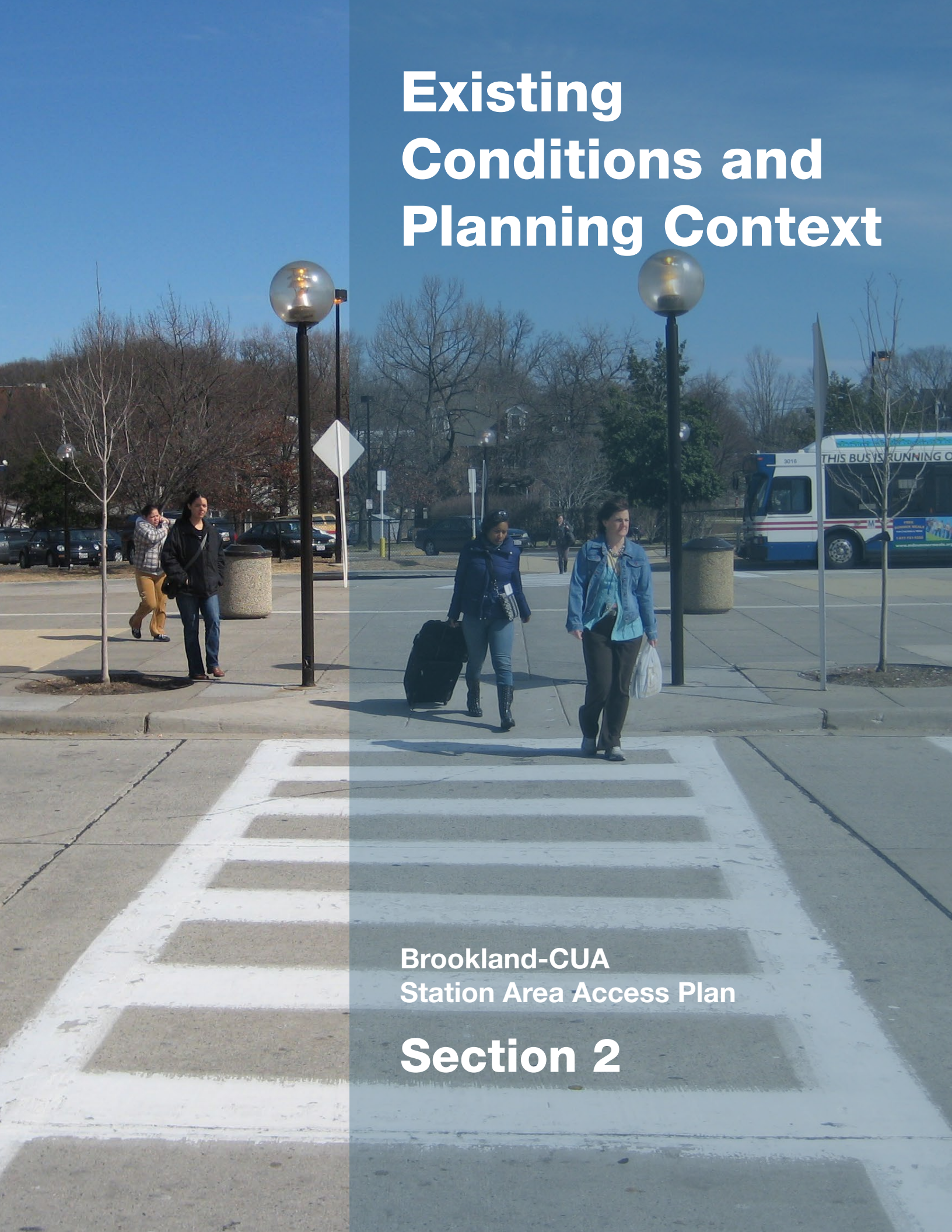

Existing Conditions and Planning Context

Brookland-CUA Station Area Access Plan

Section 2

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2.0 EXISTING CONDITIONS AND PLANNING CONTEXT

This section describes the existing conditions of the station and its vicinity, including the station facilities and site, study area land use, on-going development, and future land use plans. It provides summaries of key planning documents related to the station area, including the Brookland/CUA Metro Station Small Area Plan (referred to as the "Small Area Plan") and the Brookland/CUA Metro Station Shuttle Consolidation Strategy. Additionally, the section describes the existing conditions for the station including the facilities and their operations, entrances, and data on ridership and access modes. Furthermore this section describes all of the existing access modes to the station including Metrobus, private shuttles, pedestrian and bicycle, Kiss & Ride, taxi, car sharing, and parking in and surrounding the station. As such this section provides a strong foundation for understanding the subsequent report sections that examine impacts of the Small Area Plan and provide alternative development scenarios that accommodate the needs of all potential users.

2.1 Existing Station Area Land Use, Roadway Network, and Development

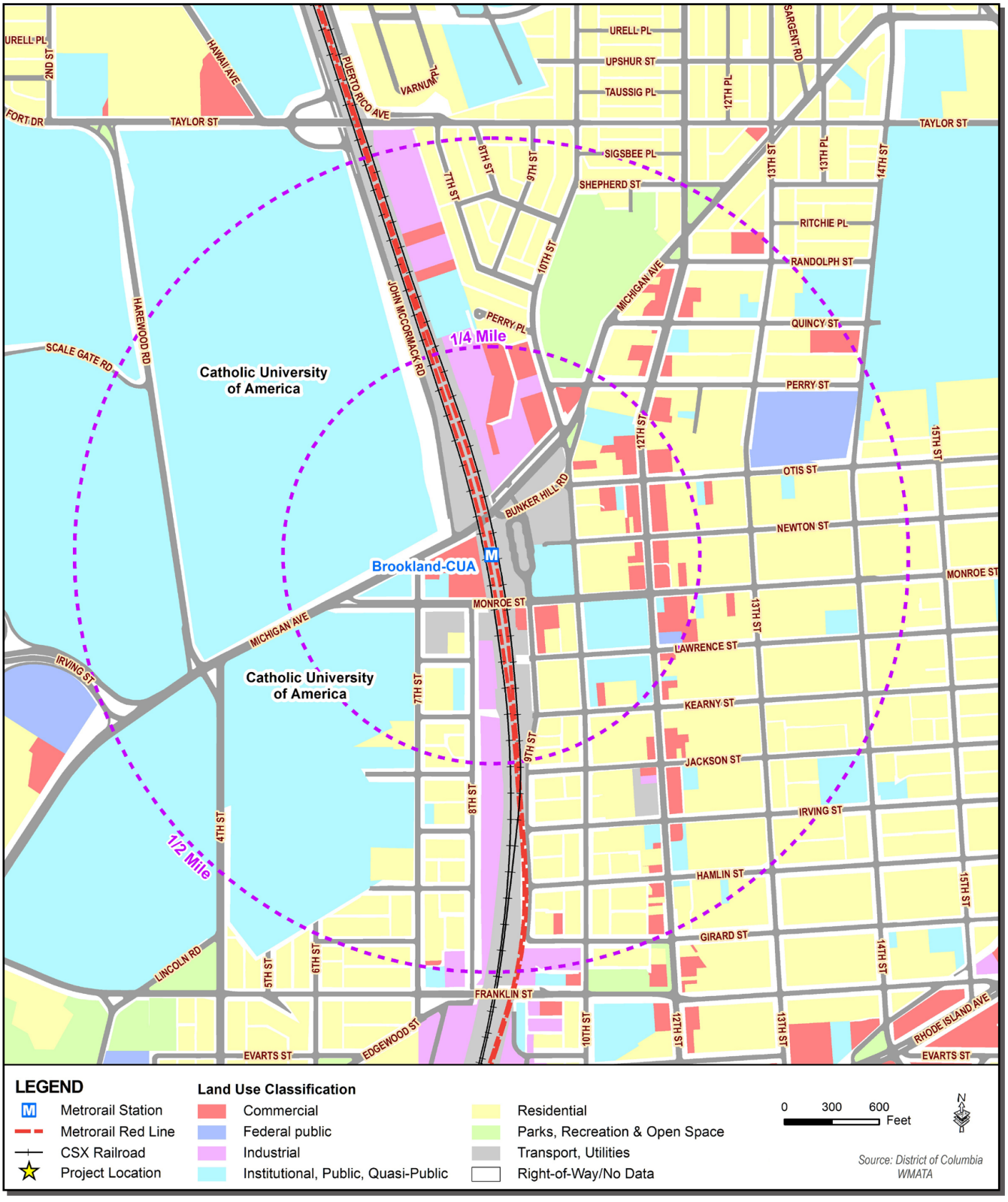
2.1.1 Land Use

The station area consists of a residential neighborhood, university campus, and light industrial and commercial area along a railroad corridor and area thoroughfares. As shown in **Figure 2-1**, the overall land use in the vicinity of the station is diverse, comprising a mix of uses. Northeast of the station are mostly commercial and light industrial uses along Michigan Avenue. East and southeast of the station is the Brookland neighborhood, which has a neighborhood retail corridor along 12th Street, NE, two blocks east of the station. South of the station are commercial and light industrial uses along the CSXT/Metro tracks with low-density residential uses along adjacent streets. West of the station is mostly institutional uses, including Catholic University of America (CUA), a private university with a 193-acre campus.

2.1.2 Roadway Network

The local streets are part of the District of Columbia's grid network, which generally provides efficient local circulation and access to arterial roads. The study area is traversed by several arterial facilities that provide both regional and local connectivity and mobility. Michigan Avenue and Monroe Street provide important east-west connections across the CSXT/Metro railroad tracks, which act as a barrier to east-west travel in Northeast DC. As a result, these roadways carry heavy volumes of traffic including buses and shuttles, which can present challenges to pedestrians and bicyclists, especially along Michigan Avenue where vehicles can operate at relatively high speeds. Further, heavy volumes of traffic on arterial roads result in unreliable schedules and delays to bus and shuttle services.

Figure 2-1 Existing Land Use



2.1.3
On-going and Planned Development

Two major development projects are under construction or proposed in the immediate station vicinity.

South Campus Development

CUA has partnered with Abdo Development Corporation to redevelop a nine-acre site immediately to the west of the Brookland-CUA Metrorail station. The new "South Campus Development" is anticipated to be completed in phases from mid-2013 through 2014 and will consist of over 80,000 square feet of ground-level retail and approximately 725-825 residential units and townhomes, including artist studios, parking, and a public square. The development blocks immediately adjacent to the Metrorail station are currently under construction and will include a pedestrian plaza near the station west entrance and a pedestrian "Arts Walk" street through the development. The Metropolitan Branch Trail (MBT) will run next to the CSXT tracks.

901 Monroe Street

At the southeast corner of Monroe Street and 9th Street is the proposed redevelopment of the Colonel Brooks Tavern property, which received zoning approval in March 2012. The redevelopment site includes most of the block; however, three small attached homes in the block are not included. The approved plan comprises approximately 13,000 square feet of retail, over 200 residential units, 66 bicycle parking spaces, and underground vehicular parking for the uses on site.

2.2
Planning Context

2.2.1
District of Columbia Comprehensive Plan (2006)

The District of Columbia Comprehensive Plan recommends long-term land use changes on industrially zoned land in the Brookland-CUA station vicinity, particularly in the area immediately north of Michigan Avenue and in the area to the southwest along 8th Street. The plan also identifies the Brookland-CUA station area as one of the primary areas that will contribute to the projected 19 percent population growth anticipated for the overall Upper Northeast planning area of the District of Columbia.

South Campus Development (Under Construction), As Viewed From Station (July 2012)

2.2.2 Brookland/CUA Metro Station Small Area Plan (2009)

The Small Area Plan (SAP) was prepared by the DC Office of Planning (DCOP) with extensive community input over an 18-month planning process and approved by the DC Council in March 2009. The adopted SAP amends the 2006 District of Columbia Comprehensive Plan. The DCOP plan envisions significant redevelopment at the Metrorail station, with a focus on the station becoming a mixed-use activity node and community gathering space for the neighborhood. The plan also covered areas beyond the immediate vicinity within the general ¼-mile radius of the station; it divided the station area into several sub-areas: the Metrorail station site and its immediate vicinity, the Monroe Street corridor (between Michigan Avenue and 12th Street), the 12th Street neighborhood business corridor, and commercial areas north and south of the station.

SAP Station Area Concept

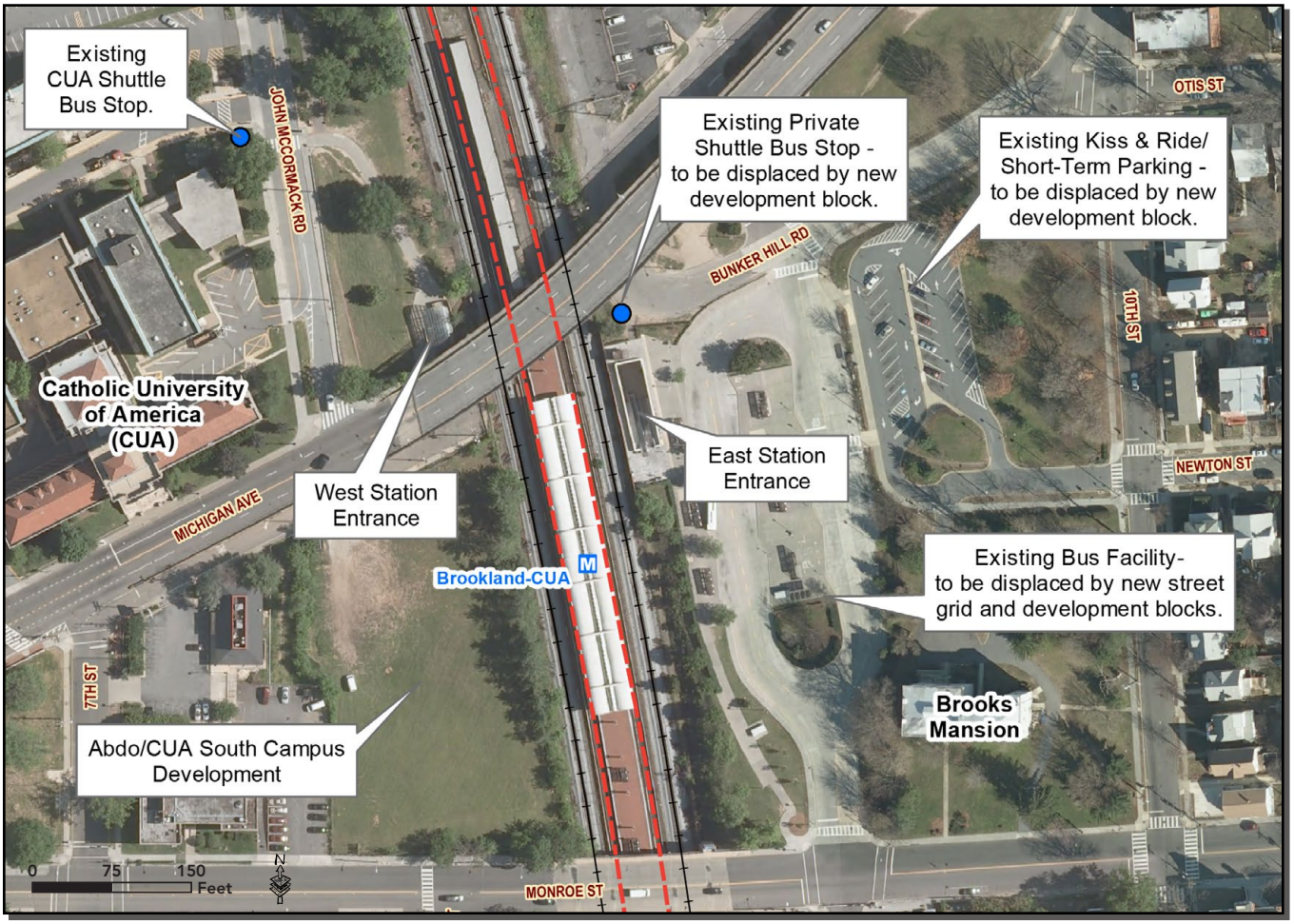
For the Metrorail station site and immediate vicinity, recommendations include reconnecting the street grid through the station site, planning for residential and neighborhood-serving retail development in the new blocks adjacent to the station, creating entry plazas with relocated station entrances to align with planned streets, and relocating bus facility, parking and Kiss & Ride functions along the new street grid.

Table 2-1 includes the Small Area Plan's concept sketch of the redeveloped station area and summarizes the key elements of the plan for the vicinity of the Brookland-CUA Metrorail station. **Figure 2-2** shows the existing station site and summarizes the major changes proposed by the Small Area Plan that would affect the station facilities and operations.

Table 2-1 Small Area Plan Recommendations

Sub-Area	Recommended Improvements in the Station Vicinity
Metro Station	Relocate the Metro station entrance slightly south to align with Newton Street Extend 9th Street and Newton Street into the Metrorail station site Remove Bunker Hill Road and extend Otis Street west to 9th Street Create blocks for development along the new street grid Extend 9th Street north of Michigan Avenue and the northern portion of Bunker Hill Road into the proposed commercial redevelopment area
Monroe Street	Extend 8th Street north of Monroe Street and re-grade the area to create a new four-way intersection of 8th Street with John McCormack Road and Michigan Avenue Create development sites along the Monroe Street bridge to allow for a continuous mixed-use development corridor from Michigan Avenue to 12th Street
Commercial North Sub-Area	Extend Perry Street to the west and 9th Street to the north to create a new access route into the proposed commercial redevelopment area north of Michigan Avenue

Figure 2-2 Existing Station Area and Planned Changes



2.2.3 Shuttle Consolidation Strategy (2010)

The Independent Shuttle Bus Consolidation Strategy Final Report was prepared by the Metropolitan Washington Council of Governments (MWCOG) in 2010 to assess private shuttle operations that serve the Brookland-CUA Metrorail station and ways to make the operations more efficient through potential consolidation of the different services. At the time of the study, nine different private shuttle providers served educational and health care institutions in Brookland and adjacent areas of the northeast District of Columbia, picking up and unloading passengers outside the Metrorail station.

Part of the MWCOG study examined the Small Area Plan's recommendations regarding shuttle services at the station. The MWCOG study concluded that the Small Area Plan proposal to relocate the shuttle stop to John McCormack Road by Catholic University would cause congestion on the campus roadways due to limited access for the shuttles on the road as it is currently configured. Instead, the MWCOG study recommended that the shuttle stop remain at its current location on Bunker Hill Road. The existing stop should be improved by creating pedestrian waiting areas and an open bus bay with capacity for five shuttle buses at a time with a dedicated boarding location for each service provider. Additionally, the study outlined strategies for coordinating the shuttle provider activity, including consolidation of routes among the shuttle providers to reduce shuttle vehicle traffic at the station.

2.2.4 Brookland Multi-modal Transportation and Streetscape Study (2007)

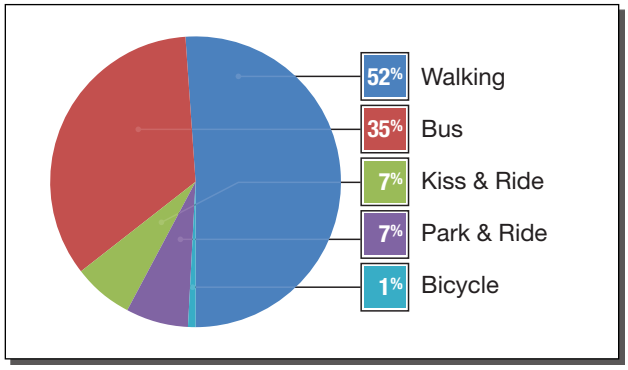
The Brookland Multi-modal Transportation and Streetscape Study was conducted by the District of Columbia Department of Transportation (DDOT) in 2007, examining transportation conditions in the Brookland neighborhood. The study focused on roadway and streetscape improvements that could benefit pedestrians, bicyclists, transit users, and motorists as well as generally enhance the neighborhood aesthetics and urban design. The study recommended improved pedestrian accommodations to the Brookland-CUA Metrorail station from 10th Street and Newton Street and streetscape improvements along Monroe Street near the station to enhance the pedestrian experience and serve as a gateway into the neighborhood.

2.3 Existing Metrorail Facilities and Operations

2.3.1 Ridership and Access Modes

The Brookland-CUA Metrorail station had 6,576 average weekday boardings in 2010-2011 (FY 2011 Metrorail Ridership Report). Among all stations in the Metrorail system, Brookland-CUA ranks in the middle range in terms of ridership. No facility capacity deficiencies, such as excessive queuing at fare gates, escalators or elevators were observed.

Figure 2-3 Access Modes of Brookland-CUA Metrorail passengers



Source: 2007 Metrorail On-board Passenger Survey

According to the 2007 Metrorail on-board passenger survey, about half of the passengers boarding Metrorail at Brookland-CUA arrived by walking and about a third arrived by bus. The remaining 15 percent of passengers were dropped off by a private vehicle ("Kiss & Ride"), drove and parked at or near the station ("Park & Ride"), or arrived by bicycles, taxi or other modes (see **Figure 2-3**).

The existing ridership at Brookland-CUA station is characterized by a broad distribution of riders entering and exiting the station throughout the day, reflecting the institutional uses in nearby areas of northeast DC that generate activity at various times of day. The off-peak period has a relatively strong share of daily ridership in contrast to other stations that mainly serve nine-to-five commuting markets, and station entries are relatively balanced between the AM and PM peak periods, indicating the area's mix of residential and non-residential land uses. The evening peak is larger than the morning peak, indicating that a slightly larger share of customers use the station as a destination station during the day, corresponding to the high number of employment and community facilities in the Brookland-CUA station area.

2.3.2 Metrorail Station Facilities

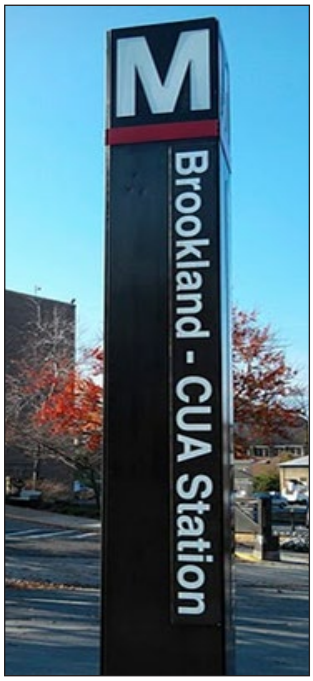
The Brookland-CUA Metrorail station platform is located in between the CSXT freight tracks, with an underground mezzanine providing access underneath the CSXT and Metrorail tracks to the station platform. Entrances on either side of the tracks provide access to the mezzanine and also serve as a pedestrian underpass for travel between the Brookland neighborhood and the CUA campus area.

East Entrance

The east entrance, by the station bus facility just south of Bunker Hill Road, is uncovered and has a single escalator, one stair, and an adjacent elevator

providing circulation between the surface level and the underground mezzanine. The stair and escalator provide adequate vertical circulation capacity for current passenger volumes; the escalator is only lightly congested during the evening peak hour.

West Entrance



West Entrance Station Signage

The west entrance, on John McCormack Road adjacent to CUA, is covered by a standard Metrorail escalator portal canopy and has a single escalator and one stair, but no elevator, providing vertical circulation between the surface level and the underground mezzanine. The stair and escalator provide adequate vertical circulation capacity for current passenger volumes; the escalator is only lightly congested during the evening peak hour.

Mezzanine

The underground mezzanine level contains the station manager kiosk, fare gates, fare vending machines, and information regarding station bus services and area wayfinding. The mezzanine has a single escalator bay with two escalators paired side by side and one elevator that provide vertical circulation between the mezzanine and the platform. The escalators provide adequate vertical circulation capacity for current passenger volumes; the down escalator is lightly congested for short periods immediately after train arrivals during the evening peak hour.

Platform

The station has a center platform configuration, which is covered by a canopy over most of the platform length. Typical amenities such as benches, Metrorail system maps, and emergency phones are provided.

2.4 Existing Bus Facilities and Operations

2.4.1 Metrobus

The station has nine bus bays located adjacent to the east station entrance in an off-street bus facility or "bus loop." Three of the bus bays are on the curbfront near the Metrorail station entrance and six are on an island median located across the bus-only roadway from the station entrance. The bus loop also has a layover lane that can accommodate up to three vehicles. The Metrobus 80, G8, H1, H2, H3, H4, H6, H8, H9, and R4 routes serve the station; and several of these routes terminate at the station. As a terminus for several bus routes, the station also serves as a location for driver reliefs both on routes that terminate at the station as well as for routes that operate through the station.

At the present time, only three layover spaces are required, as the current operating practice is to have buses take their layover/recovery time in the bus bays themselves. During the peak 15 minutes of service (i.e., 5:15 PM to 5:30 PM) at the Brookland-CUA Metrorail station, 18 buses serve the station's bus bays, including six that layover and one that enters revenue service at the Brookland-CUA Metrorail station during this time frame.

2.4.2 Private Shuttles

Nine separate shuttle services from area institutions pick up and unload passengers at the Brookland-CUA Metrorail station. Shuttle service at the station is substantial and accounts for a significant share of vehicular activity at the east entrance. The 2010 MWCOG study of private shuttles at the station observed approximately 22 shuttle trips per hour at the station during a typical weekday afternoon, compared with approximately 26 Metrobus trips per hour during the same time period. MWCOG's study of the private shuttles which serve Brookland-CUA station estimated that the services carry over 1.3 million passengers annually.

With the exception of the CUA campus shuttle which stops at the west entrance, all shuttle providers serve the east entrance via a shuttle stop on Bunker Hill Road, which is located on public right-of-way managed by DDOT outside of Metro property.

The east entrance shuttle stop lacks formal shuttle bays and shelters for passengers; however, sidewalk improvements at the shuttle pick-up/drop-off area in mid-2012 created paved waiting areas for passengers by the walkway to the east station entrance, including a waiting area under the span of the Michigan Avenue bridge, which can provide shelter in inclement weather. A paved walkway and accessible ramp provide access to the shuttle stop from the station east entrance; all other pedestrian access is via Bunker Hill Road which has recently installed sidewalks that connect the shuttle stop to 9th Street and 10th Street.

2.5 Pedestrian and Bicycle Conditions

2.5.1 Pedestrian Facilities and Access

The station site has several paved pedestrian walkways that extend out to the major streets and perimeter sidewalks, including Monroe Street, Newton Street, Bunker Hill Road, and John McCormack Road. However, the network of sidewalks and marked crossings does not cover several important pedestrian routes to the station, and there are numerous worn

Pedestrian Facilities-Adjacent to Kiss & Ride Looking East

pedestrian pathways across landscaped areas of the station site, particularly approaching the station from 10th Street. The east entrance layout is primarily oriented to bus traffic. Pedestrians entering the station from Newton Street and Bunker Hill Road must use crosswalks that pass through the bus loop facility.

2.5.2 Bicycle Facilities and Access

The station has bicycle racks and lockers, providing parking for approximately 75 bicycles. The Metrorail station is adjacent to two Capital Bikeshare stations, one near each entrance. An additional Capital Bikeshare station is located two blocks east of the station site on 12th Street.

Brookland Metro Station Shuttle Pick-Up/Drop-Off Area

The Metropolitan Branch Trail (MBT), an important north-south bicycle route in northeast DC, connects directly to the station's west entrance. The station is also connected to the District of Columbia's system of signed on-street bicycle routes, including a marked on-street bike lane along Monroe Street, which is an important east-west route for bicyclists.

2.6 Kiss & Ride, Taxi and Car Sharing

The Kiss & Ride facility (shown in **Figure 2-4**) is located at the east entrance and has several functions, including pick-up/drop-off of passengers, short-term metered parking, driver-attended parking, car share (Zipcar) vehicle parking, and Americans with Disabilities Act (ADA)-accessible parking. The facility has a passenger waiting area with a shelter, seven spaces for driver-attended waiting for up to 15 minutes, 23 short-term metered parking spaces, two reserved car-sharing spaces, and two ADA-accessible spaces.

The Kiss & Ride facility sometimes has insufficient capacity during the peak hours when the parking lot can be 90 percent occupied. As a result, Kiss & Ride drivers may wait in the pick-up/drop-off lane, potentially blocking other vehicles, or circulate through the site repeatedly until their passenger arrives. Many private vehicles also informally pick-up and drop-off passengers along Bunker Hill Road near the shuttle stop.

Taxi activity at the station is generally low. Taxis use the Kiss & Ride and Bunker Hill Road near the shuttle stop as passenger loading and unloading locations. The curb frontage along Bunker Hill Road between the shuttle stop and the station bus loop entrance was designated a dedicated taxi stand in mid-2012; however, private shuttles continue to use this location for loading an unloading when other shuttles are occupying the designated stop area.

As noted above, there are two dedicated Zipcar vehicles in the station Kiss & Ride facility, and Metro has made up to four parking spaces available to Zipcar if the company chooses to add vehicles at the station. In addition, there are three other Zipcar locations, each with two vehicles, within a quarter mile of the Brookland-CUA Metrorail station.

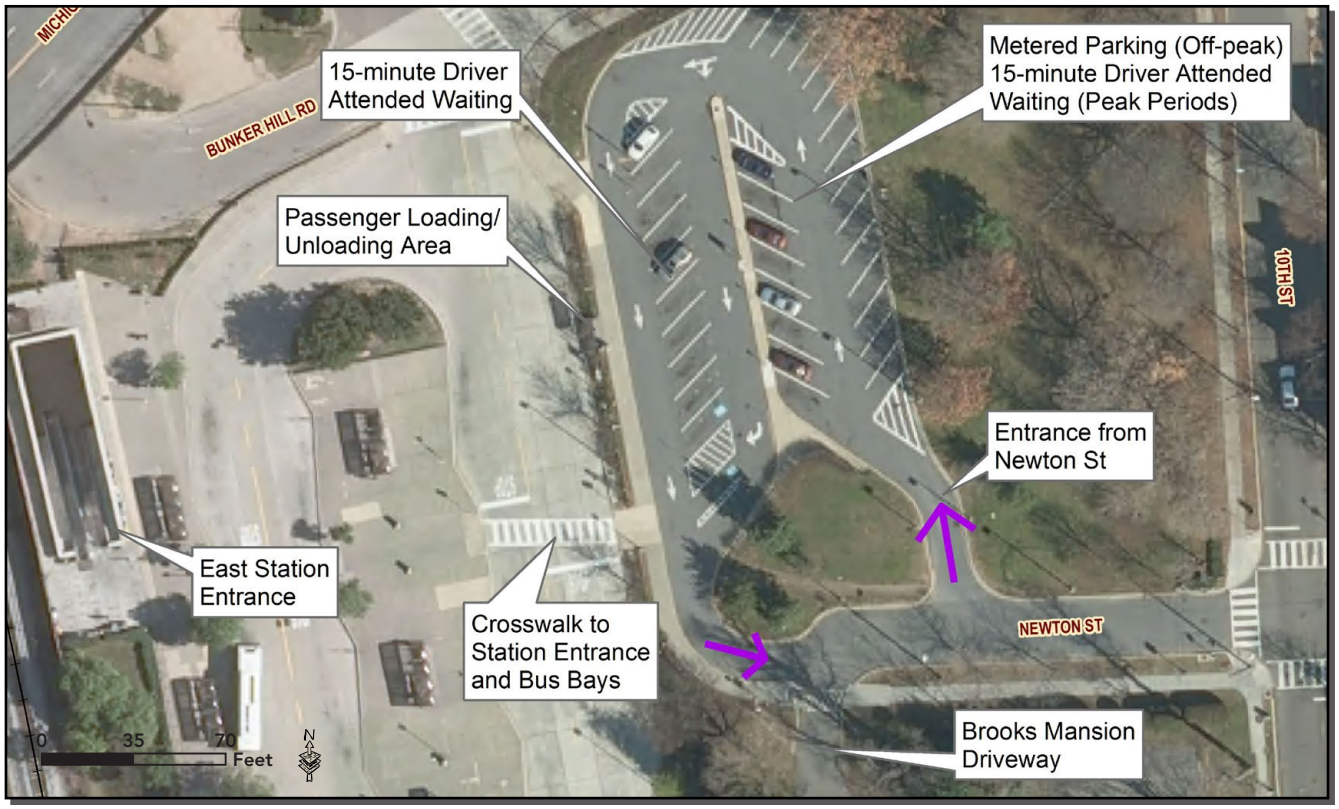
2.7 Vehicular Access to the Station

Michigan Avenue and Monroe Street are the primary arterials for vehicular access to Brookland-CUA station, providing access via 10th Street to the Newton Street Kiss & Ride and Bunker Hill Road informal pick-up/drop-off area. There are several intersections in the vicinity of the station that negatively impact vehicular station access.

There are significant operational and safety issues at the Michigan Avenue/10th Street intersection. The prohibition of westbound left turns from Michigan Avenue onto 10th Street results in vehicles using Bunker Hill Road to access 10th Street. High volumes and restricted operations at this intersection in the peak hours negatively impact station users arriving from the northeast.

In addition, site observations have shown that the Michigan Avenue/7th Street intersection and Monroe Street/8th Street intersection have operational issues, such as limited site distances and high traffic speeds along Michigan Avenue, that negatively impact performance and safety, both for vehicles and pedestrians. The intersection of Monroe Street and 7th Street has a poor level of service during the AM and PM (CUA South Campus Redevelopment Transportation Impact Study, July 2009), with delays that increase travel times along this corridor during peak periods and negatively impact station users arriving from the west.

Figure 2-4 Kiss & Ride Facility

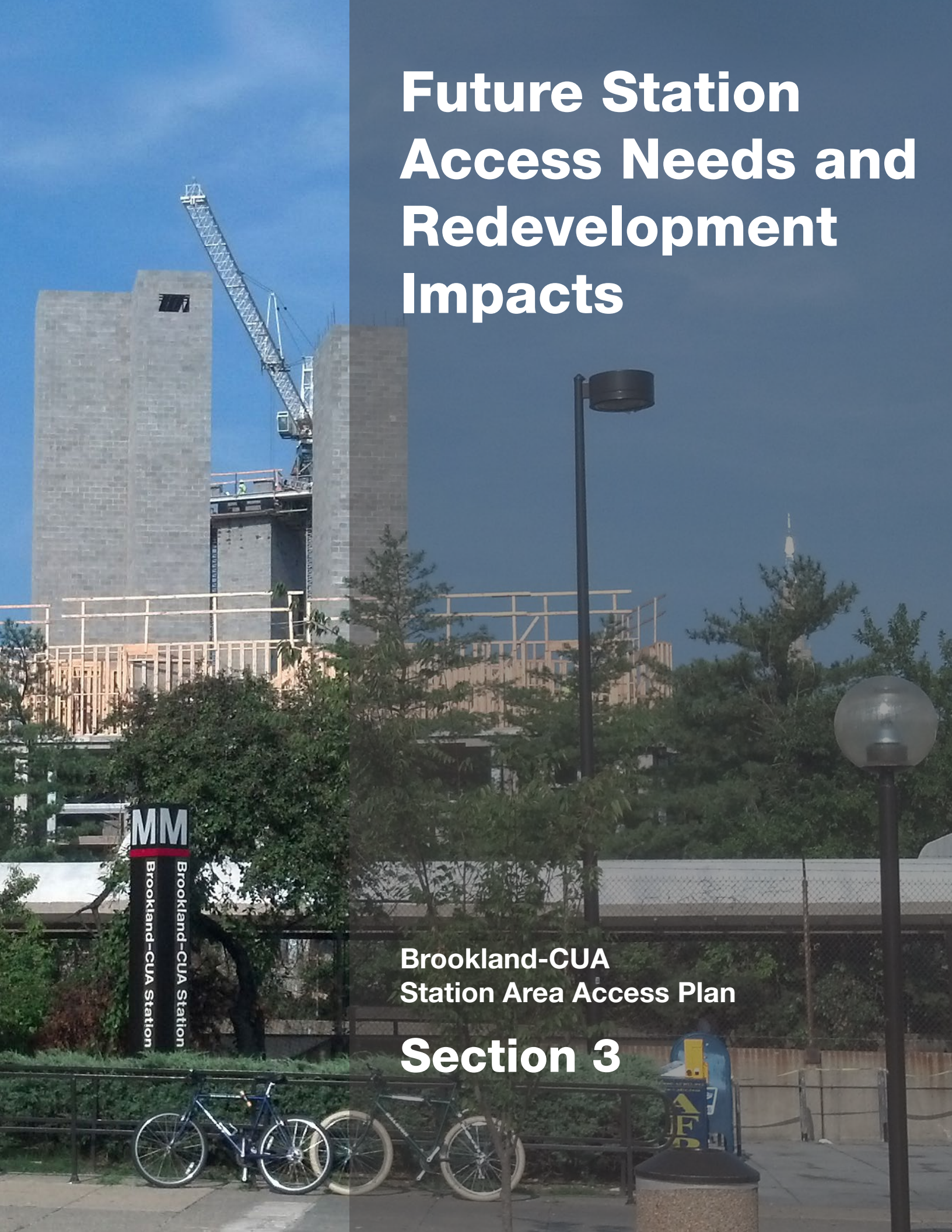


2.8 Off-Site Parking

The surrounding station area has a significant amount of on-street parking; however, use is restricted. The area streets are covered by District of Columbia Zone 5 residential permit parking that generally restricts two-hour parking for non-permit holders. Some businesses and landowners rent small numbers of off-street spaces for weekday parking; however, no large commercial parking lots serving the general public are located near the station. The area under the Michigan Avenue overpass near the shuttle stop is often used as an unofficial short-term parking area, primarily for drivers waiting to pick up station passengers.

Example of Station Area On-Street Parking

Future Station Access Needs and Redevelopment Impacts



Brookland-CUA
Station Area Access Plan

Section 3

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3.0 FUTURE STATION ACCESS NEEDS AND REDEVELOPMENT IMPACTS

This section describes projected future station access needs and their relationship to the redevelopment proposals in the *Brookland/CUA Metro Station Small Area Plan*. The future facility needs and operations are described by mode: Metrorail, bus (Metrobus and planned DC Circulator), streetcar, private shuttles, pedestrian, bicycle, Kiss & Ride, taxi, car sharing, and short-term parking. Additionally, general wayfinding needs and recommendations are also described in this section.

3.1 Projected Metrorail Demand and Facility Needs

Weekday station boardings are projected to grow 21 percent to 7,925 by the year 2030 (WMATA Regional Transit System Plan, August 2012; interpolated for 2030). Based on existing observations, the station has sufficient circulation capacity and is not likely to need additional fare gates or vertical circulation elements in the near term, with the exception of a new elevator at the west entrance. Also, because Brookland-CUA station experiences a larger share of off-peak ridership compared to many stations in the Metrorail system, station usage is more spread out over the course of the day, rather than being concentrated during the peak hours.

As additional station area redevelopment occurs and ridership grows, facility utilization should be monitored to assess the potential for capacity deficiencies, such as excessive queuing at fare gates, escalators or elevators. In particular, vertical circulation from station entrances to the mezzanine currently consists of a stair and escalator pair at each entrance. In the future, the potential need to replace the stair with an escalator should be monitored, especially if the lack of a down escalator were to contribute to excessive queues at elevators.

3.2 Projected Bus Operations and Facility Needs

An analysis was conducted of current bus operating schedules, potential ridership growth, and service expansion plans for lines serving the Brookland-CUA Metrorail station. Based on the service projections out to the year 2030, future operations and facility needs for bus bays and layover spaces were estimated. Facility needs for private shuttles were determined separately and are discussed in the following section.

3.2.1 Bus Bays

To estimate the number of additional bus bays needed, the number of additional buses that would serve the Brookland-CUA Metrorail station during the peak 15 minutes of service in the year 2030 was determined.

Planned Service Changes

DDOT has identified a future cross-town DC Circulator There are currently no planned changes to any of the Metrobus routes that serve the Brookland-CUA Metrorail station. However, the Metrobus 80 route has been designated by Metro as part of its bus Priority Corridor Network (PCN). Future service evaluation studies of PCN lines and implementation of their recommendations may result in modifications to the Metrobus 80 route, possibly including higher service frequencies and new limited-stop service on the line corridor proposed to begin service in the FY 2016-18 timeframe that would serve the station.

Projected Service Growth

To assess projected ridership growth between the current year and the planning horizon (i.e., the year 2030), the following assumptions were made:

- Average ridership growth rate of 2 percent per year on each Metrobus route[1];
- Future new "Metro Express" limited-stop bus route operating on the Metrobus Route 80 – North Capitol Street Line priority corridor; and
- Future new DC Circulator route originating at the Brookland-CUA Metrorail station and operating every ten minutes towards locations to the west.

On several Metrobus routes, there would already be sufficient capacity under existing service levels to handle the anticipated ridership growth by the year 2030. However, three Metrobus routes would require additional buses during the peak 15 minutes of service, and the two new routes would also add trips during the peak 15 minutes, as follows:

- Existing Northbound Metrobus Route 80 – 1 additional bus;
- Existing Eastbound Metrobus Route G8 – 1 additional bus;
- Existing Eastbound Metrobus Routes H2/H3/H4 – 2 additional buses;
- Future North Capitol Street Line Metro Express service – 4 buses (i.e., two in each direction); and
- Future DC Circulator – 2 buses (this represents a conservative estimate, as only one would require a bay in any given 15-minute period, assuming a ten-minute headway).

Therefore, ten additional bus trips were added to the 18 trips currently using the Brookland-CUA Metrorail station during the peak 15 minutes of service, resulting in an estimated 28 bus trips serving the station during the peak 15 minutes of service in the year 2030. **Appendix A** describes the methodology and lists the future service projections for each bus route.

Future Bus Bay Needs

Based on the service projections, nine bus bays are recommended to accommodate peak service levels in 2030. This estimate assumes that buses use separate layover areas[2] and provides an extra bus bay to allow for operational flexibility and possible schedule variations in the bus service. The recommended number of bays is the same as exist currently at the facility, but without layover activity occurring in the bays (as in the current operations), the bays would be able to accommodate additional trips during peak periods.

Approximately half of these nine bus bays should be sized to accommodate an articulated bus; this would allow for future use of larger buses on some key Metrobus corridors.[3] The nine bays should be located as closely to each other and the station entrance as possible to minimize walking distances for both Metrorail and Metrobus-to-Metrobus transfers.

3.2.2 Layover Areas

Based on the service projections, it is estimated that future layover areas at the Brookland-CUA Metrorail station would need to accommodate approximately seven buses. Currently, six buses layover during the peak 15 minutes of service (i.e., between 5:15 PM and 5:30 PM), and an additional layover space will likely be needed for the future DC Circulator route.[4] The seven proposed layover spaces will be able to accommodate future growth in Metrobus service, the future DC Circulator service, and any schedule variations in the bus service. To provide flexibility,

[1] WMATA bus planning estimate to account for existing and planned redevelopment in Northeast District of Columbia.

[2] The assumption is based on the Small Area Plan's proposed relocation of the bus bays to on-street stops adjacent to new retail and residential development, which would not be suitable locations for bus layover activities to occur in the bus bays.

[3] WMATA bus planning estimate.

[4] The analysis assumed that the trip entering revenue service at the Brookland-CUA Metrorail station during the peak 15-minute time frame (i.e., one Metrobus Route G8 trip) is timed so that it directly accesses its revenue service bay and spends no more than a four-minute dwell time there, thus not requiring a layover spot.

approximately four or five of the seven layover spaces should be able to accommodate articulated buses.

Layover areas would need convenient access to a restroom for use by bus drivers. Currently, the Metrorail station restrooms are in close proximity to bus bays and layover areas. However, if a remote layover area, significantly farther from the station, were to be considered, an employee restroom would need to be provided.

3.2.3 Potential Layover Circulation Requirements and Impacts

If a nearby layover facility is used, buses would need to serve the on-street revenue service bays, travel to the separate layover area, and return as expeditiously as possible to the revenue service bays. This travel time would need to be added to the cycle time and operating costs of each trip terminating at the Brookland-CUA Metrorail station. If the round trip travel time to potential nearby layover areas (several blocks away by driving distance from the bus bays) is assumed to take approximately five minutes, the preliminary estimated impact to the annual operating cost of the existing Metrobus routes would be approximately $735,500.[5]

Recirculation requirements for separate layover areas, located away from the station bus stops, would also have significant impacts on the urban environment. A significant number of additional one-way bus trips would take place throughout the day along neighborhood streets between the station area and an off-site layover facility. When considering solely the existing bus services, it is estimated that approximately 586 one-way weekday trips, 270 one-way Saturday trips and 216 one-way Sunday trips would need to travel to and from the layover area.[6]

3.2.4 Bus Stop Considerations

The Small Area Plan proposes new bus stops along 9th Street as a replacement for the existing off-street bus loop and bays. It is recommended that any new bus bay locations have access to the Metrorail station entrance that is as convenient as possible, thus allowing for walking distances for transferring passengers to be minimized. The WMATA *Station Site and Access Planning Manual (2008)* guidelines specify 500 feet as the maximum distance from the furthest bus bay to the station entrance. Depending on the arrangement of bus bays along 9th Street, the east entrance elevator may not be within 500 feet of all bus bays. Locations of bus bays may need to be adjusted to comply with this guideline. In addition, walkways along bus stops must be no steeper than 1:20;[7] 9th Street, immediately north of Monroe Street, rises to meet Monroe Street, and this grade would need to be assessed in locating any new on-street bus stops in this location. In addition, as Brookland-CUA is an important station for bus-to-bus transfers, the nine bays should be located in close proximity to each other to minimize walking distances for bus-to-bus transfer distances.

The proposed 9th Street bus bays create a concern regarding the impact of a perceived “wall of buses” along 9th Street and the consequent frequent bus operations on the streetscape environment of the new mixed-use blocks, especially the proposed public plaza and prime retail area at the 9th Street and Newton Street intersection. Shifting the bus bays away from the plaza and retail area would need to be balanced with station accessibility and passenger convenience.

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[5] This figure was estimated by taking the existing Metrobus operating schedules and adding five minutes to every trip that required layover at the Brookland-CUA Metrorail station. The total number of hours added per year (derived from the number of trips in the weekday, Saturday and Sunday/holiday schedules) was then multiplied by approximately $100.00 for each service hour, as this figure has been utilized previously when developing planning scenarios for Metrobus services. This resulted in the additional $735,500 operating cost per year.

[6] These bus trips were determined by taking the existing Metrobus operating schedules and determining how many bus trips on each route during a typical service day would need access to and from the layover facility.

[7] Americans with Disabilities Act Accessibility Guidelines.

Figure 3-1 On-Street Bus Bay and Layover Area Potential Locations (SAP Proposed Street Grid)

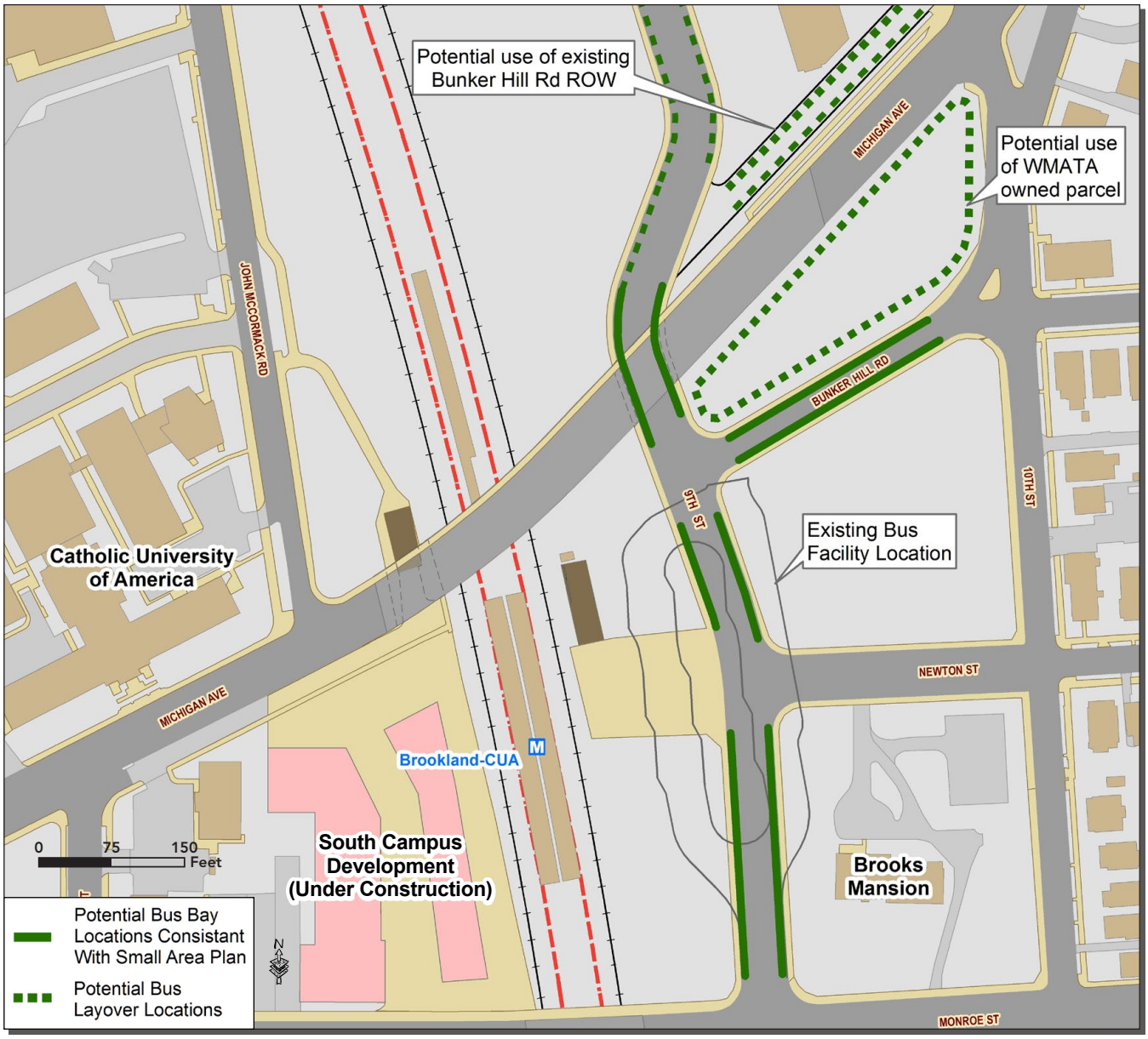
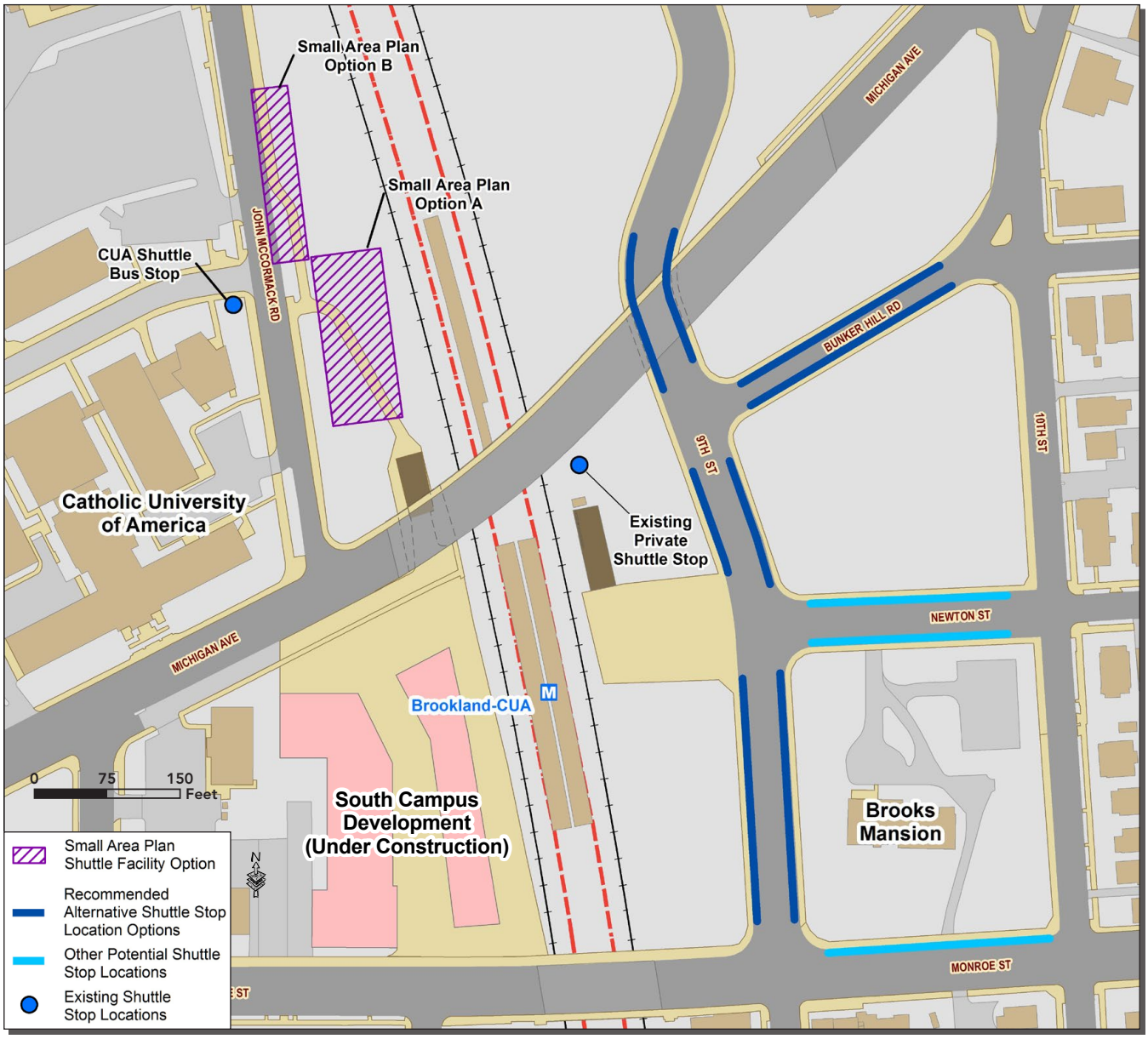


Figure 3-1 shows potential on-street bus bay and layover locations based on the considerations discussed above.

3.3 Streetcar

The *DC Streetcar System Plan* (DDOT 2009) proposes a cross-town streetcar corridor from the Woodley Park Metrorail station to Catholic University and the Brookland-CUA Metrorail station. The planned corridor passes through Adams Morgan, Columbia Heights, the northern edge of Howard University, the Washington Hospital Center, the Soldiers' and Airmen's Home redevelopment area, and the Catholic University/Trinity College area along Michigan Avenue. The line is not planned until the final phase of the system plan, by the year 2030, and no detailed alignment or exact terminus location has been identified for the streetcar line.

Figure 3-2 Private Shuttle Stop Potential Locations (SAP Proposed Street Grid)



3.4 Private Shuttles

To address existing needs and planned future reconfiguration of the street grid at the current shuttle stop location, this study assessed the Small Area Plan's proposed location for the shuttle stop and other alternative locations.

3.4.1 Future Capacity Needs

The *MWCOG Independent Shuttle Bus Consolidation Strategy* recommends space for up to five shuttles at a time. Shuttle buses can be up to 35 feet in length and require up to 50 feet for parking. Providing 250 feet of curb space for shuttle stops and layovers would accommodate passenger loading and unloading and layover functions by multiple shuttles and allow for future service growth based on the MWCOG study.

3.4.2 Small Area Plan Proposed Off-Street Facility on John McCormack Road

The Small Area Plan proposed a new shuttle stop at the station west entrance on John McCormack Road that would accommodate all of the shuttle services at the station. The two alternative locations (shown as Options A and B on **Figure 3-2**) appear sufficiently large to accommodate up to five shuttle buses at any given time in an open bus bay configuration. However, overall the proposed John McCormack Road location has the following constraints:

- Poor vehicular access to/from Michigan Avenue, including limited site distance and high traffic volumes at the intersection with John McCormack Road, and the current one-way configuration of the road that would require vehicles to circulate through the CUA campus;
- Impacts to the existing pedestrian and bicycle access to the station west entrance, impacts to the MBT, potential grade issues, and property impacts that would require further analysis; and
- Lack of existing elevator access at the west entrance to accommodate ADA needs, as many of the shuttles serve medical facilities.

Implementation of a shuttle stop facility on John McCormack Road would require close coordination with both CUA and DDOT and the following mitigation measures:

- Conversion of John McCormack Road and Michigan Avenue into a three-way signalized intersection;
- Reconstructing and widening of the southern portion of John McCormack Road to provide southbound left and right turns onto Michigan Avenue;
- Provision of a traffic circle or other type of vehicular turn-around on John McCormack Road north of the off-street shuttle facility if there is not sufficient space in the off-street facility for a shuttle turn-around; and
- Provision of an elevator at the station west entrance.

3.4.3 Alternative Shuttle Stop Locations

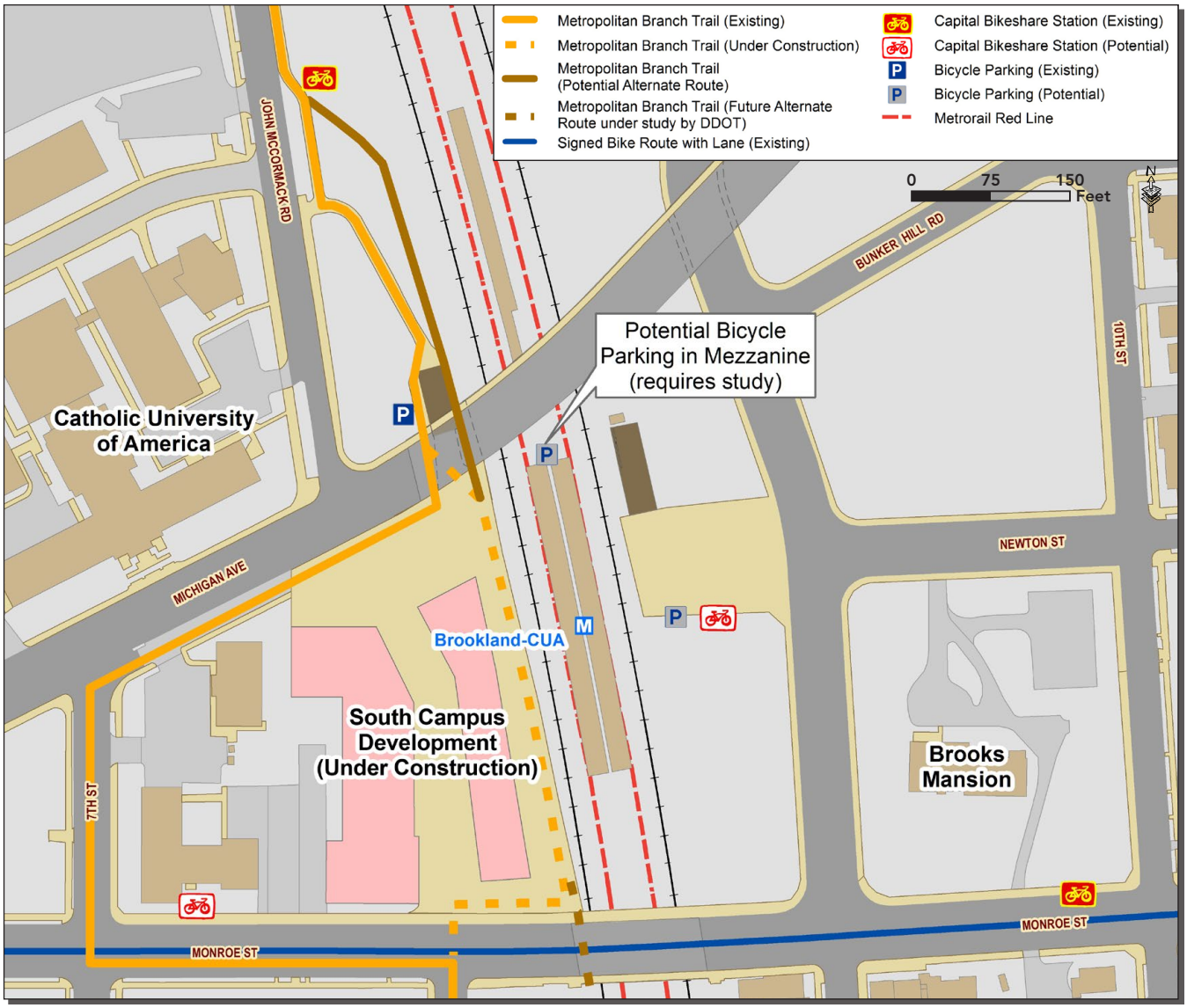
Due to the significant roadway improvements needed and potential adverse impacts of the proposed shuttle stop location on John McCormack Road, the current study evaluated a new on-street stop near the east station entrance. **Figure 3-2** shows the locations of potential shuttle stop locations, which are described below.

Two potential shuttle stop locations at the east entrance were identified:

- **9th Street** – 250 linear feet of curbside parking could be provided for shuttle operations on 9th Street, preferably on the west side to provide direct access for shuttle passengers to the station. However, the east side of 9th Street is also a suitable location. A shuttle loading and unloading area along the east side of 9th Street by the Brooks Mansion property would lessen potential adverse impacts of idling vehicles to storefront retail uses and the outdoor plaza along the west side of the street. Grades and distances to the station entrance and elevator would be able to meet Metro and ADAAG accessibility guidelines, except those near Monroe Street along 9th Street, which are on a moderate grade and are 500 feet or more walking distance from the elevator.
- **Bunker Hill Road** – As an alternative to 9th Street, Bunker Hill Road south of Michigan Avenue, between 9th Street and 10th Street, could also provide 250 linear feet of curbside space for shuttle operations. The location would still be in relatively close proximity to the station entrance but would not occupy street frontage at the prime mixed-use development focal area along 9th Street. A location on the south side of Bunker Hill Road would enable passengers to access the Metrorail station entrance with only one street crossing. Grades and distances to the station entrance and elevator would be able to meet Metro and ADAAG accessibility guidelines.

Other locations considered but that may not be feasible include the following:

Figure 3-3 Planned and Proposed Bicycle Improvements (SAP Proposed Street Grid)



- **Newton Street** – If this roadway were closed on weekends for community activities, as proposed in the Small Area Plan, an alternative location would need to be provided for weekend shuttle operations; and
- **Monroe Street** – The location is over 500 feet from the Metrorail entrance, farther than Metro guidelines for station bus stops. The location would need to be on the north side of the street in front of the Brooks Mansion to avoid shuttle passengers having to cross Monroe Street to reach the station. It may also conflict with the school bus loading/unloading area for the current charter school in the Brooks House and may conflict with the existing Capital Bikeshare station.

These potential shuttle stop locations would require coordination with Metrobus, Kiss & Ride, and other station access modes that would also be utilizing these roadways as well as coordination with vehicular access to the new joint development.

3.4.4 Shuttle Coordination and Consolidation

It is also recommended that a shuttle coordination and consolidation strategy be pursued, as proposed in the *MWCOG Independent Shuttle Bus*

Consolidation Strategy Plan. Consolidation of multiple shuttle providers and services could reduce shuttle activity at the station, mitigating facility needs and traffic impacts, while potentially improving service levels. However, previous consolidation efforts by several institutional shuttle providers have had limited success, primarily due to overcrowded buses on consolidated routes.

3.5 Pedestrian and Bicycle Access

Implementation of joint development on the station site and construction of planned development projects and associated streetscape improvements in the station vicinity will address many of the gaps in the pedestrian network identified in Section 2 and generally improve pedestrian and bicycle access to the station as well. As continued redevelopment occurs in the station vicinity, conditions for pedestrians and bicyclists accessing the station should be reviewed. **Figure 3-3** shows existing and potential future bicycle accommodations and facilities.

3.5.1 West Entrance Access

Abdo/CUA South Campus Development

The Abdo/CUA South Campus Development is expected to improve pedestrian and bicycle access to the west station entrance from the area south of Michigan Avenue by creating the following:

- Station entrance plaza on the south side of the Michigan Avenue bridge;
- "Pedestrian street" connecting the intersection of 8th Street and Monroe Street to the station entrance plaza;
- Extension of the MBT along the CSXT tracks to Monroe Street; and
- Wide pedestrian path along the south side of the Michigan Avenue bridge from the station entrance plaza to 7th Street.

Metropolitan Branch Trail

The MBT by the west station entrance may be insufficient to handle increased volumes of station users and trail through-traffic at the station west entrance. There are observed conflicts between station and trail users and worn grass on each side of the existing path.

Potential solutions to increase the capacity of pedestrian and bicycle accommodations and reduce conflicts among station users, trail users, and patrons of the South Campus Development could include a realigned MBT segment from the area north of the Michigan Avenue bridge and through the bridge underpass. A new trail segment could diverge from the existing path along John McCormack Road near the location of the existing Capital Bikeshare station, run across Metro property between the existing station access path and the CSXT/Metro tracks, and continue under the Michigan Avenue bridge along the east side of the station escalator portal (see **Figure 3-3**).

3.5.2 East Entrance Access

Pedestrian Access

The extensions of 9th Street and Newton Street into the station site and the reconfiguration of Bunker Hill Road as a neighborhood street with sidewalks on both sides would improve pedestrian access to the station east entrance. The new streets and sidewalks would provide pedestrian accommodations along existing desire lines to/from the neighborhoods east of the station and make pedestrian access to the station more pleasant by providing street trees and other amenities.

Bicycle Access

To facilitate bicycle access to the station east entrance, new bicycle accommodations through the station area should be coordinated with planning for a new bus facility and joint development.

3.5.3
Bicycle Parking and Bikesharing

Future Bicycle Parking Needs

The Bicycle and Pedestrian facilities element of Metro's current Capital Improvement Plan estimated bicycle parking facility needs through 2030, with a goal of increasing bicycle parking capacity at the station to a total of 75 spaces. According to the recommendations of the *Metrorail Bicycle & Pedestrian Access Study* (October 2010), this additional bicycle parking would be better located closer to station entrances than existing parking and could consist of covered inverted-U racks, on-demand rental lockers, annual rental lockers, and/or additional inverted-U racks located in a secure room or cage. Additional bicycle parking was added at the station in mid-2012 at both entrances.

The addition of secure and highly visible bicycle parking at each entrance should be considered in the following potential configurations:

- Moveable sleds of inverted-U racks placed directly outside the fare gates within the station tunnel (pending further study); and
- Secure covered bicycle parking incorporated as an integral part of the redesigned east side station entrance plaza.

Capital Bikeshare Stations

Site accommodations for two additional Capital Bikeshare stations should be considered in the vicinity of the Brookland-CUA Metrorail Station:

- Adjacent to the east station entrance (possibly replacing nearby existing bikeshare station at intersection of Monroe Street 10th Street); and
- Monroe Street between 7th Street and 8th Street by South Campus Development.

Capital Bikeshare Station Adjacent to West Station Entrance and Metropolitan Branch Trail

3.6
Kiss & Ride

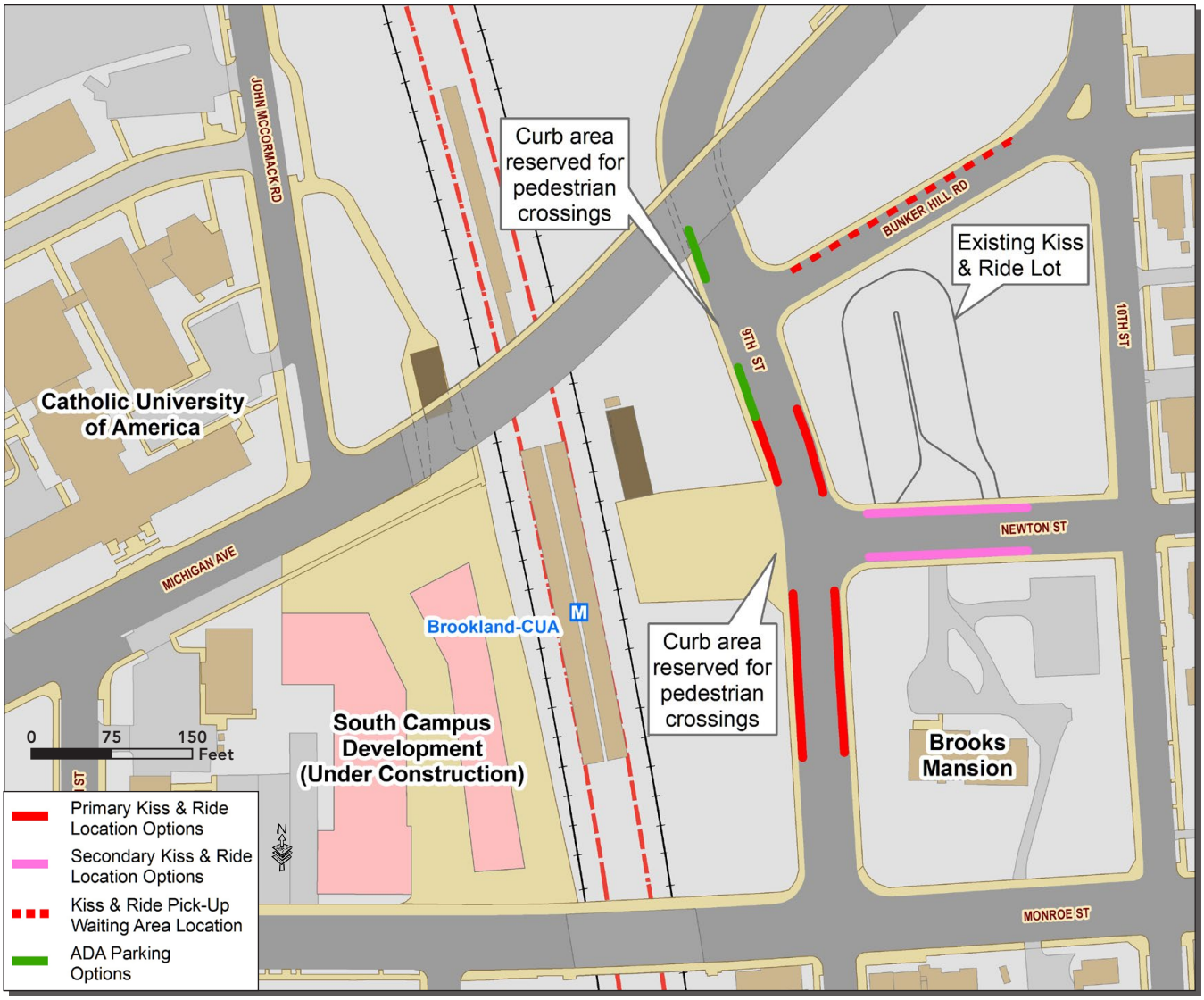
3.6.1
Small Area Plan Recommendations

The Small Area Plan proposes moving Kiss & Ride operations to curbside locations along the new extensions of 9th Street and Newton Street near the east station entrance. 9th Street, between

Existing Kiss & Ride Curbside Pick-Up/Drop-Off Area

Monroe Street and Michigan Avenue, could provide approximately 1,200 linear feet of frontage for vehicle parking or waiting. Newton Street, from 10th Street to 9th Street, could provide up to 500 linear feet of frontage for vehicle parking or waiting. Based on WMATA Station Site and Access Planning guidelines, the farthest passenger pick-up/drop-off or parking space must be within 600 feet of the station entrance This new street frontage, however, will potentially be shared with Metrobus operations, private shuttles, taxis, and residential and retail users of the new station site development. The available frontage that could be utilized for parking or waiting may also be less than these estimates as a result of further pedestrian and streetscape treatments outlined in the Small Area Plan and the *Brookland Multi-modal Transportation and Streetscape Study* (DDOT 2007).

Figure 3-4 Potential Kiss & Ride and ADA-Accessible Parking Locations (SAP Proposed Street Grid)



3.6.2 Potential On-Street Locations

Formal Kiss & Ride lots in proximity of a station entrance provide space for many functions. If not provided, station users create informal spaces for these functions, which include passenger drop-off/pick-up, shuttle service/staging, temporary parking, taxi service, and the like.

To provide adequate space for Kiss & Ride pick-up/drop-off activities, 100 linear feet of frontage (adequate length for five parallel parking spaces) should be designated for exclusive Kiss & Ride pick-up/drop-off use. Depending on the availability of curbside space, an additional 100 linear feet could be reserved for future expansion. This arrangement would reserve a similar number of spaces for driver-attended pick-up/drop-off as the current Kiss & Ride facility. Depending on the locations of future bus and shuttle stops, Kiss & Ride areas

Example of Pick-Up/Drop-Off Signage

could be located along both the west and east sides of 9th Street to provide options for drivers arriving from either direction. Newton Street between 10th Street and 9th Street could also be utilized for a portion of the weekday Kiss & Ride activity, but it would be closed to vehicles during weekend special events and activities as proposed in the Small Area Plan.

The curbside Kiss & Ride frontage should be designated and signed as a passenger loading/unloading zone at all times. This area would operate similar to a school or airport curbside loading/unloading zone. If passenger loading zones/Kiss & Ride spaces are provided, at least one space must be an accessible loading zone that is 60 inches wide and 20 feet long adjacent and parallel to the vehicle pull up space.

Depending on the availability of curbside space and demand for on-street parking in the area, an additional 100 linear feet (adequate length for five parallel parking spaces) of curbside parking could be designated for exclusive Kiss & Ride pick-up waiting during the PM peak period. This area could be located along Bunker Hill Road between 9th Street and 10th Street. This parking would be limited to 15 minutes during the PM peak period with a driver-attended vehicle, operating similar to an airport cell phone lot for Kiss & Ride vehicles that need to wait for longer periods for their passengers. **Figure 3-4** shows the potential locations for Kiss & Ride and ADA-accessible Parking. Pedestrian routes from the Kiss & Ride and ADA-accessible parking areas to the station entrance and bus stops would be accessible routes with curb ramps and no significant grade changes.

3.7 Taxi Service

Although, taxi activity at the station currently appears to be very low based on field observations, two to three dedicated spaces should be provided for taxis as demand increases with future development. A portion of the on-street parking space along 9th Street, Newton Street, or Bunker Hill Road could be reserved for taxi parking.

3.8 Car Sharing

The Small Area Plan proposes “developing a strategy for shared parking and implementation of car sharing programs in all new developments” but does not designate an area for car sharing spaces. To provide adequate space for Zipcar use (and potential increase in demand), two dedicated Zipcar spaces (approximately 30 linear feet) should be provided on Bunker Hill Road between 10th Street and 9th Street. The option to convert two additional adjacent metered parking spots should be reserved to provide a total of four spots as demand warrants. As there are already Zipcar locations on the CUA campus and on Monroe Street east of 9th Street, placing the station’s car sharing services on Bunker Hill Road would provide a central location for the Metro station sub-area and the proposed commercial sub-area development to the north.

3.9 Short-Term Parking

The Small Area Plan does not provide a designated off-street parking lot for station use, nor does it explicitly designate the amount of roadway frontage or the amount of spaces that will be provided for short-term parking. Rather, the Small Area Plan describes short-term parking as being “integrated with the street grid” and as “adequate but at low transit-oriented development parking ratios”. It envisions that any joint development project would replace the existing parking spaces either as part of the development, part of a shared parking arrangement in the station area, or a combination of these two options. **Figure 3-4** shows potential locations for replacement of ADA-accessible parking spaces near the station east entrance. The existing Kiss & Ride facility provides 23 metered short-term parking spaces and two ADA-accessible spaces. Potential mitigation measures to meet Metro’s

one-for-one parking replacement requirement include the following options:

- **On-street parking** – Two ADA-accessible and 23 metered on-street spaces; or
- **Shared garage parking** – 23 short-term parking spaces in a garage under redeveloped properties adjacent to the station. ADA-accessible spaces could be provided on-street near the station or in the shared garage depending on the proximity of station access.

Existing Wayfinding Sign Examples

3.10 Wayfinding

A unified pedestrian wayfinding system should be considered to identify the locations of the following:

- Metrobus and other surface transit stop locations;
- Private shuttle bus loading areas;
- Kiss & Ride, taxi, and car sharing facilities; and
- Destinations such as CUA, the National Basilica, MBT, and the 12th Street commercial area.

Beyond the station site, the standard blue District of Columbia destination wayfinding sign system should be considered. Existing wayfinding signage in the station area that needs to be maintained and enhanced includes the DC bicycle route and MBT signage systems. The standard green roadway signs featuring the Metro logo in tandem with the station name are recommended to guide motorists to the station from the surrounding roadway network.

Station Access Alternatives

Brookland-CUA Station Area Access Plan

Section 4

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4.0
STATION ACCESS ALTERNATIVES

This section presents alternatives for providing bus, shuttle, and Kiss & Ride services at the Brookland-CUA Metrorail Station using the proposed street grid of the Small Area Plan. An on-street bus alternative and three off-street bus alternatives illustrate different access options. Concept drawings depict the future street grid and show general locations proposed for access modes, including potential off-street bus facilities. The illustrations of curb lengths reserved for different access modes are approximate. The Kiss & Ride, taxi stand, and on-street parking locations/dimensions are indicative. As preferred bus and shuttle alternatives are further developed as part of a future metro joint development plan, these access mode accommodations would be refined to address anticipated passenger unloading/loading patterns and volumes on the new street grid.

4.1
Development of Alternatives

4.1.1
Modifications to Small Area Plan Street Grid

The future street network used to develop the alternatives incorporated several modifications from the Small Area Plan concept drawings to address the following roadway issues:

- **Vertical clearance of 9th Street underpass of Michigan Avenue bridge** – The location of the 9th Street underpass is retained in its current location rather than being shifted east to the adjacent span as shown in the Small Area Plan. The adjacent span has a lower vertical clearance that is less than 13 feet in places.
- **Alignment of Bunker Hill Road south of Michigan Avenue** – The current alignment of Bunker Hill Road between 9th Street and 10th Street is maintained as a result of keeping the current 9th Street underpass location under Michigan Avenue. Without relocating 9th Street to the east, the Small Area Plan's proposed extension of Otis Street west to intersect with 9th Street is unfeasible.
- **Street cross sections for travel lanes and bus stop lanes** – Wider cross sections (approximately 48 feet curb-to-curb) than those depicted in the Small Area Plan were used to accommodate two travel lanes and curbside bus stop lanes/on-street parking along both sides of 9th Street, Newton Street, and the segment of Bunker Hill Road south of Michigan Avenue.
- **South Campus Development site plan** – The development does not extend 8th Street north of Monroe Street to connect to Michigan Avenue as proposed in the Small Area Plan.

The street grid layout and basic roadway cross sections depicted in the alternatives were developed for the purposes of evaluating station access alternatives and are not intended as detailed road geometry and cross section recommendations.

4.1.2
Bus and Shuttle Facility and Operations Requirements

The alternatives have been designed to meet the following Metro guidelines:

- *Station Site and Access Planning Manual* (May 2008) – used for Metrorail station facilities and off-street bus facilities; and
- *Guidelines for the Design and Placement of Transit Stops* (December 2009) – used for determining space requirements for proposed bus stops on public streets.

Specific requirements used in all alternatives include the following:

- **Bus bays within 500 feet of station entrance** – The alternatives seek to place bus stops as close as possible to the station east entrance. However, due to the replacement of the bus loop with a linear street grid and new development blocks, the locations of many stops are further from the entrance than the existing bus loop. All alternatives strive to keep the furthest stops within the maximum distance.
- **Bus bays within 500 feet of other bus bays** – The station has a significant number of bus-to-bus transfers, so the alternatives intend to keep stops as close to each other as feasible given the linear street grid.
- **Shuttle services accommodated within a single area** – It is recommended that the shuttle stops are in a single location to make wayfinding easy for users. This arrangement would also allow for potential future consolidation of some of the shuttle services. A single curbside bay of 250 feet is provided in each alternative to allow space for up to five shuttles at a time, accommodating layovers and passenger loading/unloading without blocking travel lanes.
- **Replacement of ADA-accessible parking near the station east entrance** – Reserved accessible parking spaces are located on the street as close to the elevator as feasible. Approximately 50 feet of curbside space is reserved for two spaces.
- **No bus or shuttle stops or circulation on Newton Street** to allow for weekend street closures for community events – Some options locate portions of the weekday peak period Kiss & Ride spaces on Newton Street. Otherwise, the only access mode using the street is metered parking and local private vehicle circulation.
- **On-street bus stops and off-street bus bays and layover areas are designed to meet Metro's guidelines for minimum dimensions** – Stops, bays and layover areas are sized for both standard and articulated buses according to Metro guidelines (referenced above). Note that the on-street bus stop locations labeled on the concept drawings indicate approximate locations along the street block.
- **No bus or shuttle circulation on 10th Street between Monroe Street and Bunker Hill Road** – The alternatives are designed so that bus and shuttle routes would not need to use this existing residential segment of 10th Street. Most circulation would use 9th Street and Bunker Hill Road to access the bus bays at Brookland-CUA station.

4.1.3 On-Street Bus Stops Alternative

The On-Street Alternative replaces all bus stops on-street by the station east entrance, as recommended in the Small Area Plan. The on-street alternative provides the following features:

- Approximately 800 feet of curb space is provided for nine bus bays (five articulated bus bays and four standard bus bays) based on Metro guidelines for on-street bus stops;
- Approximately 250 feet of linear curb space is provided for shuttle stops and layover (space for up to five 35-foot shuttle vehicles at a time);
- On-street metered parking is provided along curb frontage not utilized by buses and shuttles. On-street parking spaces are relatively limited in the immediate station vicinity to accommodate Kiss & Ride functions; and
- A potential bus layover location is provided along the existing segment of Bunker Hill Road north of the Michigan Avenue bridge, between 9th Street and 10th Street. This roadway would be retained as a bus-only driveway, operating with one-way bus traffic for use in circulation and layover areas.

Two options for locating bus stops on-street were developed to illustrate advantages and disadvantages of different stop configurations along 9th Street and Bunker Hill Road to address the requirements described below. These options are described in detail in Sections 4.2 and 4.3.

Bus Circulation Requirements

The biggest challenge to locating bus stops on the proposed new street grid at Brookland-CUA Metrorail station is accommodating bus circulation needs without a turn-around loop. Most routes currently enter and leave the station area from the same street and require a way to turn around in the station area. The following routes require a turn-around path:

- Metrobus Routes 80, G8, H1, H2, H3, and H4 – enter and leave the station from 9th Street and Monroe Street; and
- Metrobus Routes H6 and R4 – enter and leave the station from Michigan Avenue and Bunker Hill Road.

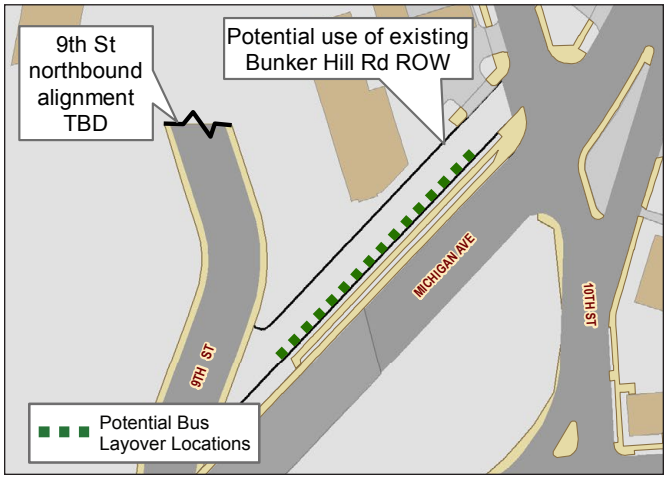
Only Metrobus Routes H8 and H9 enter and leave the station at different access points (9th Street on the south side and Bunker Hill Road/10th Street on the north side) and do not require a turn-around path.

In addition, routes that take layover at the station require a way to access the layover area and return to the bus bays. Metrobus routes H1, H2, H3, H4, H6, and R4, and the proposed new cross-town DC Circulator route terminate and take layover at Brookland-CUA Metrorail station.

Proposed North Bunker Hill Road Bus Circulation and Layover Area

To accommodate turn-around and layover circulation without using existing residential streets, the on-street alternative proposes using the existing segment of Bunker Hill Road north of the Michigan Avenue bridge as a one-way bus driveway and layover area. After unloading passengers at the station on 9th Street, bus routes could continue north along 9th Street, turn into the bus-only driveway, turn right onto 10th Street to cross Michigan Avenue, and return to the station area via the existing segment of Bunker Hill Road on the south side of Michigan Avenue. A special signal phase at the intersection of 10th Street and Michigan Avenue would be required to allow buses to turn right out of bus circulation driveway onto 10th Street southbound and cross Michigan Avenue.

A detailed traffic study would be needed to assess potential impacts to intersection levels of service and pedestrian crossings by the new signal phase, adjustments to stop bar locations, and other potential modifications to the intersection. Further study of the additional time required to access remote layover areas and return to the bus bays would also be needed to assess additional operating costs and potential impacts to bus headways that may require additional vehicles in service.



Proposed North Bunker Hill Road Bus Circulation and Layover Area

View of Existing Roadway

The Small Area Plan concept drawings propose removing the segment of Bunker Hill Road north of Michigan Avenue to create additional redevelopment area north of Michigan Avenue. However, without this roadway, most bus routes would be forced to use the residential segment of 10th Street south of Bunker Hill Road and the new segment of Newton Street to turn around and return to the station or continue to Monroe Street. Alternatively, bus routes such as the Metrobus 80 would have to be restructured to enter and exit the station area from different directions, and terminal bus routes would have to take layovers in their on-street bus bays, which would adversely impact adjacent proposed transit-oriented development.

Potential Bus Re-routing

Options for potential re-routing of two Metrobus routes, 80 and G8, were also explored, due to the increase in travel times on these routes from looping through north through the Michigan Avenue/10th Street intersection to return to Monroe Street. Description and graphics of these options are included in **Appendix B**.

4.1.4 Off-Street Bus Facility Alternatives

Three alternatives use off-street bus bay and layover facilities as potential ways to avoid negative impacts on the plaza and retail area and to provide more efficient bus circulation. Off-street bus facilities would also free up space along 9th Street for other station access modes and on-street parking for retail uses.

The Brookland/CUA Metro Station Small Area Plan did not recommend an off-street facility; however, due to the challenges of accommodating bus and other station access modes along 9th Street, while still fostering a pleasant and pedestrian-friendly urban environment, off-street bus alternatives were explored as an alternative way to accomplish the Small Area Plan goals. By shifting some of the bus operations away from curbside locations at the focal point of the new mixed-use development, an off-street bus facility could be consistent with Small Area Plan goals to enhance the streetscape environment and provide on-street metered parking for new development.

4.1.5 Description and Assessment of Station Access Alternatives

The sections below present the On-Street and Off-Street Alternatives for vehicular station access. Each section addresses the following:

- Facilities, including locations of bus bays and layover areas, shuttle stop, Kiss & Ride areas, and on-street parking;
- Bus circulation, including route inbound to station, circulation to/from layover area, and outbound circulation route; and
- Assessment of performance, including advantages or disadvantages of the alternative with respect to:
  - Bus operations,
  - Shuttle operations,
  - Pedestrian & bicycle conditions,
  - Kiss & Ride functions,
  - On-street parking availability for new mixed-development,
  - Traffic operations,
  - Compatibility with the east entrance pedestrian plaza and new development,
  - Potential effects on proposed development parcels and volumes,
  - Estimated capital costs,
  - Property requirements.

4.2 On-Street Bus Stops Alternative - Option A

4.2.1 Facilities

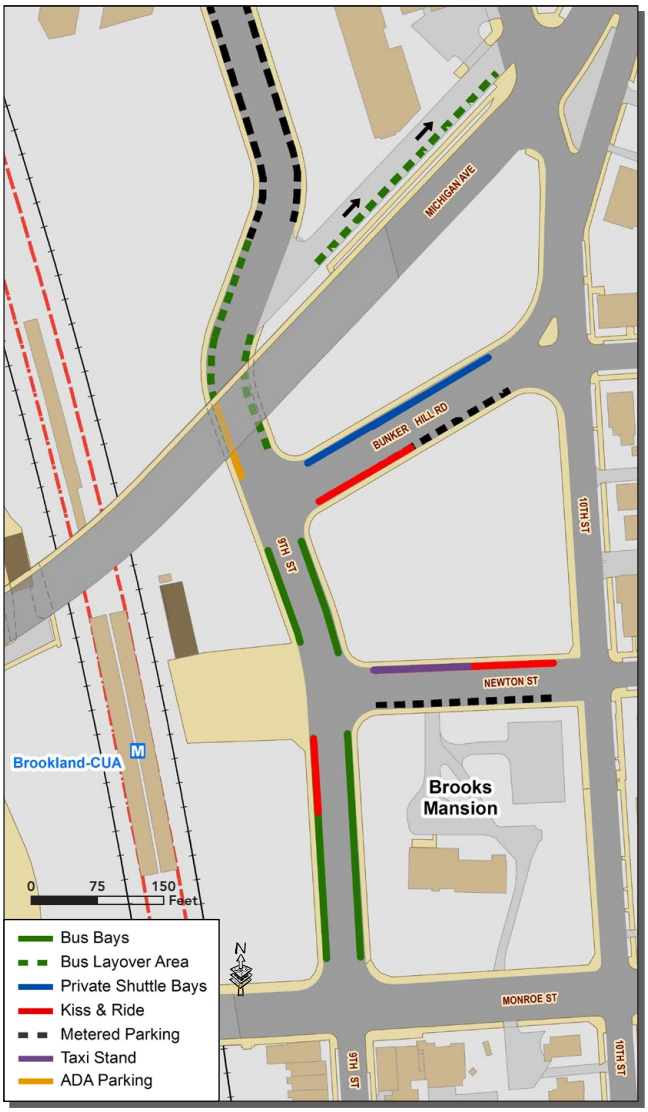
This option accommodates all bus bays along 9th Street between Monroe Street and Bunker Hill Road, as proposed in the Small Area Plan, to maximize access to the station entrance. **Figure 4-1** shows the layout of station access modes, and **Figures 4-2 and 4-3** show bus circulation routes to/from the bus stops and layover areas.

4.2.2 Bus Circulation

Under Option A, Metrobus routes serving the station from Monroe Street (80, G8, H1, H2, H3, and H4) would be able to use the north Bunker Hill Road bus circulation/layover area and return to the on-street bus bays along 9th Street (see **Figure 4-2**). The Metrobus H8 and H9 routes would be able to enter/exit the station area from the north via Bunker Hill Road. Alternatively, in the future if the Small Area Plan's proposed extension of 9th Street north of Michigan Avenue (connecting to Perry Street) is implemented, the H8 and H9 routes could be re-routed to use this new street connection as a way to avoid the congested Michigan Avenue/10th Street intersection (see **Figure 4-2**).

The H6 and R4 routes, which access the station from Michigan Avenue would not be able to service 9th Street bus bays, take layovers on north Bunker Hill Road and re-circulate back to Michigan Avenue northbound without using either local residential streets (Newton Street/10th Street) or a circuitous route via Monroe Street and 7th Street (see **Figure 4-3**). The longer route via Monroe Street and 7th Street would add considerable travel time to the bus schedule due to the longer distance and multiple signalized intersections, which are often congested during peak periods.

Figure 4-1 On-Street Option A - Layout of Station Access Modes



4.2.3 Assessment of Option

Option A places the bus stops in a convenient, high-visibility location but leaves little space for other access modes along 9th Street. The bus layover circulation requires a loop through the Michigan Avenue/10th Street intersection. Metrobus H6 and R4 routes would require long circuitous routes to access the station area and layover areas. Option A may create the feeling of a "wall of buses" along 9th Street in front of the plaza and along the streetscape of the new mixed-use development.

Figure 4-2 On-Street Option A – Bus Circulation (Routes 80, G8, H1-4, and DC Circulator)

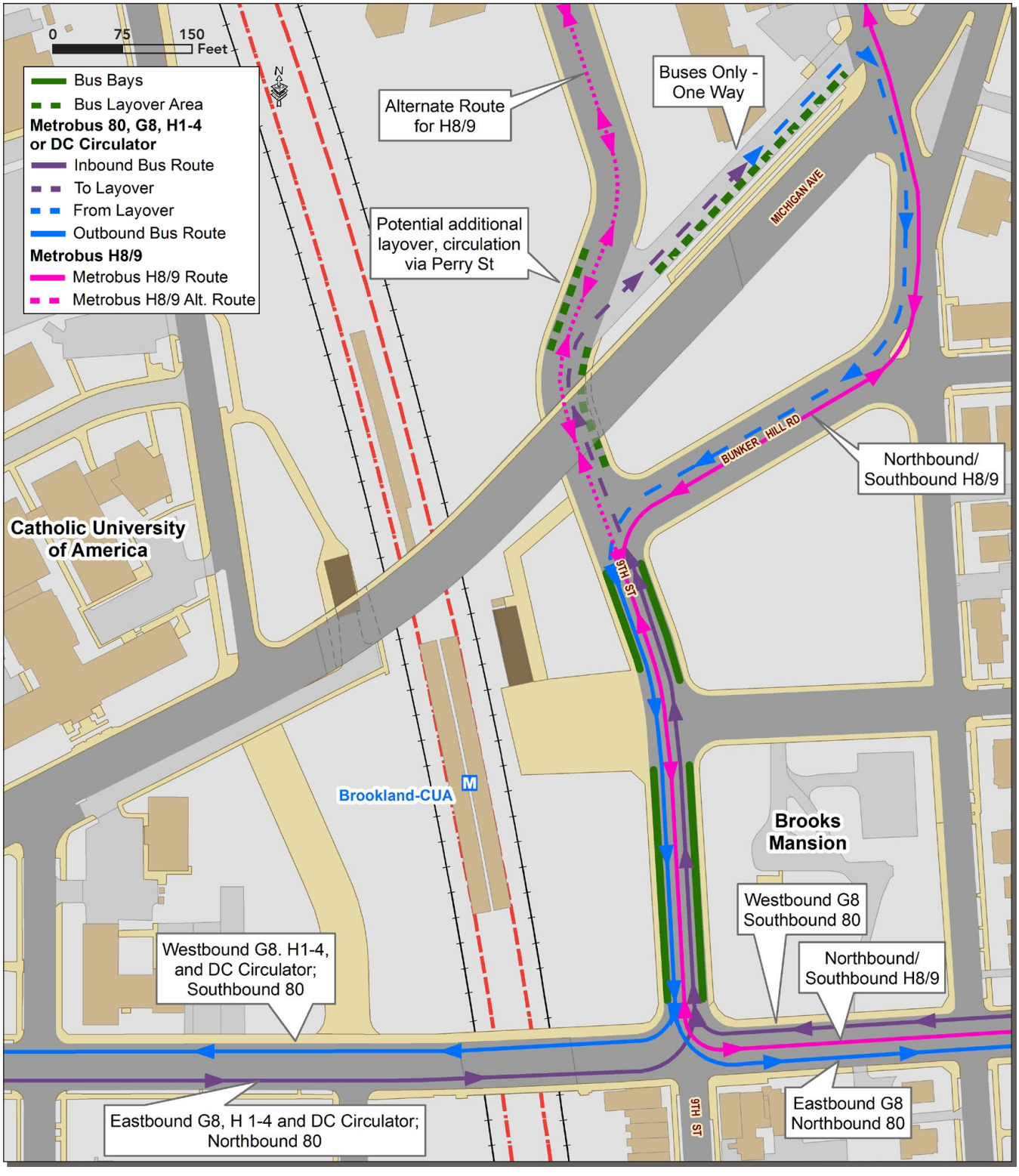
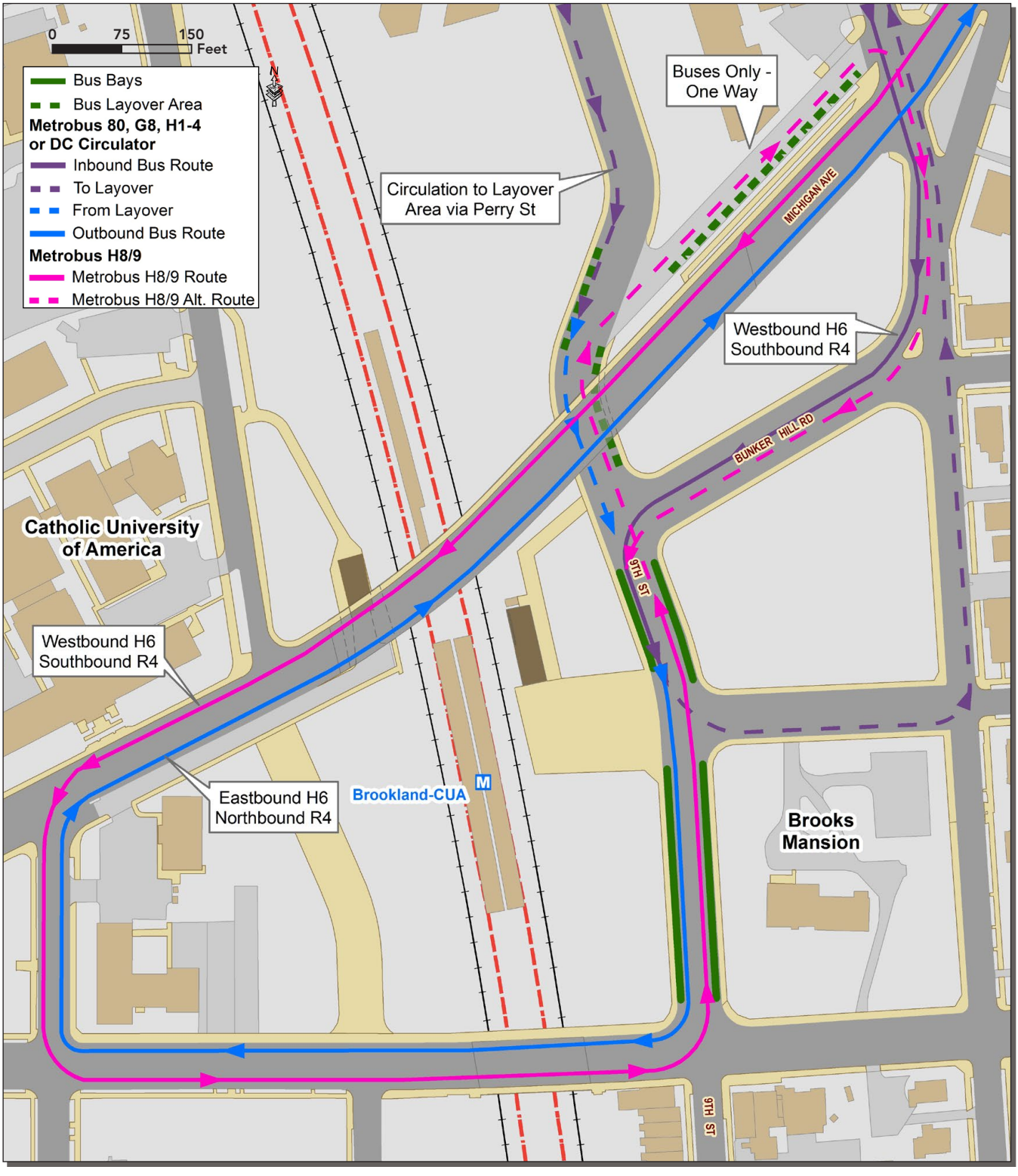


Figure 4-3 On-Street Option A – Bus Circulation (Routes H6 and R4 only)



Advantages

- *Bus Operations* – Bus stops are in convenient high-use area in center of mixed-use development and clearly visible from station entrance.
- *Shuttle Operations* – Stop is located close to east entrance elevator.
- *Pedestrian Accessibility* – Bus stops are maintained close to existing residential areas.
- *TOD environment and development volume* – Minimizes changes to Small Area Plan; maximizes area available for development, except for use of existing Bunker Hill Road right-of-way on north side of Michigan Avenue.
- C*apital Cost* – Does not require new capital facilities or property.

Disadvantages

- *Bus Operations* –
  - Circulation to/from layover areas requires buses to circulate through Michigan Avenue/10th Street intersection;
  - Existing Metrobus 80 and G8 routes would require revenue service time to circulate through Michigan Avenue/10th Street intersection and return to Monroe Street. However, there are potential re-routing options that would resolve this issue and could be studied further;
  - Metrobus H6 and R4 routes would require long circuitous routes to access the station area and layover areas in order to avoid using the residential portion of 10th Street. These routes would use congested portions of Monroe Street and Michigan Avenue. This issue could be a fatal flaw in On-Street Option A; and
  - Bus bays on south end of 9th Street at Monroe Street would need to address slope issues to comply with ADA requirements, also a potential fatal flaw.
- *Kiss & Ride* – Area on 9th Street only in southbound direction; however, additional Kiss & Ride areas on Newton Street and Bunker Hill Road allow for northbound circulation from Monroe Street.
- *Parking* – Very limited on-street parking in center of TOD area.
- *Pedestrian and Bicycle Safety and Comfort* – Potential for conflicts with informal Kiss & Ride and taxi loading/unloading along 9th Street (see Traffic Operations below).
- *Traffic Operations* –
  - Layover circulation and facility would require special exclusive signal phase at Michigan Avenue/10th Street intersection (for buses to exit Bunker Hill Road and return southbound along 10th Street to station area or leave eastbound on Michigan Avenue), decreasing Level of Service at intersection, creating additional delay; and
  - The location of all bus bays and all other vehicular access functions along the new East Entrance street grid (i.e., 9th Street, Newton Street, and Bunker Hill Road) results in less flexibility to arrange Kiss & Ride and taxi functions in optimal locations and with sufficient space. Thus, the on-street options have more potential for private vehicles to load/unload passengers in generally prohibited locations where they may obstruct travel lanes, bus bays, shuttle stops, pedestrian crosswalks, and any on-street bicycle facilities.
- *TOD environment and development volume* – Potential negative impacts on plaza area and adjacent mixed-use development from all bus operations concentrated on 9th Street. In addition potential negative impacts of shuttle operations on adjacent mixed-use development along Bunker Hill Road.

Other Considerations

Layover facility on Bunker Hill Road may depend on concurrent redevelopment of Comcast property as facility would restrict private vehicle access into property. Alternatively, the existing loop of Bunker Hill Road under the Michigan Avenue bridge could be used as interim layover location until redevelopment occurs north of Michigan Avenue.

4.3 On-Street Bus Stops Alternative - Option B

4.3.1 Facilities

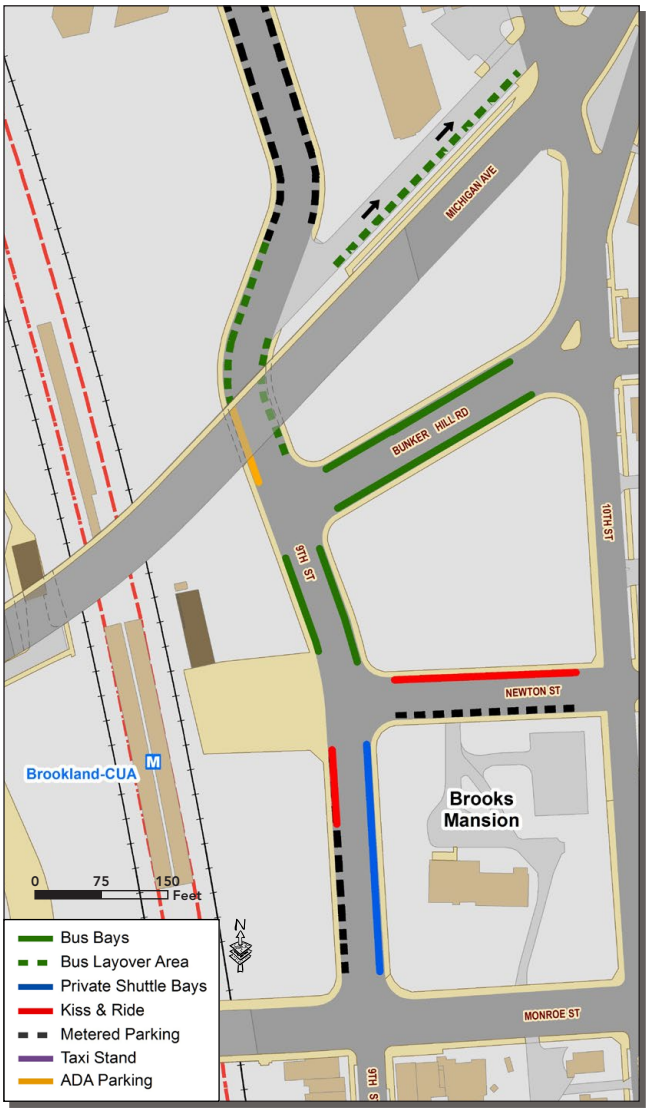
On-street Option B places some bus bays along Bunker Hill Road south of Michigan Avenue in addition to along 9th Street. The arrangement seeks to reduce potential negative impacts on the plaza area and storefront retail along 9th Street. **Figure 4-4** shows the layout of station access modes, and **Figures 4-5 and 4-6** show bus circulation routes to/ from the bus stops and layover areas.

4.3.2 Bus Circulation

Under Option B Metrobus routes serving the station from Monroe Street (80, G8, H1, H2, H3, and H4) would have the same circulation patterns as under Option A (see **Figure 4-2**). Metrobus routes H8 and H9 would also have similar circulation patterns as in Option A (see **Figure 4-5**).

Option B bus circulation would differ from Option A by allowing efficient circulation for the Metrobus H6 and R4 routes without having to use local residential streets. Placing some bus bays on Bunker Hill Road would allow the Metrobus H6 and R4 routes to unload passengers at the station bus bays, circulate to layover areas, return to load passengers, and then exit the station area northbound along Michigan Avenue using the north Bunker Hill Road circulation/layover area (see **Figure 4-6**).

Figure 4-4 On-Street Option B – Layout of Station Access Modes



4.3.3 Assessment of Option

The primary characteristic of Option B is the placement of bus bays on both 9th Street and Bunker Hill Road.

Option B performs similar to Option A, except that some bus stop locations are along Bunker Hill Road and not as visible from the station entrance plaza as in Option A. However, the Bunker Hill Road stops allow the Metrobus H6 and R4 routes to access the station

Figure 4-5 On-Street Option B - Bus Circulation (Routes 80, G8, H1-4, and DC Circulator)

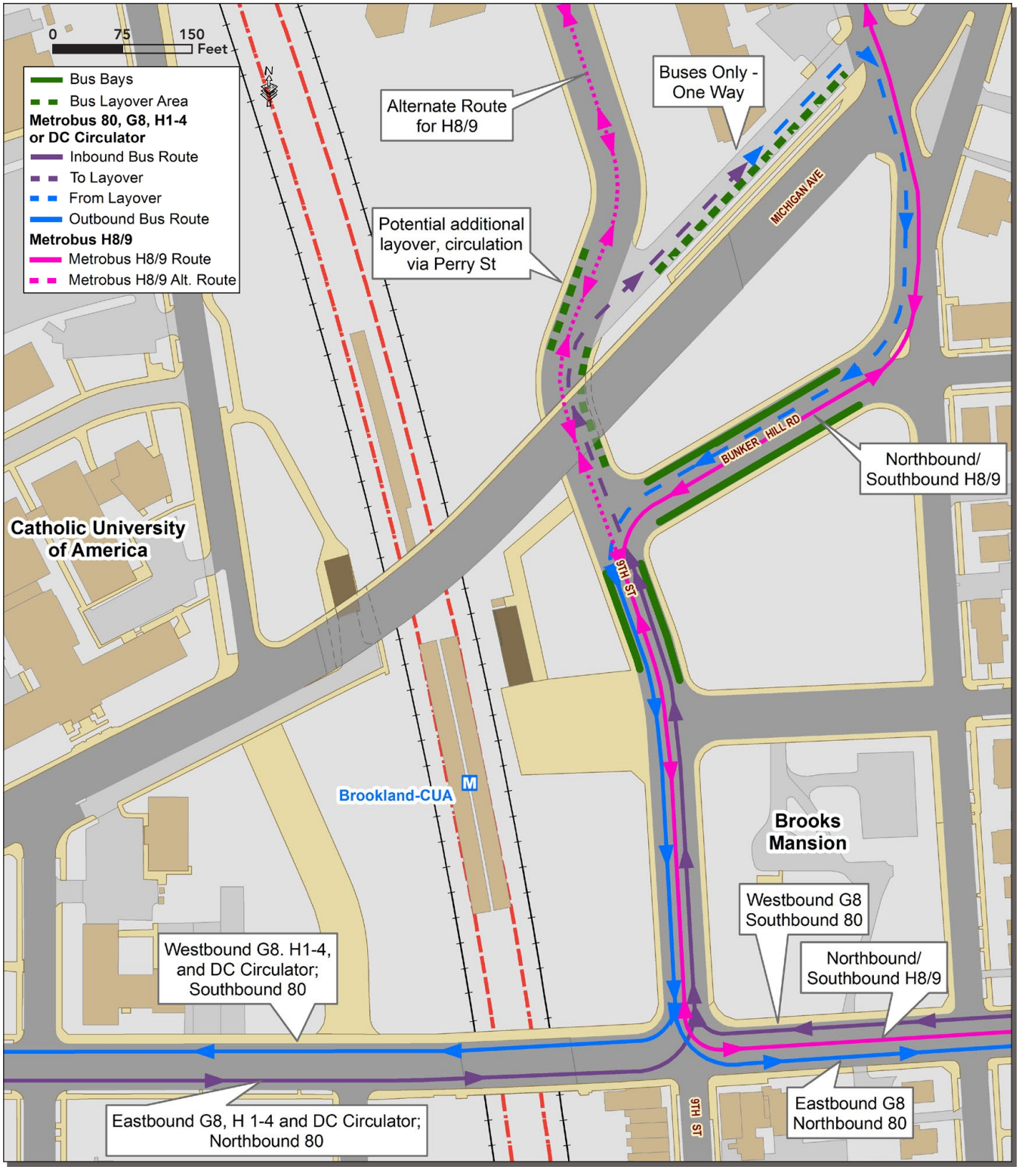
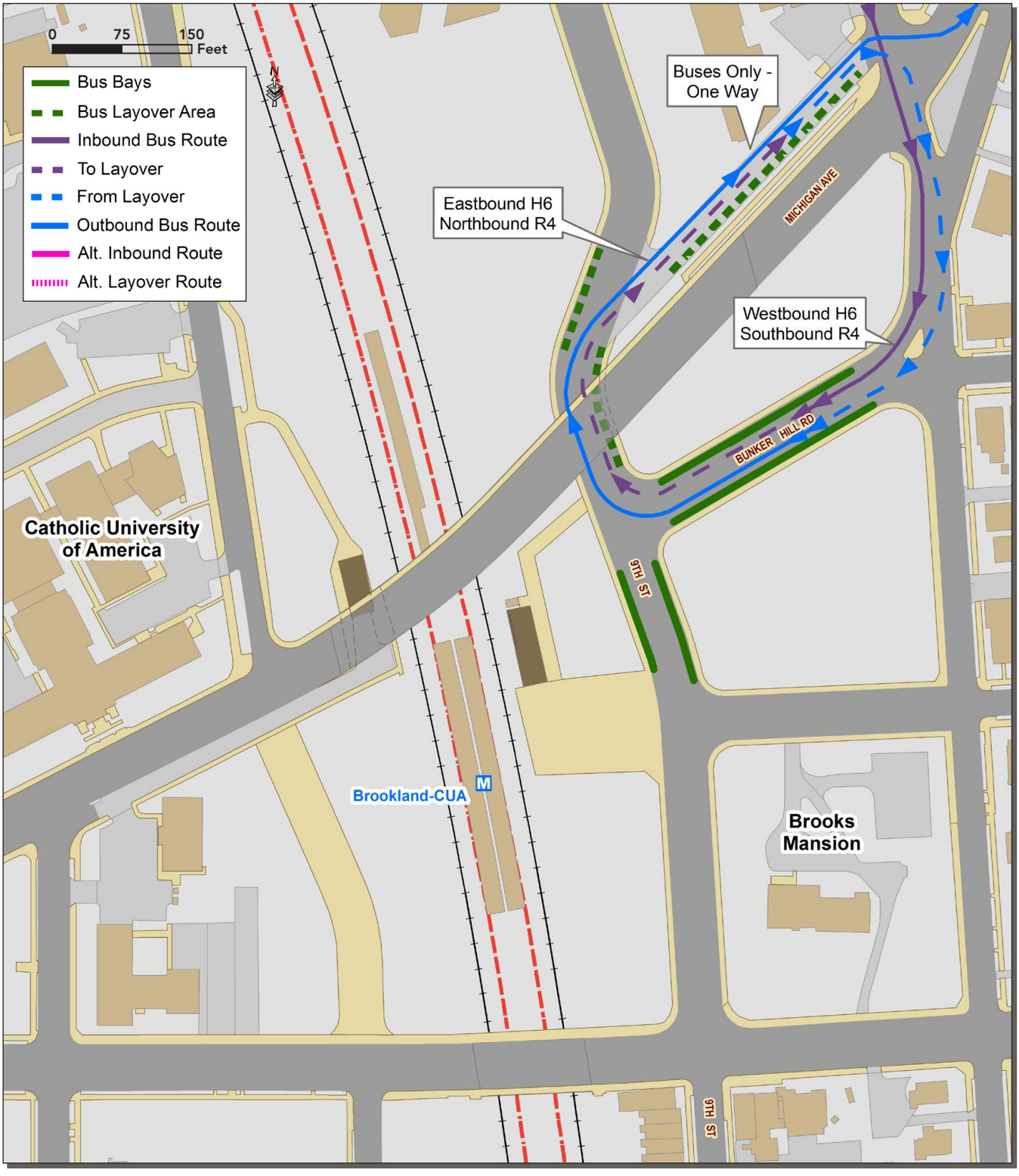


Figure 4-6 On-Street Option B – Bus Circulation (Routes H6 and R4 only)



and layover areas and return to Michigan Avenue without circuitous re-routing as Option A would require. Option B also allows more space for other access modes along 9th Street and has less impact on the 9th Street plaza and mixed-use development from its bus activities as some would take place on Bunker Hill Road.

Advantages

- *Bus Operations* – unlike Option A, the H6 and R4 Routes would be able to access the layover area and reverse direction without significantly adding to their revenue service routes.
- *Shuttle Operations* – stop is located close to east entrance escalator and in high-visibility location but requires street crossing.
- *Parking* – some additional on-street parking in center of new mixed-use development compared with Option A.
- *Pedestrian Accessibility* – bus stops are maintained close to existing residential areas.
- *TOD environment and development volume* –
  - Less potential adverse impact of bus activity on 9th Street plaza and mixed-use development than Option A.
  - Shuttle stop/layover area is adjacent to landscaped buffer of Brooks Mansion property and has less impact on adjacent street level uses than Option A location on Bunker Hill Road.
  - Minimizes changes to Small Area Plan; maximizes area available for development, except for use of existing Bunker Hill Road right-of-way on north side of Michigan Avenue.
- *Capital Cost* – does not require new capital facilities or property.

Disadvantages

- *Bus Operations:*
  - Bus stop locations on Bunker Hill Road are not as highly visible as 9th Street locations.
  - Circulation to/from layover areas requires buses to circulate through Michigan Avenue/10th Street intersection.
  - Existing Metrobus 80 and G8 routes would require revenue service time to circulate through Michigan Avenue/10th Street intersection and return to Monroe Street. However, there are potential re-routing options that would resolve this issue and could be studied further.
- *Kiss & Ride* – Small area on 9th Street only in southbound direction but additional Kiss & Ride area on Newton Street allows for northbound circulation from Monroe Street via 10th Street.
- *Parking* – limited on-street parking in center of new mixed-use development area.
- *Pedestrian and Bicycle Safety and Comfort* – potential for conflicts with informal Kiss & Ride and taxi loading/unloading along 9th Street (see Traffic Operations below).
- *Traffic Operations:*
  - Layover circulation and facility requires special signal phase at Michigan Avenue/10th Street intersection, decreasing Level of Service at intersection, creating additional delay.
  - The location of bus bays and all other vehicular access functions along the new East Entrance street grid (i.e., 9th Street, Newton Street, and Bunker Hill Road) results in less flexibility to arrange Kiss & Ride and taxi functions in optimal locations and with sufficient space. Thus, the on-street options have more potential for private vehicles to load/unload passengers in generally prohibited locations where they may obstruct travel lanes, bus bays, shuttle stops, pedestrian crosswalks, and any on-street bicycle facilities.
- *TOD environment and development volume* – 9th Street and Bunker Hill Road bus operations may impact adjacent mixed-use development.

Other Considerations

- Similar to Option A, layover facility on Bunker Hill Road may depend on concurrent redevelopment of Comcast property as facility would restrict

private vehicle access into property. Alternatively, the existing loop of Bunker Hill Road under the Michigan Avenue bridge could be used as interim layover location until redevelopment occurs north of Michigan Avenue bridge.

4.4 Off-Street Bus Facility Alternative 1

Off-street Alternative 1 replaces the existing bus loop with a new off-street bus facility north of the east entrance, extending north under the Michigan Avenue bridge along the east side of the Metrorail tracks.

4.4.1 Facilities

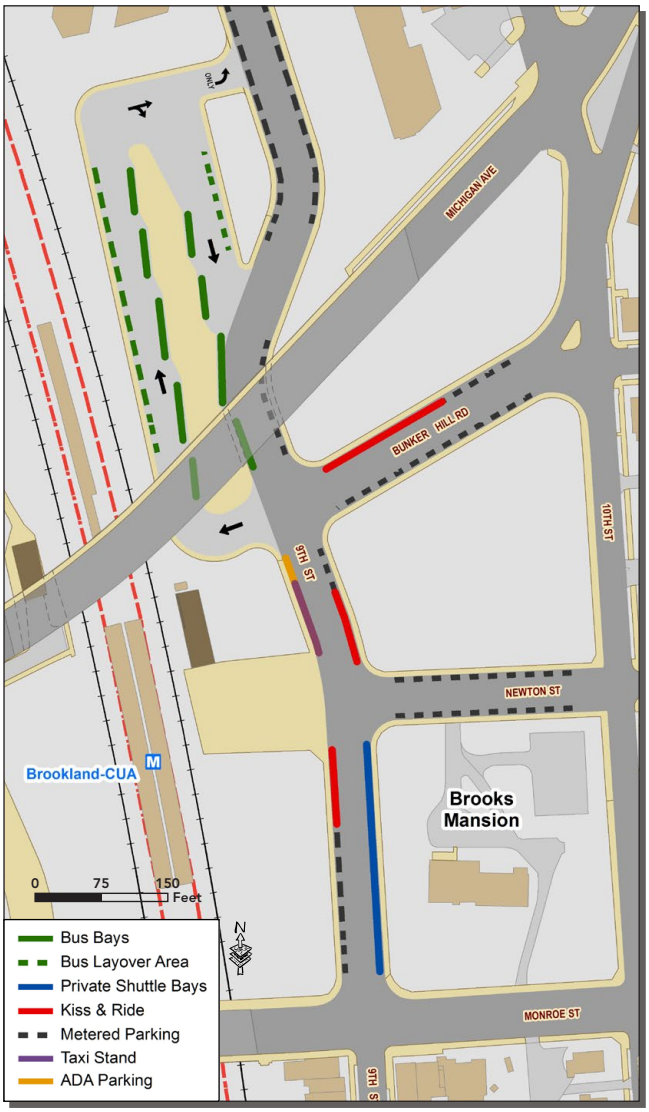
The facility would be located on existing public right-of-way on Bunker Hill Road and on a portion of the privately owned parcel currently occupied by parking and outdoor storage uses. The single off-street bus facility would accommodate all bus unloading/loading and layover functions at the station, with nine bus bays (four standard-sized bays and five bays for articulated buses) and seven bus layover spaces (two standard-sized and five for articulated buses). 9th Street would be available to accommodate a private shuttle stop, Kiss & Ride pick-up/drop-off areas, and on-street metered parking.

Figure 4-7 shows the layout of station access modes in Off-Street Alternative 1. Details of bus circulation routes, potential facility design, and impacts to Small Area Plan proposed development blocks by the off-street facility are included in **Appendix C**.

4.4.2 Bus Circulation

All bus routes would be able to use the off-street bus facility for efficient recirculation and layovers as needed. Unlike in the On-Street Bus Stops Alternative, the routes would not have to access remote layover areas or circulate through the 10th Street/Michigan Avenue intersection after unloading passengers to turn around and return to the station to load passengers. Diagrams of bus circulation patterns for Off-Street Alternative 1 are included in **Appendix C**.

Figure 4-7 Off-Street Alternative 1 – Layout of Station Access Modes



4.4.3 Assessment of Alternative

Off-street Alternative 1 places bus stops and layovers in a single efficient location. However, some stops are located far from the east entrance escalators and passengers at those stops may feel isolated. The alternative allows 9th Street to be used for other access modes and has the least impact of bus stops on the adjacent streetscape and plaza of all alternatives. The large off-street facility would require costly acquisition of property and support

of the District government for the acquisition via development proffer or condemnation, and the facility would preclude use of a large area for future mixed-use redevelopment.

Advantages

- *Bus Operations* –
  - Stops are in single location with great convenience for transfers.
  - Bus layover circulation functions efficiently within off-street bus loop.
- *Kiss & Ride* – areas on both sides of 9th Street allow southbound and northbound circulation.
- *Parking* – generous on-street parking in center of TOD area.
- T*raffic Operations* – The location of bus bays off the street grid results in more flexibility to arrange Kiss & Ride and taxi functions in optimal locations and with sufficient space. Thus, loading/unloading passengers of passengers can be more orderly, with fewer conflicts with other modes and fewer adverse impacts on traffic operations.
- *TOD environment and development volume* – low adverse impacts on plaza area and adjacent mixed-use development from bus operations.

Disadvantages

- *Bus Operations* –
  - Due to linear shape of site, some stops are located far from the east entrance escalators.
  - Passengers at some stops may feel isolated from activity center around station entrance area.
- *Shuttle Operations* – distances of many bus-to-shuttle transfers are long due to location of off-street bus facility.
- *TOD environment and development volume* – requires use of development parcels on north side of Michigan Avenue and reduces size of development parcel on west side of 9th Street adjacent to station escalator/elevator.
- *Capital Cost* – requires acquisition/purchase of large land parcel and construction of new off-street bus loop with larger dimensions than current facility.
- *Private Land Acquisition* –
  - Requires acquisition of private land parcel.
  - Would need support of property owners and the District of Columbia for control of privately owned site via proffer in conjunction with redevelopment project.

4.5 Off-Street Bus Facility Alternative 2

4.5.1 Facilities

Off-street Alternative 2 illustrates how existing Metro-owned property and public right-of-way could potentially be utilized for new bus facilities. The alternative replaces the existing bus loop with new off-street bus facilities as well as some on-street bus bays along Bunker Hill Road. Alternative 2 provides the following facilities:

- Small off-street bus facility on the Metro-owned parcel along Bunker Hill Road on south side of Michigan Avenue bridge, between 9th Street and 10th Street with four bays (two standard and two articulated-sized bays) and four layover spaces (two standard and two articulated-sized spaces);
- Two on-street bus bays (articulated-sized) on Bunker Hill Road adjacent to the facility;
- Off-street bus bays along existing Bunker Hill Road loop under the Michigan Avenue bridge north of the east entrance elevator with three bus bays (two standard bays and one articulated-sized bay); and
- Layover and circulation area with space for up to four buses (two standard and two articulated-sized spaces) along the existing segment of Bunker Hill Road north of the Michigan Avenue bridge, between 9th Street and 10th Street.

Figure 4-8 shows the layout of station access modes in Off-Street Alternative 2. Details of bus circulation routes, potential facility design, and impacts to Small Area Plan proposed development blocks by the off-street facilities are included in **Appendix D**.

4.5.2 Bus Circulation

Bus routes serving the station from Monroe Street (80, G8, H1, H2, H3, and H4) would have to use the bus-only driveway along the north side of the Michigan Avenue bridge and the 10th Street/Michigan Avenue intersection to turn around and return to Monroe Street. Some of the routes that terminate at the station could unload passengers, take layover, and load passengers within the off-street facility on Bunker Hill Road south of the Michigan Avenue bridge. However, because there is not enough layover space within the off-street facility to accommodate all layover activity, some routes would have to use the layover facility along the bus-only driveway along the north side of the Michigan Avenue bridge, circulate through the 10th Street/ Michigan Avenue intersection and return to the bus bays load passengers. Diagrams of bus circulation patterns for Off-Street Alternative 2 are included in **Appendix D**.

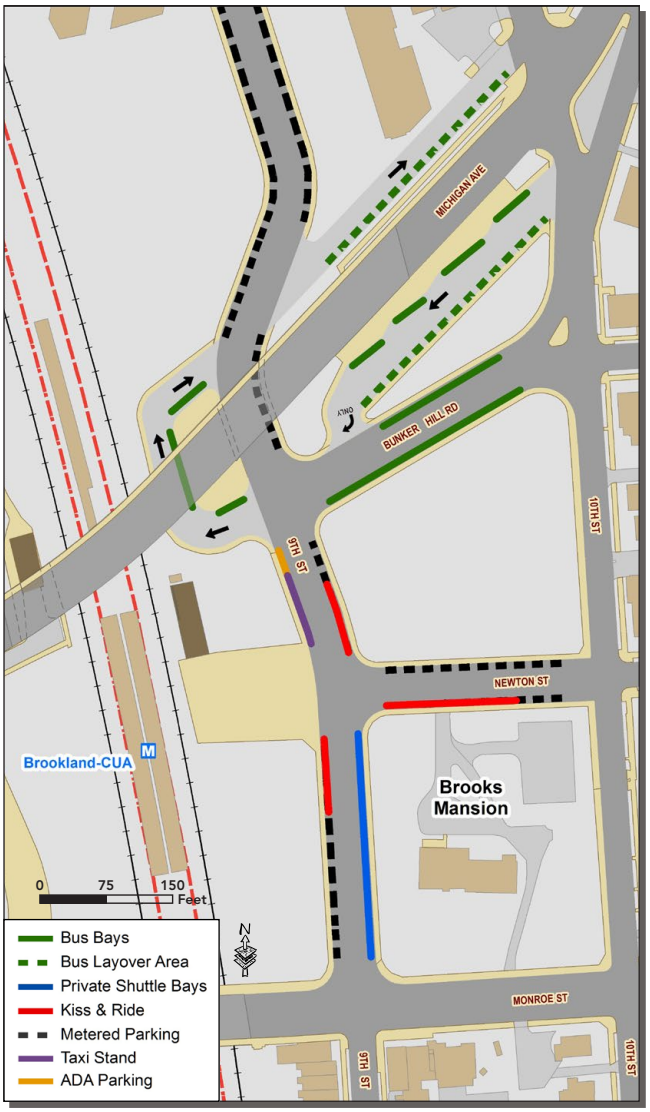
4.5.3 Assessment of Alternative

Off-Street Alternative 2 has high potential for adverse impacts on traffic circulation, especially at intersection of Michigan Avenue/10th Street/Bunker Hill Road. It takes advantage of existing public right-of-way or Metro-owned property for off-street bus stop and layover sites. However, some stops would be relatively far from the station entrance.

Advantages

- *Capital Cost* – provides off-street bus facilities in cost-effective manner, using existing Metro-owned property and public right-of-way.
- *Kiss & Ride* – areas on both sides of 9th Street allow southbound and northbound circulation.

Figure 4-8 Off-Street Alternative 2 – Layout of Station Access Modes



- *Parking* – Generous on-street parking in center of mixed-use development area.
- *TOD environment and development volume* – low adverse impacts on plaza area and 9th Street.
- *Traffic Operations* – The location of most bus bays off the street grid (and all bus bays off of 9th Street) results in more flexibility to arrange Kiss & Ride and taxi functions in optimal locations and with sufficient space. Thus, loading/unloading of passengers can be more orderly, with fewer conflicts with other modes and fewer adverse impacts on traffic operations.

Disadvantages

- *Bus Operations* –
  - Stop locations require passengers to cross streets and bus driveways for bus-to-bus transfers and bus-to-rail transfers.
  - Bus layover circulation requires most buses to circulate through Michigan Avenue/10th Street intersection.
  - Existing Metrobus 80 and G8 routes would require revenue service time to circulate through Michigan Avenue/10th Street intersection and return to Monroe Street. However, there are potential re-routing options that would resolve this issue and could be studied further.
  - Passengers at easternmost stops may feel isolated from the station entrance and 9th Street activity center.
- *Shuttle Operations* – distance of many bus-to-shuttle transfers is far due to location of off-street bus facility.

Traffic Operations –

- Off-street bus facility near 10th Street would create vehicle conflict points at driveways located very close to intersections of Michigan Avenue/10th Street and Bunker Hill Road/9th Street.
- Layover circulation and facility would require special exclusive signal phase at Michigan Avenue/10th Street intersection (for buses to exit Bunker Hill Road and return southbound along 10th Street to station area or leave eastbound on Michigan Avenue), decreasing Level of Service at intersection, creating additional delay.

- *Pedestrian Accessibility* – Location of off-street facility entrance near intersections of 10th Street and Michigan Avenue and Bunker Hill Road creates additional conflict points between vehicles and pedestrians in this area.
- *TOD environment and development volume* –
  - Bunker Hill Road bus operations may impact adjacent mixed-use development.
  - Reduces size of development parcel on west side of 9th Street adjacent to station escalator/elevator.
  - Layover facility on Bunker Hill Road may depend on concurrent redevelopment of Comcast property as the facility would restrict vehicular access to the property. Alternatively, the existing loop of Bunker Hill Road under the Michigan Avenue bridge could be used as interim location until redevelopment occurs north of Michigan Avenue bridge.
- *Capital Cost* – requires use of Metro-owned property and construction of small new off-street bus facility on area that could otherwise be sold/leased for private development consistent with the Small Area Plan.

4.6 Off-Street Bus Facility Alternative 3

4.6.1 Facilities

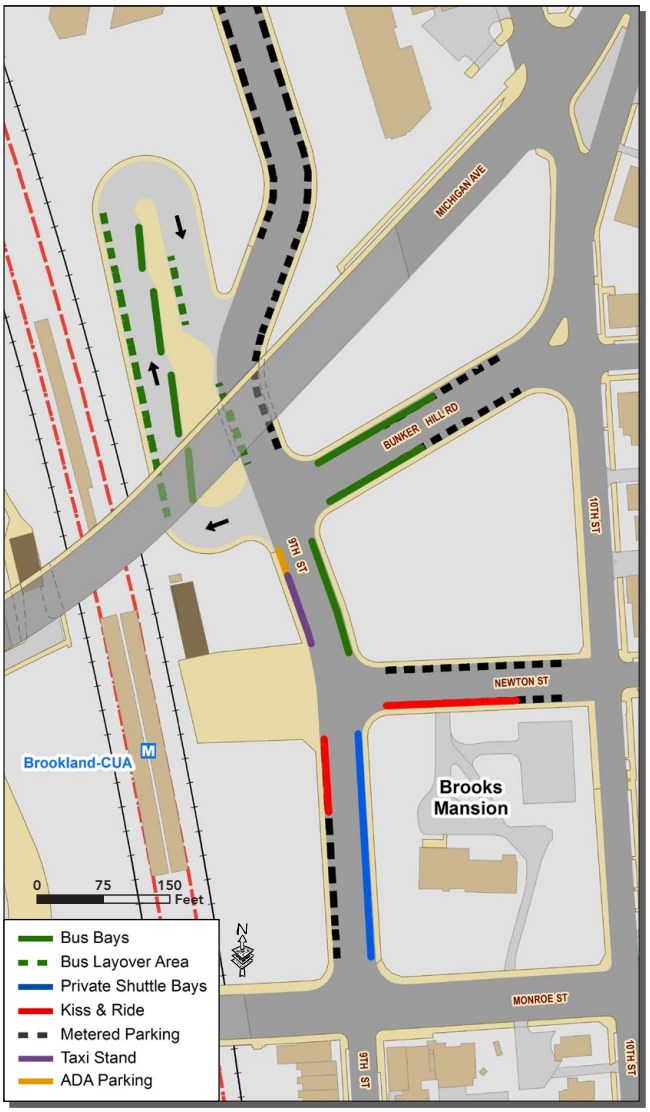
Off-street Alternative 3 provides an off-street facility only for terminal routes that need to take layover at Brookland-CUA station; other routes would use on-street bus stops. The arrangement allows efficient circulation from bus bays to/from layover areas while reducing the size and property needed for an off-street bus facility. Alternative 3 replaces the existing bus loop with a new off-street bus facility north of the east entrance, in the same location as the Alternative 1 facility, and with on-street bus stops on Bunker Hill Road south of Michigan Avenue and on the 9th Street. Similar to Alternative 1, the off-street bus facility would be located on existing public right-of-way on Bunker Hill Road and on a portion of the privately owned parcel currently occupied by parking and outdoor storage uses. Alternative 3 provides the following facilities:

- Off-street bus facility with four bus bays (two standard-sized bays and two bays for articulated buses) and seven bus layover spaces (two standard-sized and five for articulated buses); and
- Five on-street bus bays (two standard-sized bays and three articulated-sized bays) on Bunker Hill Road south of Michigan Avenue and on 9th Street north of Newton Street;

Most of 9th Street would be available to accommodate a private shuttle stop, Kiss & Ride pick-up/drop-off areas, and on-street metered parking.

Figure 4-9 shows the layout of station access modes in Off-Street Alternative 3. Details of bus circulation routes, potential facility design, and impacts to Small Area Plan proposed development blocks by the off-street facility are included in **Appendix E**.

Figure 4-9 Off-Street Alternative 3 – Layout of Station Access Modes



4.6.2 Bus Circulation

All terminal bus routes would be able to use the off-street bus facility for layovers and efficient recirculation. Bus routes serving the station from Monroe Street (80, G8, H1, H2, H3, and H4) would be able to use the off-street bus facility to turn around and return to Monroe Street. None of the routes would have to use the 10th Street/Michigan Avenue intersection after unloading passengers to turn around and return to the station to load passengers. Diagrams of bus circulation patterns for Off-Street Alternative 3 are included in Appendix E.

4.6.3 Assessment of Alternative

Off-street Alternative 3 allows for efficient layover circulation for terminal bus routes. However, the alternative would require costly acquisition of property and would preclude use of a large area for future mixed-use redevelopment.

Advantages

- *Bus Operations* –
  - Places terminal bus stops and layover areas in single efficient location.
  - Allows 9th Street to be used for other access modes and has very limited impact of bus stops on adjacent streetscape and plaza.
- *Traffic Operations* – The location of most bus bays off the street grid results in more flexibility to arrange Kiss & Ride and taxi functions in optimal locations and with sufficient space. Thus, loading/unloading passengers of passengers is expected to be more orderly, with fewer conflicts with other modes and fewer adverse impacts on traffic operations.

Disadvantages

- *Bus Operations* – some stops on Bunker Hill Road are located far from the east entrance escalators and passengers at those stops may feel isolated.
- *Shuttle Operations* – distances of many bus-to-shuttle transfers are long due to location of off-street bus facility and bays along eastern portion of Bunker Hill Road.
- *Kiss & Ride* – small area on 9th Street only in southbound direction but additional Kiss & Ride area on Newton Street allows for northbound circulation.
- *Parking* – some on-street parking in center of mixed-use development area but still limited.
- *TOD environment and development volume* – requires use of development parcels on north side of Michigan Avenue and reduces size of development parcel on west side of 9th Street adjacent to station escalator/elevator.
- *Capital Cost* – requires acquisition/purchase of large land parcel and construction of new off-street bus loop.
- *Private Land Acquisition* – requires acquisition of private land parcel.
  - Would need support of property owners and the District of Columbia for control of privately owned site via proffer in conjunction with redevelopment project or via condemnation.

4.7 Conceptual Capital Cost Estimates

Conceptual capital costs for each on-street and off-street bus bays alternative were estimated. These costs included modifications and enhancements to the bus facilities but excluded modifications to the station site streetscape (i.e., new streets and sidewalks) which would be borne by the developer. To determine total estimated capital costs for each alternative, individual program elements were first itemized and the raw values (unit price X quantity) calculated and summed to provide a total raw value. Final construction costs were estimated by applying percentage costs for drainage, landscaping, preliminary engineering, contingency, and engineering overhead.

Table 4-1 summarizes the final construction costs estimates for each alternative. **Table 4-2** summarizes the final construction costs, assessed values of the property acquisition for each alternative, potential land acquisition costs, and total capital costs. All costs are expressed in 2012 dollars. Detailed capital cost estimates and assessed property values for the alternatives are included in **Appendix F**.

Table 4-1 Capital Cost Estimates

Alternative	Raw Value Total	5% Drainage, + 5% Landscaping, + 20% Preliminary	30% Contingency	15% Engineering Overhead	Total Construction Cost (Rounded)*
On-Street A	$290,000	$90,000	$120,000	$70,000	$570,000
On-Street B	$290,000	$90,000	$120,000	$70,000	$570,000
Off-Street 1	$950,000	$290,000	$370,000	$240,000	$1,850,000
Off-Street 2	$730,000	$220,000	$280,000	$190,000	$1,420,000
Off-Street 3	$810,000	$240,000	$320,000	$200,000	$1,570,000

Note: all costs in 2012 dollars.
*Estimate does not include potential utility relocation or property costs. Totals may not add due to rounding.

Table 4-2 Construction and Assessed Property Costs

Alternative	Total Construction Cost	Area of Additional Property Required (acres)	Tax Assessed Value of Property Required**	Potential Acquisition Cost of Property***	Total Capital Cost
On-Street A	$570,000	N/A*	N/A*	N/A*	$570,000
On-Street B	$570,000	N/A*	N/A*	N/A*	$570,000
Off-Street 1	$1,850,000	1.4	$2,840,000	$5,680,000	$7,530,000
Off-Street 2	$1,420,000	N/A*	N/A*	N/A*	$1,420,000
Off-Street 3	$1,570,000	1.0	$2,020,000	$4,040,000	$5,610,000

Note: all costs in 2012 dollars.
*Alternative would only require space within existing public right-of-way or existing Metro-owned parcels. No off-site property would be needed.
**Estimated value of property required for the alternative was based on the land assessed value of parcels (no existing structures would need to be acquired), pro-rated based on the percentage area required for the bus facility. Source: 2012 DC Real Property Database (https://www.taxpayerservicecenter.com/), accessed June 2012.
*** Actual land acquisition costs would likely be higher than the tax assessed value. A 100 percent mark-up was used as a conservative assumption to account for potentially higher market values and other acquisition costs for private land.

4.8 Summary Matrix and Comparison of Station Access Alternatives

The alternatives were evaluated based on the following two factors:

- Performance of bus operations and other station access modes; and
- Consistency with the walkable urban character and development volumes of the transit-oriented development (TOD) envisioned in the Small Area Plan.

4.8.1 Scoring

The evaluation used a qualitative and relative ranking of Excellent, Good, Fair, and Poor in each category as follows:

- *Excellent* – alternative performs very well and has no apparent disadvantages in category;
- *Good* – alternative performs well with only one or two minor disadvantages;
- *Fair* – alternative has both advantages and disadvantages; and
- *Poor* – alternative has major disadvantages that outweigh advantages.

Capital cost was rated based on a relative order-of-magnitude ranking of Low, Medium, and High as follows:

- *Low* – alternative would require base level of capital investment for new station access facilities assumed in all alternative s (i.e., new west entrance elevator and canopy over east entrance escalator) but otherwise would require a low level of additional capital investment for replacement of bus facilities as on-street bus stops;
- *Medium* – alternative would require additional capital investment to construct a new off-street station access facility; and
- *High* – alternative would require significant additional capital investment for a major new off-street facility, including private land acquisition costs.

The evaluation also indicated if private land acquisition would be required (“Yes” or “None”). Private land acquisition would require support from the property owners and the District of Columbia, involving either a development proffer or condemnation of land, and may affect the feasibility of an alternative.

Evaluation Matrix

Table 4-3 lists the evaluation categories, criteria, and the assigned qualitative evaluation scores for the alternatives. The table describes the relative advantages and disadvantages of each alternative. **Table 4-4** at the end of the section provides a short summary table, with overall scores for the general evaluation categories.

Summary of Alternatives Evaluation

Table 4-4 provides a summary matrix of the evaluation scores. Based on the scores for individual evaluation criteria included in **Table 4-3** above, an overall score was assigned for the evaluation category.

Note that the summary matrix scores differ in some instances from the detailed matrix scores, reflecting higher weighting given to major issues rather than a straight average of the criteria scores. For each alternative, any rating of "poor" (i.e., potential fatal flaw) for an evaluation criterion was weighted more heavily than the other criteria scores in assigning an aggregate score for the overall category. For example, in "Bus Operations," if an alternative would require an excessively long, circuitous bus route to access the bus stops, then this significant disadvantage would receive a poor score for the "Ease of bus circulation between routes and bays" criterion; and this criterion would be weighted more heavily compared to the higher scores of other bus operations criteria in determining the aggregate score for overall Bus Operations.

4.9 Station Access Evaluation Summary

The evaluation of the alternatives for station access on the proposed new urban street grid shows that accommodating bus operations, both bus stops and layover areas, as well as private shuttle operations presents various challenges. The constraints of the street network, including weekend closures of Newton Street and the goal to avoid bus routing along residential blocks of 10th Street, make it difficult for buses to reverse direction in the station vicinity. There are no publicly owned sites large enough to accommodate a bus turn-around. Placing all bus stops along 9th Street would adversely impact the planned community plaza and storefront retails uses.

Use of the area under the Michigan Avenue bridge and portions of the Bunker Hill Road right-of-way may be able to accommodate bus bays and layover areas in the near-term, so that only a few bus stops would be needed on 9th Street. However, the projected growth in bus demand, potential use of articulated buses, high number of bus-to-bus transfers, and bus layover activities at Brookland-CUA station would need to be addressed over the long term as bus service plans for key corridors such as the Metrobus 80 route and planned new DC Circulator route are developed.

Modifications of Metrobus route alignments could be explored further to develop efficient routes through the station area that avoid the need to pass through the Michigan Avenue and 10th Street intersection for turning around. In addition, to fully assess the potential traffic demands placed on 9th Street from bus operations, shuttle operations, and Kiss & Ride activity, as well as vehicular trips generated by the new mixed-use development, a detailed traffic study is recommended.

Table 4-3 Station Access Alternatives Detailed Evaluation Matrix

Categories	Criterion	On-Street Alternative		Off-Street Bus Facility Alternatives		
		Option A	Option B	1	2	3
Bus Operations	1. Proximity and accessibility of bays to station entrance (distances, street crossings and grades to escalator and elevator)	Fair	Good	Fair	Poor	Fair
	2. Proximity and accessibility of bays to each other (distances, street crossings and grades)	Good	Good	Excellent	Fair	Fair
	3. Proximity and ease of bus circulation between layover spaces and bays	Poor	Fair	Excellent	Fair	Excellent
	4. Ease of bus circulation between routes and bays	Poor	Fair	Good	Fair	Good
	5. Passenger environment (amenities and security)	Excellent	Good	Good	Good	Good
Shuttle Operations	6. Proximity and accessibility of shuttle stop to station entrance (distances, street crossings and grades to escalator and elevator)	Good	Good	Good	Good	Good
	7. Proximity and accessibility of shuttle stop to bus bays (distances, street crossings and grades)	Fair	Fair	Poor	Poor	Poor
	8. Ease of shuttle circulation between service routes and shuttle stop	Good	Good	Good	Good	Good
	9. Passenger environment (amenities and security)	Good	Good	Good	Good	Good
Pedestrian and Bicycle Access	10. Pedestrian access to station facilities from neighborhood	Excellent	Excellent	Good	Fair	Good
	11. Ability to accommodate on-street/off-street bicycle access routes and facilities	Good	Good	Good	Good	Good
	12. Pedestrian and bicycle safety and comfort along new East Entrance streets (9th St, Newton St, Bunker Hill Rd NE)	Good	Good	Excellent	Excellent	Excellent
Kiss & Ride and Station Area Parking	13. Proximity of Kiss & Ride to station entrance	Good	Excellent	Excellent	Excellent	Excellent
	14. Ease of vehicle circulation to/from Kiss & Ride	Fair	Fair	Excellent	Excellent	Good
	15. Capacity of on-street parking and proximity to station entrance and mixed-use development	Fair	Fair	Excellent	Good	Good

Table 4-3 Station Access Alternatives Detailed Evaluation Matrix *cont'd.*

Categories	Criterion	On-Street Alternative		Off-Street Bus Facility Alternatives		
		Option A	Option B	1	2	3
Traffic Operations	16. Effect on traffic operations of new East Entrance streets (9th St, Newton St, Bunker Hill Rd NE)	Fair	Fair	Good	Good	Good
	17. Effect on traffic operations outside of immediate station area (Michigan Ave, Monroe St, 10th St NE)	Fair	Fair	Good	Poor	Good
TOD Environment And Development Volume	18. Location of bus and shuttle bays away from east entrance plaza	Poor	Fair	Good	Good	Good
	19. Maximization of area available for development	Good	Good	Fair	Fair	Fair
Capital Cost	20. Capital cost of transit facilities	Low	Low	High	Medium	High
	21. Private land acquisition	None	None	Yes	None	Yes

Table 4-4 Station Access Alternatives Detailed Evaluation Matrix

Categories	On-Street Alternative		Off-Street Bus Facility Alternatives		
	Option A	Option B	1	2	3
Bus Operations	Poor	Fair	Good	Fair	Good
Shuttle Operations	Good	Good	Fair	Fair	Fair
Pedestrian & Bicycle	Good	Good	Good	Fair	Good
Kiss & Ride	Fair	Good	Excellent	Excellent	Good
On-Street Parking	Fair	Fair	Excellent	Good	Good
Traffic Operations	Fair	Fair	Good	Poor	Good
Plaza & TOD Environment	Poor	Fair	Good	Good	Good
Development Volume	Good	Good	Fair	Fair	Fair
Capital Cost	Low	Low	High	Medium	High
Private Land Acquisition	None	None	Yes	None	Yes

STATION ENTRANCE ALTERNATIVES

Brookland-CUA
Station Area Access Plan

Section 5

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5.0 STATION ENTRANCE ALTERNATIVES

5.1 East Entrance Plaza and Access Concepts

The Small Area Plan proposed moving and realigning the east station entrance to correspond with the axis of Newton Street. However, the new location would require significant below-grade construction and reconfiguration of the existing mezzanine to accommodate a new entrance tunnel. Alternatively, the realigned entrance would require a long extension of the existing underground passageway, with limited pedestrian sight lines to the mezzanine area, to connect to the new escalator landing.

An alternative to realigning the east entrance would be to maintain the existing location of the stair and escalator but to extend the entrance level plaza to align with the Newton Street axis. A building wing or feature object in the plaza could serve as a terminal focal point for the Newton Street axis, providing an identifiable entrance to the public plaza and the Metrorail station. This alternative would not require significant changes to the existing station and would not introduce new safety concerns within the station's underground passageway.

Four plaza concepts were developed to address the Small Area Plan's development scheme as well as potential station bus bay alternatives. For all design concepts the following assumptions were made:

- The east entrance escalator/stair and elevator are retained in their existing locations;
- The escalator/stair portal is protected from the elements by a new canopy structure or overhead building wing;
- Plaza layouts and proposed building massing can be adjusted to integrate different bus bay locations; and
- Proposed building heights and height setbacks can be adjusted to improve views to the Basilica of the National Shrine of the Immaculate Conception.

Option 1 – uses a building wing to terminate the Newton Street axis and frame the plaza area.

Option 2 – incorporates an open plaza area at the corner of 9th Street and Bunker Hill Road, which would open up the entrance area to potential bus bay locations along Bunker Hill Road.

Option 3 – places development over the escalator/stair bay and elevator rather than along 9th Street, creating an open plaza area for potential bus stops along the adjacent block of 9th Street north of the intersection with Newton Street.

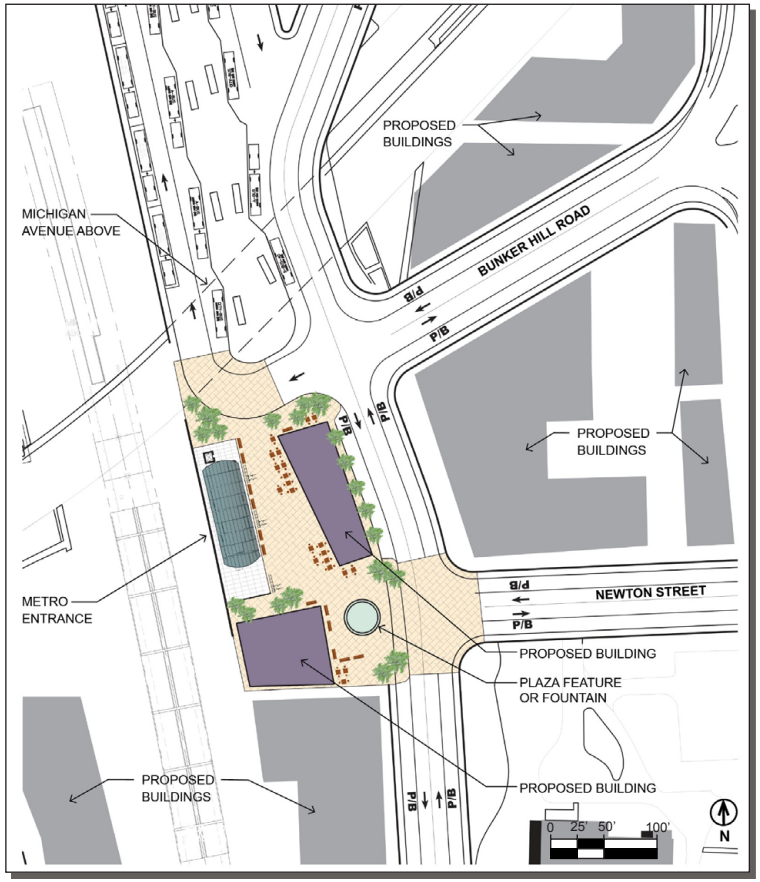
Option 4 – maintains the Small Area Plan concepts of an open axis at the terminus of Newton Street, by using a sculptural/landscape feature instead of a building, and locates the development block on the north side of the plaza along 9th Street.

Table 5-1 on the following page summarizes the characteristics of the alternatives and their advantages and disadvantages.

Table 5-1 Summary and Evaluation of Plaza Options

Option	Description	Advantages	Disadvantages
Plaza Option 1	• Uses building wing to terminate axis of Newton Street, frame public plaza and provide activity around Metro entrance • Proposed building along 9th Street brings activity to street and plaza • Public fountain placed at axis of Newton Street to activate plaza • New canopy over Metro entry	• Plaza can be extended to integrate transit modes to the north • Suitable for on-street and off-street bus stop configurations • Plaza space is clearly defined and street frontage along 9th Street is maintained • Easy access to Metro entrance and elevator from Bunker Hill Road	• Northern half of the plaza is visually isolated from activity along 9th Street by building block
Plaza Option 2	• Uses building wing to terminate axis of Newton Street, similar to above • Incorporates public plaza and green space open to activity on 9th Street and Bunker Hill Road • Public fountain placed at axis of Newton Street to activate plaza • New canopy over Metro entry	• Plaza can be extended to integrate transit modes to the north • Suitable for on-street and off-street bus stop configurations • Plaza space is open to activity along and across 9th Street • Metro entrance and elevator visible from many locations	• Plaza lacks definition, with both east and west sides open • Lack of development around plaza may not provide urban density • Less activity around plaza and Metro entrance may be less safe because of fewer “eyes on the street”
Plaza Option 3	• Places development over escalator and elevator, rather than along 9th Street, creating a plaza open to 9th Street activity • Proposed building over Metro entrance terminates axis of Newton Street and frames western edge of plaza • Public fountain placed at axis of Newton Street to activate plaza	• Plaza space is clearly defined and open to activity along and across 9th Street • Western edge of plaza is clearly defined and area around Metro entrance is active and covered • Development can activate area under Michigan Avenue and to the north	• Not as suitable for off-street bus stop configurations north of Michigan Avenue • Most appropriate for on-street bus stop configurations (but building massing could be adjusted to better suit other configurations)
Plaza Option 4	• Maintains Small Area Plan concept of open axis at terminus of Newton Street and maintains the development volume on north side of plaza along 9th Street • Development along 9th Street incorporates pedestrian pass-through for visible access to Metro elevator • Public fountain placed at axis of Newton Street to activate plaza • New canopy over Metro entry and increased landscaping along western edge	• Plaza can be extended to integrate transit modes to the north • Street frontage along 9th Street is maintained • Development can activate area under Michigan Avenue and to the north • Follows Small Area Plan recommendation to preserve views to the National Shrine	• Not as suitable for off-street bus stop configurations north of Michigan Avenue • Most appropriate for on-street bus stop configurations • Does not provide a defined termination of Newton Street axis

Figure 5-1 East Entrance Plaza Option 1



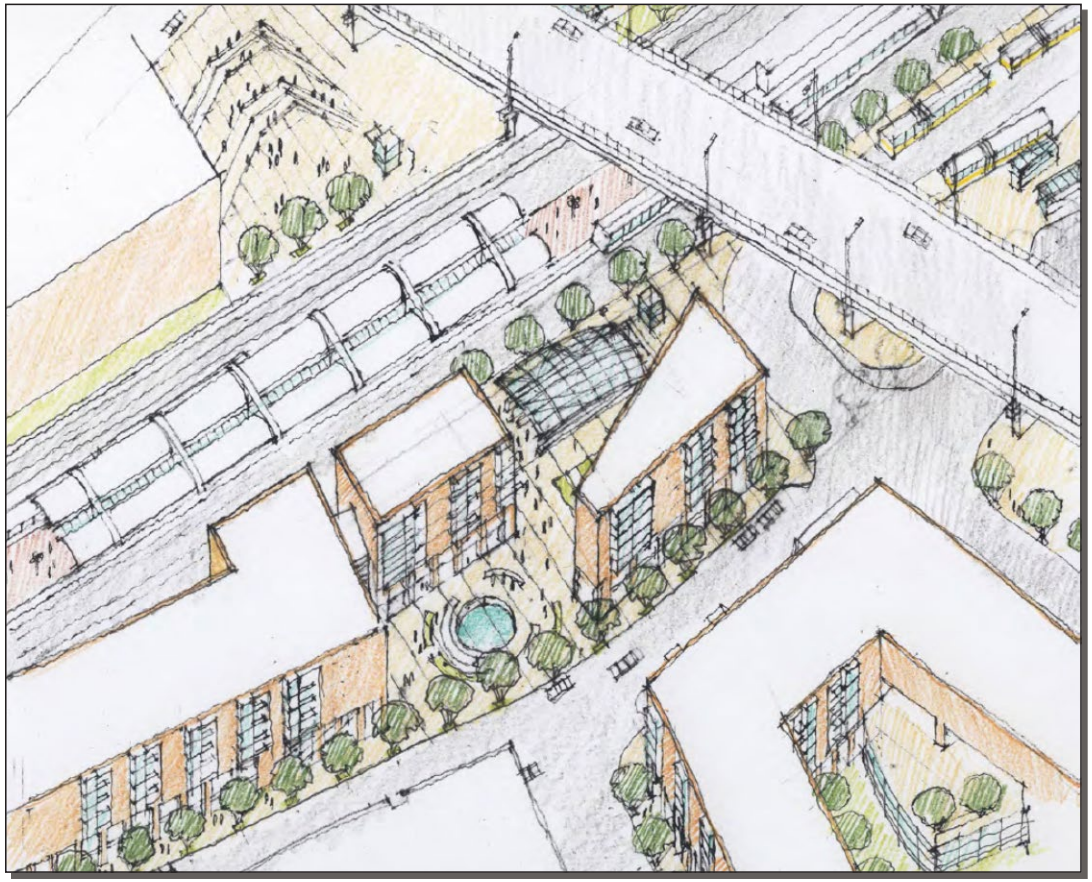
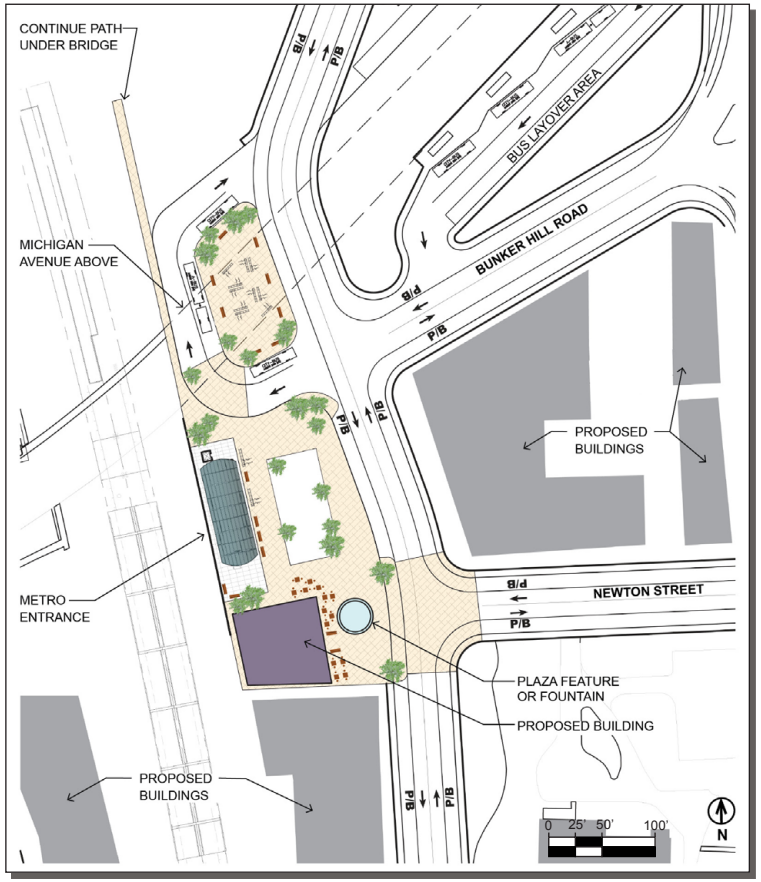


Figure 5-2 East Entrance Plaza Option 2



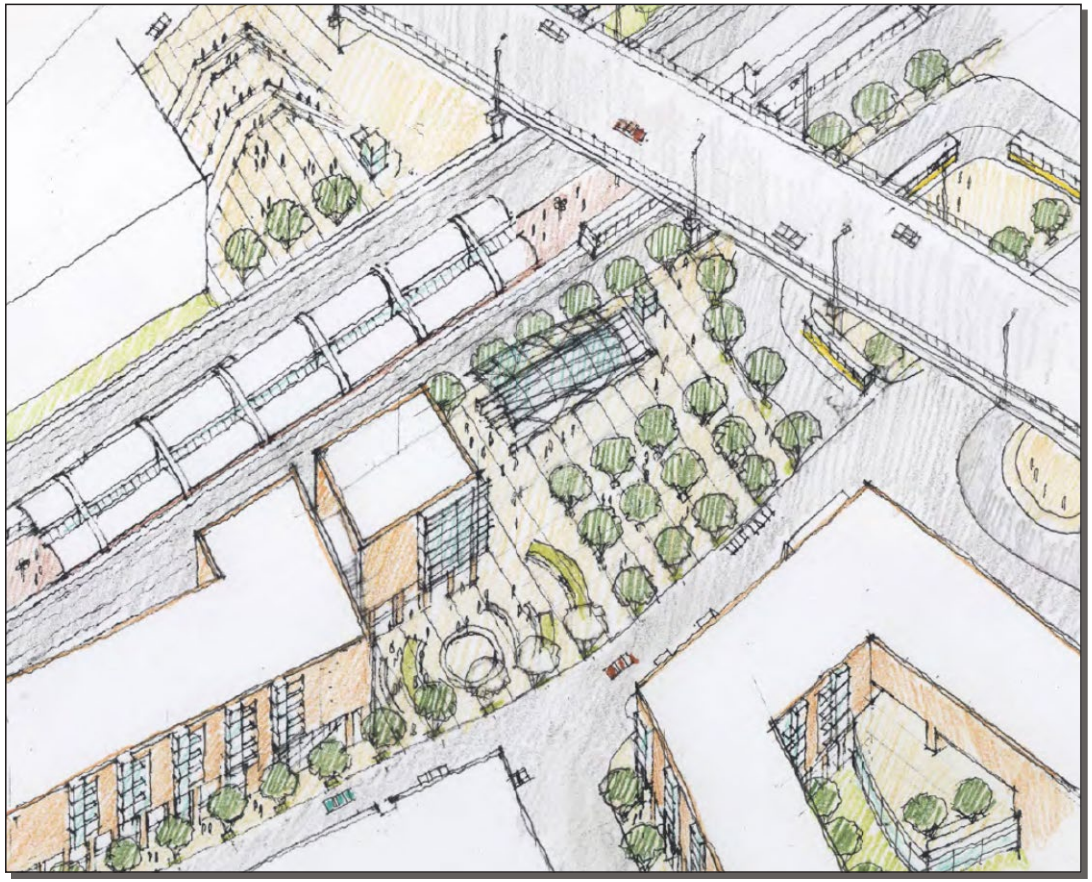
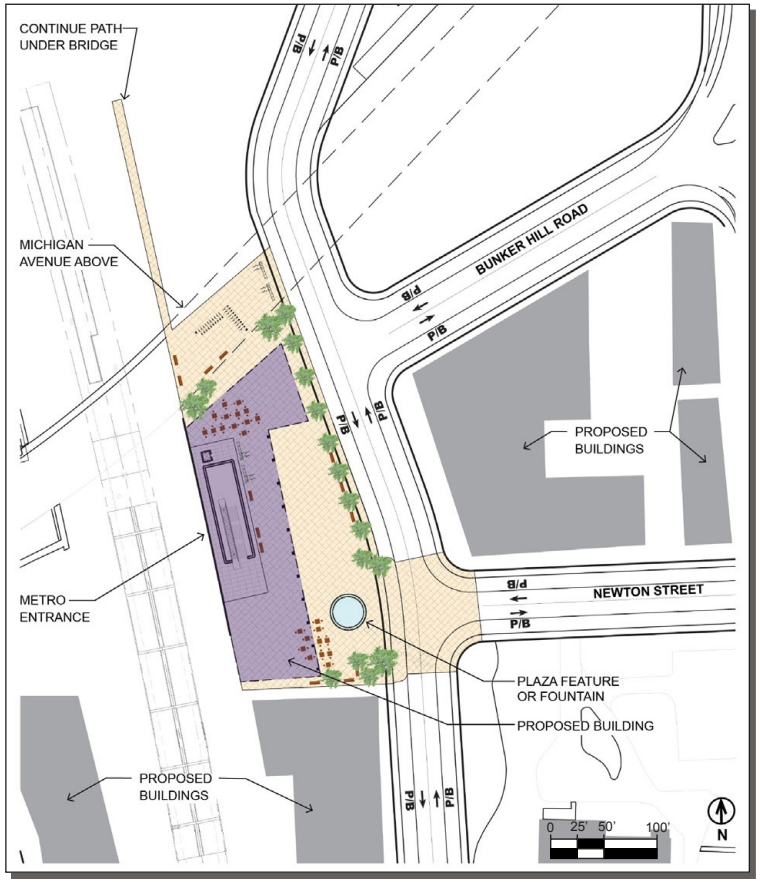


Figure 5-3 East Entrance Plaza Option 3



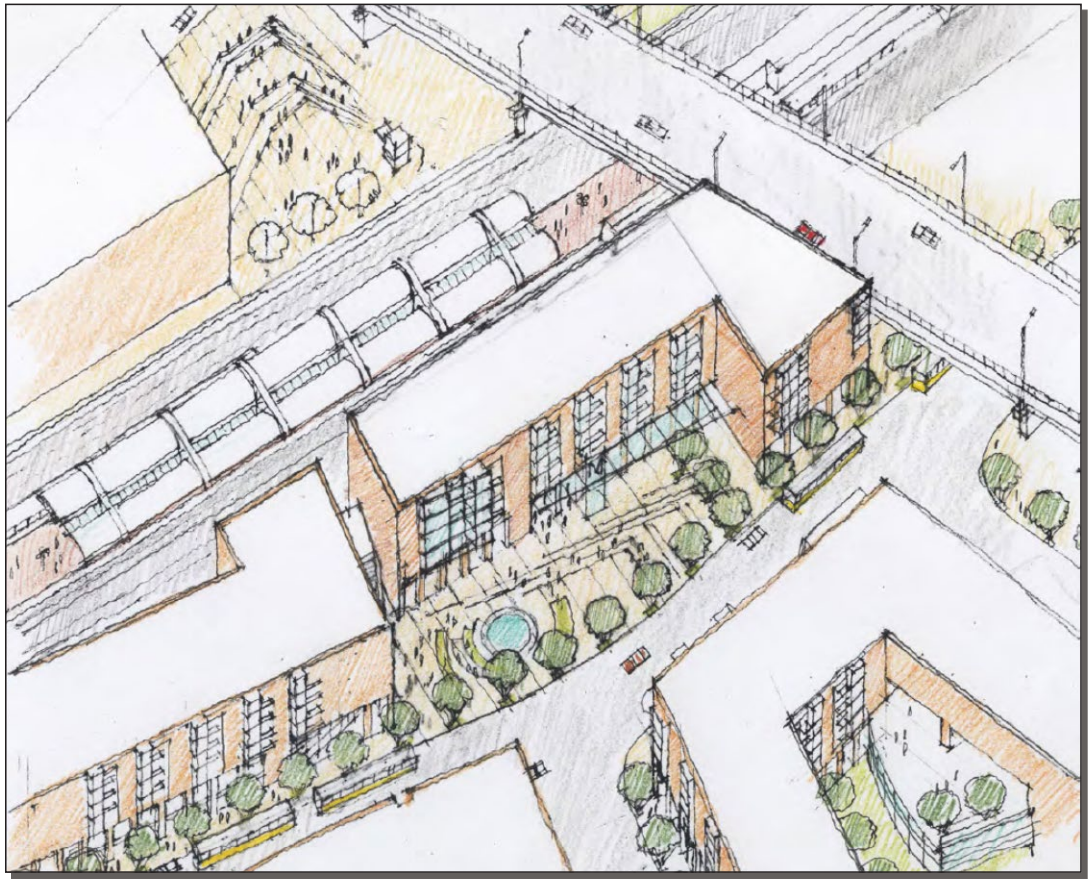
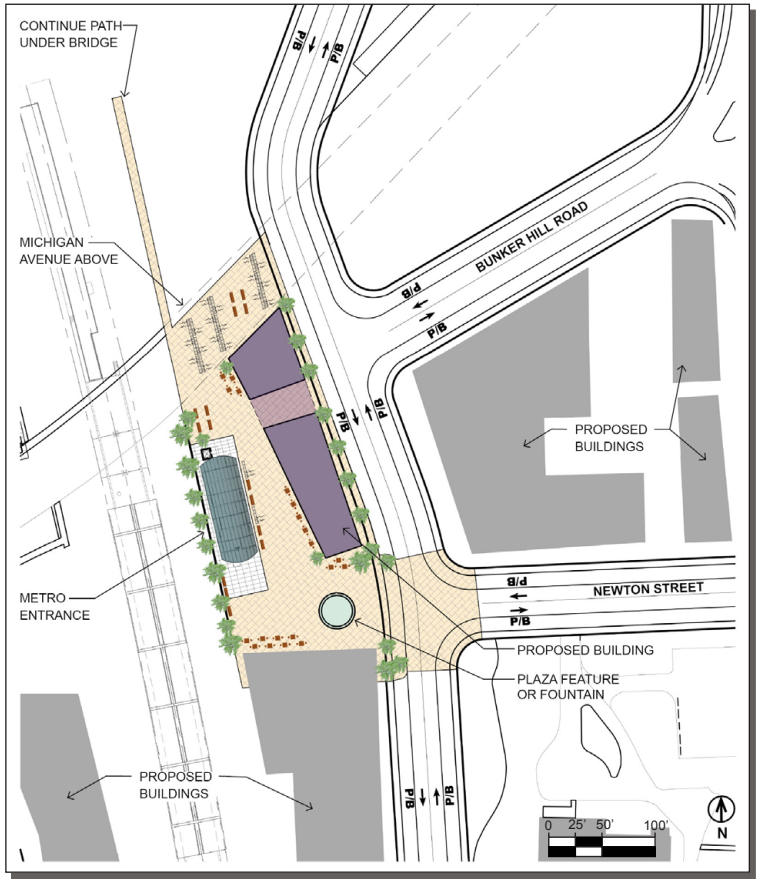
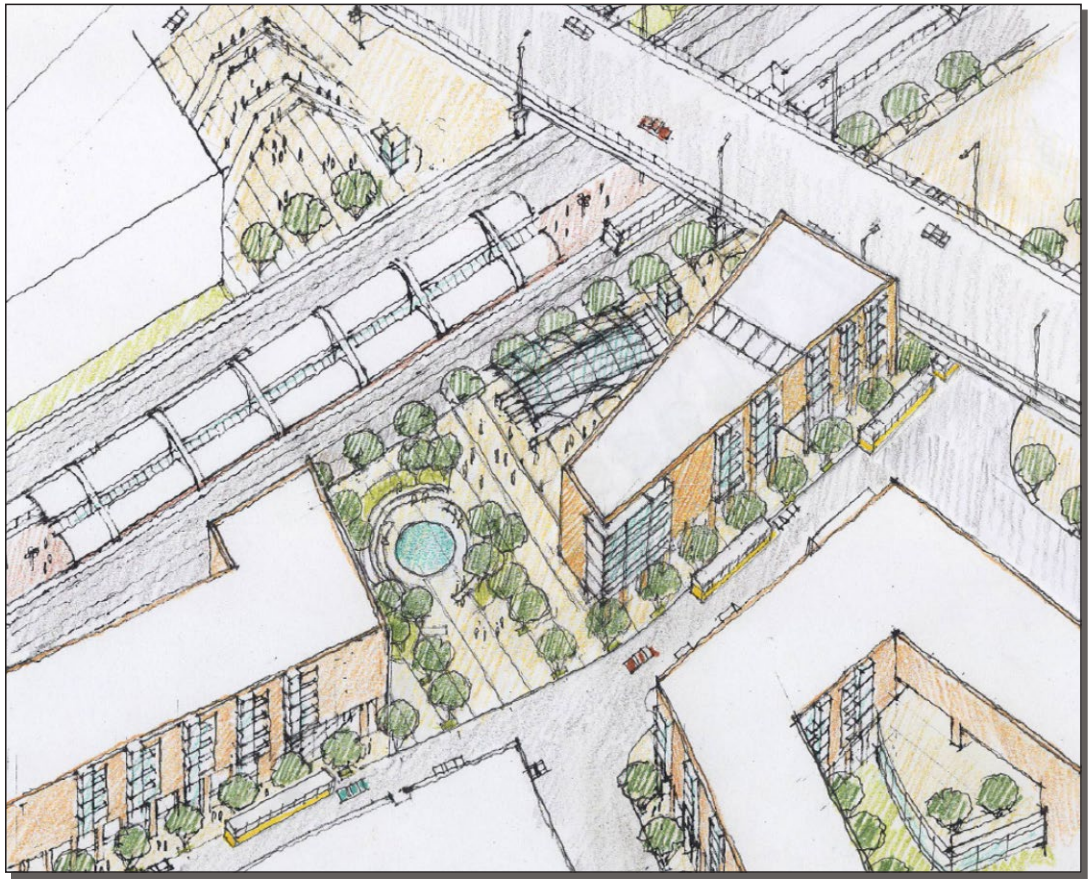


Figure 5-4 East Entrance Plaza Option 4

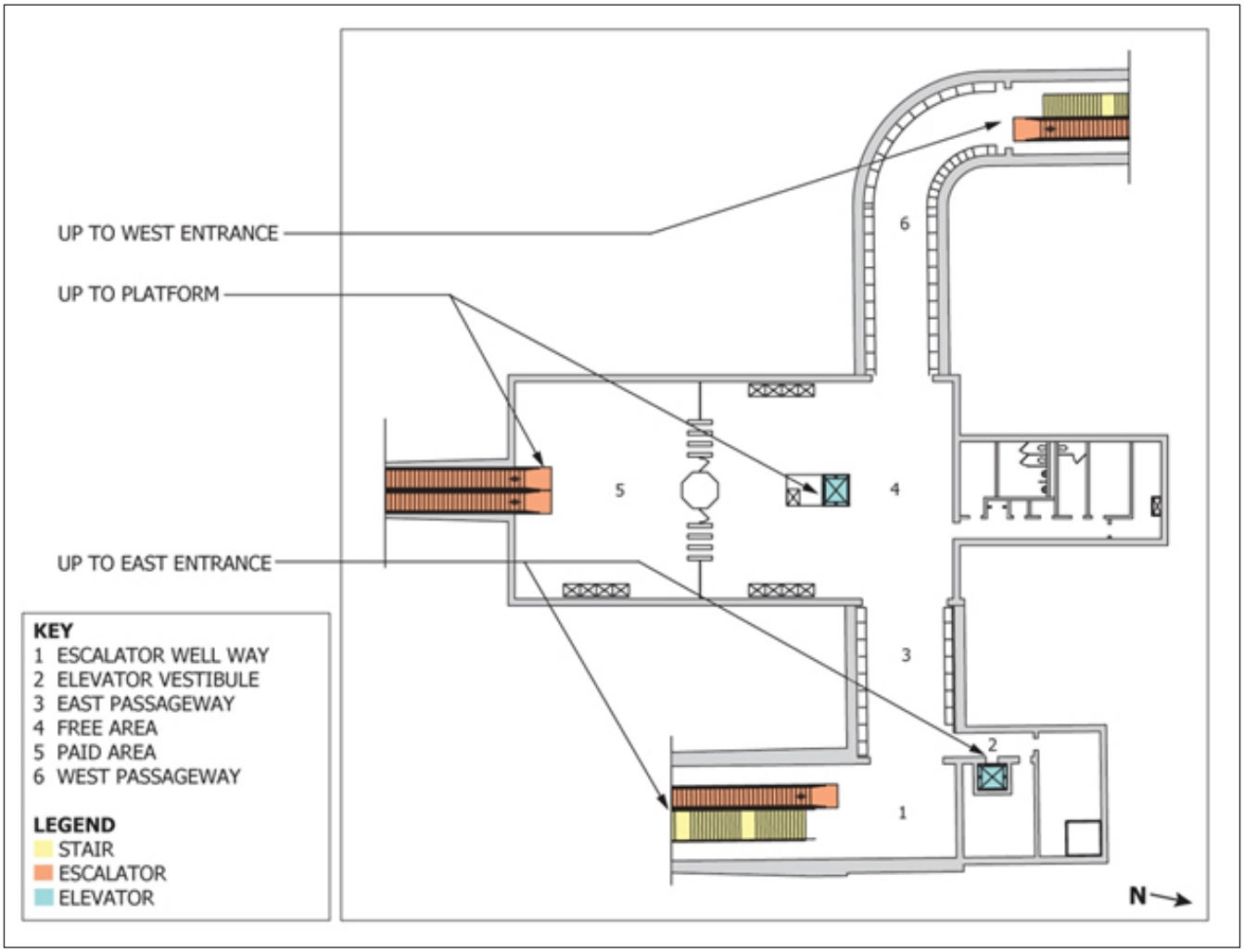




5.2
West Entrance Elevator Concept

The Small Area Plan proposed moving and realigning the west station entrance of the Brookland-CUA Metrorail station to correspond with the axis of Newton Street, which would be in a location currently occupied by the Abdo/CUA South Campus Development. An alternative that would not conflict with the South Campus Development would be to maintain the existing location of the station escalator and stair but to add an elevator, which the west entrance currently lacks. **Figure 5-5** shows the existing mezzanine level and locations of vertical circulation elements. Several options for a new elevator serving the West Entrance are described below.

Figure 5-5 Mezzanine Level Vertical Circulation



5.2.1 Initial Elevator Options

Two initial elevator location options were developed, placing the elevator away from the South Campus Development entrance plaza. **Figure 5-6** shows the approximate locations of the options with respect to the Metrorail station site, and **Appendix G** includes more detailed drawings and artist renderings.

- *Option 1* – The option places the elevator under the Michigan Avenue Bridge. At the mezzanine level, the elevator is located near the base of the stair/ escalator.
- *Option 2* – The option places the elevator to the north of the Michigan Avenue Bridge and assumes that the escalator bay will be moved further north of its existing location.

5.2.2 Refined Elevator Option

A third option for the elevator location at the west entrance was developed. At the entrance level, the elevator is located to the south of the Michigan Avenue bridge, in the plaza that will lead into the new Abdo/CUA South Campus Development and connect to pedestrian and bicycle circulation routes from the south and southwest. At the mezzanine level, the elevator is located midway along the passageway between the vertical circulation and the station mezzanine facility. The option has two alternate designs:

- *Option 3A* – The sub-option locates the elevator on just a portion of the mezzanine passageway curve to avoid as much as possible the additional structural costs associated with creating an opening in the curved portion of the wall. At the entrance level, however, the location does not take account the landscape plan for the South Campus Development plaza area. This location would partially block the proposed entrance to the MBT from the plaza area.
- *Option 3B* – The sub-option responds to the landscape plan for the South Campus Development plaza area. It shifts the elevator location out of the way of the proposed entrance to the MBT from the plaza area. At the mezzanine level, the shift in location from Option 3A requires that the elevator access be on the curve of the pedestrian passageway.

Figure 5-6 shows the approximate locations of the options with respect to the Metrorail station site, and **Appendix G** includes more detailed drawings of the mezzanine and surface level, including the relationship of the locations to the South Campus Development landscape plan.

Note that the pass-through space under Michigan Avenue near the west entrance may get heavy foot traffic from the South Campus Development, and this pedestrian circulation space should be kept as open as possible. Further design of the proposed elevator will need to be coordinated with the final design of the South Campus Development plaza and the MBT to ensure integration of each element, reduce circulation conflicts, and provide appropriate queuing space at the elevator.

As noted in Section 3, the MBT Concept Plan shows the MBT passing along the west side of the escalator/stair bay at the West Entrance. However, the preliminary recommendation of the Brookland-CUA Station Area Access Plan is that the MBT should pass along the east side of the escalator bay to minimize conflicts between through-traffic on the trail and pedestrians accessing the escalator/stair bay from either Catholic University or from the South Campus Development. In either case (MBT west or east of the escalator/stair bay); Option 3B would not obstruct the MBT.

Table 5-2 summarizes the advantages and disadvantages of the alternatives.

Figure 5-6 West Entrance Elevator Location Options

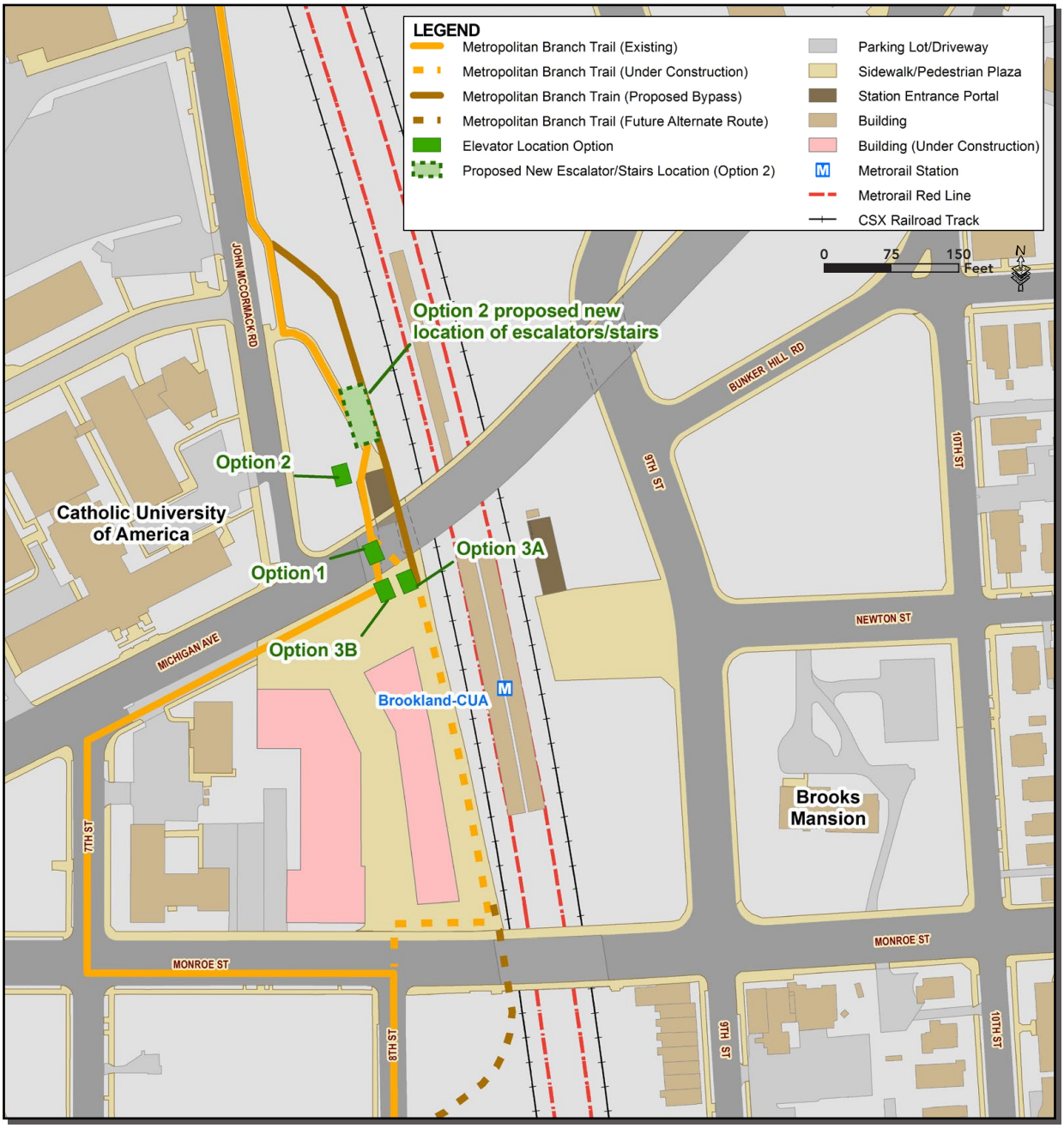
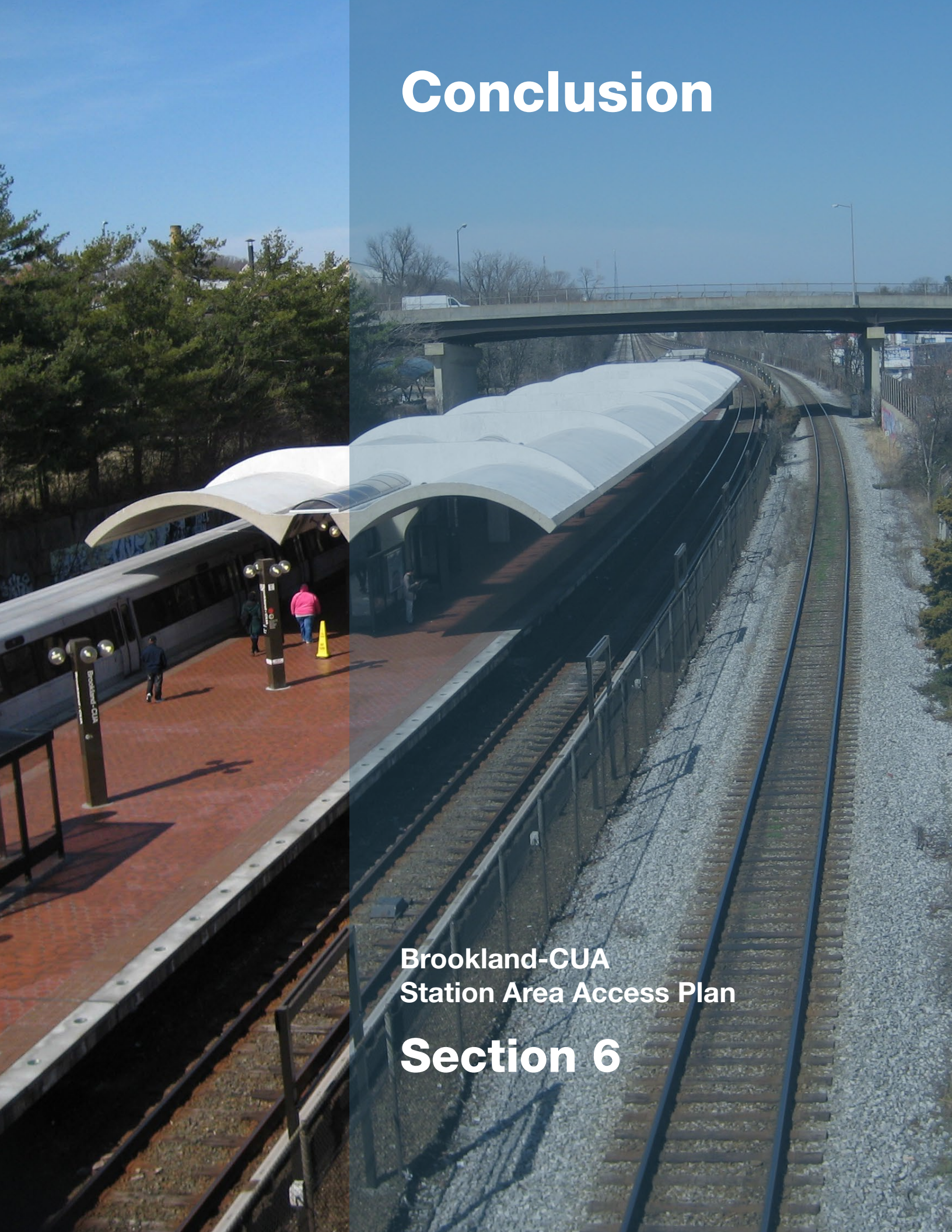


Table 5-2 Summary and Evaluation of West Entrance Elevator Options

Option	Description	Advantages	Disadvantages
Elevator Option 1	• Located under the Michigan Avenue Bridge • At the mezzanine level, the elevator is located near the base of the stair/ escalator	• At the surface level, elevator is visible from the north pathway and from the future Abdo/CUA South Campus Development • Elevator entrance is in close proximity to the stair/ escalator entrance at the surface • Construction does not require punching through the curved part of the passageway, which is more costly	• Elevator vestibule can be a safety issue • Construction may conflict with bridge foundation • At surface level, elevator blocks circulation space west of stair/escalator • Elevator entrance facing the bridge abutment feels unpleasant and confined • Elevator door at the base of stairs may be too close to landing if the stair is converted to escalator in future
Elevator Option 2	• Located north of the Michigan Avenue bridge • Assumes that the escalator bay will be moved further north	• At the surface level, elevator is visible from the north pathway and from the South Campus Development • Elevator entrance is in close proximity to the relocated stair/escalator entrance at the surface • Elevator queuing at surface level is not restricted by bridge abutment	• Elevator vestibule can be a safety issue • At surface level, elevator blocks circulation space west of stair/escalator • At mezzanine level, elevator is too close to stair/ escalator landing • Depends on costly relocation of current escalator bay
Elevator Option 3A	• Located south of the Michigan Avenue bridge, in the plaza that will lead into the new South Campus Development • At the mezzanine level, the elevator is located midway along the passageway between the stair/escalator and fare gate area	• Elevator door can be accessed directly from passageway without creating new corridors or vestibules, which can be a safety issue • Located on just a portion of the curved passageway wall to avoid additional structural costs • Elevator queuing space does not conflict with stair/ escalator landing • At surface level, elevator is located in new pedestrian plaza space and does not constrict the pass-through space under the bridge west of the stair/escalator	• At the surface level, visibility of the elevator from the north pathway is limited by the entrance canopy • Elevator entrance is farther away from stair/escalator entrance at the surface • Construction requires punching through a portion of the curved part of the passageway • At the surface level, elevator location conflicts with planned extension of the Metropolitan Branch trail
Elevator Option 3B	• Location is similar to Option 3A but takes into account the landscape plan for the South Campus Development • Elevator is shifted west several feet	• Elevator door can be accessed directly from passageway without creating new corridors • Elevator queuing vestibule is visible from stair and escalator, which has safety benefits • At surface level, elevator is located in new pedestrian plaza space, and does not constrict the pass-through space under the bridge west of the stair/escalator • Allows approx. 10 feet of clearance between elevator and CSXT tracks for the Metropolitan Branch Trail	• At the surface level, visibility of the elevator from the north pathway is limited by the entrance canopy • Elevator entrance is farther away from stair/escalator entrance at the surface • Construction requires excavating through the curved part of the passageway wall

Conclusion



Brookland-CUA
Station Area Access Plan

Section 6

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6.0 CONCLUSION

The Brookland-CUA Station Area Access Plan provides options for maintaining station access functions as redevelopment and changes to the street network occur in the vicinity of the station. Some of the recommendations of the District of Columbia's Small Area Plan for the station vicinity can be accomplished through joint development of Metro-owned station property, but other changes will depend on actions by other landowners. Thus, alternatives for bus and shuttle access and redevelopment of portions of the Brookland-CUA station site will need to take into account the actual manner in which implementation of the Small Area Plan occurs. Variations of the station access options presented in this report will need to be further developed and adapted as part of the redevelopment of Metro property. The options for an east entrance plaza accordingly are intended to be flexible, responding to different building, roadway, and bus facility configurations. Future economic development and improvements to access for all modes of travel may affect design alternatives for bus, shuttle, bicycle, pedestrian and general vehicular access.

As described in the evaluation of station access alternatives, vehicular access will need to be balanced with creating a pleasant, urban streetscape character with sufficient density close to the station east entrance and planned plaza. Continued coordination among Metro, DDOT and DCOP will be an essential component to redevelopment, implementing the District of Columbia's Small Area Plan and redeveloping Metro property in a complementary manner. The station access plan can support the transportation functions of the station and help realize the transit-oriented development potential of the station site within the Brookland neighborhood.

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Appendix

Brookland-CUA
Station Area Access Plan

Appendices A - G

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Appendix A:
ESTIMATION OF FUTURE BUS BAY FACILITY NEEDS

Methodology

To assess projected ridership growth between the current year and the planning horizon (i.e., the year 2030), the following assumptions were made:

- Average ridership growth rate of 2 percent per year on each Metrobus route[1];
- Future new "Metro Express" limited-stop bus route operating on the Metrobus Route 80 – North Capitol Street Line priority corridor; and
- Future new DC Circulator route originating at the Brookland-CUA Metrorail station and operating every ten minutes towards locations to the west.

Starting with current ridership data, the ridership on each bus route at the maximum load point by each direction of service was increased by 2 percent per year until the year 2030. The ridership was then divided by 40 (i.e., the seated capacity of a typical transit bus) to determine how many additional buses on each route would be needed during that time frame. On Metrobus Route H6, the ridership was divided by 30, as this route uses smaller buses.

Projections

On several Metrobus routes, there would already be sufficient capacity under existing service levels to handle the anticipated ridership growth by the year 2030. However, three Metrobus routes would require additional buses during the peak 15 minutes of service, and the two new routes would also add trips during the peak 15 minutes, as follows:

- Existing Northbound Metrobus Route 80 – 1 additional bus;
- Existing Eastbound Metrobus Route G8 – 1 additional bus;
- Existing Eastbound Metrobus Routes H2/H3/H4 – 2 additional buses;
- Future North Capitol Street Line Metro Express service – 4 buses (i.e., two in each direction); and
- Future DC Circulator – 2 buses (this represents a conservative estimate, as only one would require a bay in any given 15-minute period, assuming a ten-minute headway).

Therefore, ten additional bus trips were added to the 18 trips currently using the Brookland-CUA Metrorail station during the peak 15 minutes of service, resulting in an estimated 28 bus trips serving the station during the peak 15 minutes of service in the year 2030.

[1] WMATA bus planning estimate to account for planned redevelopment in Northeast District of Columbia.

Table A-1 Future Bus Bay Needs

Route/Direction		Bus Trips During Peak 15 Minutes		
		Current	Estimated Additional Trips by 2030	Total 2030 Trips
Terminal Routes	H1 Potomac Park	1	2	3
	H2/H3/H4 Crosstown Line	2	0	2
	H6 Fort Lincoln	2	0	2
	R4 Highview	1	0	1
	Proposed DC Circulator	0	2	2
Through Routes	80 Kennedy Center	2	1	3
	80 Fort Totten	2	1	3
	G8 Avondale	2	0	2
	G8 Farragut Square	2	0	2
	H8/H9 Brentwood	2	0	2
	H8/H9 Mount Pleasant	2	0	2
	Proposed Metro Express 80 NB	0	2	2
	Proposed Metro Express 80 SB	0	2	2
Total Bus Trips		**18**	**10**	**28**
Bus Minutes (assumed 4-minute dwell time X # total bus trips)				112 (28 X 4 = 112)
Estimated Bays Needed during Peak (total bus minutes ÷ 15-minute peak)				8 (112÷15 = 8)
Additional Bay for Schedule Variation				1
TOTAL BUS BAYS REQUIRED				**9**

Future Bus Bay Needs

Table A-1 lists future projected peak service levels and facility needs.

Assuming a dwell time of approximately four minutes for each bus, about eight bus bays would be needed. To allow for possible schedule variations in the bus service, an additional bay is recommended so that there is some operational flexibility. Therefore, nine bus bays are proposed for the Brookland-CUA Metrorail station – the same number as exist currently at the facility. This requirement for nine bus bays in the year 2030 assumes that buses would take layover in their bays[2] and that private shuttle routes are not utilizing these bus bays.[3]

Approximately four or five of these nine bus bays should be sized to accommodate an articulated bus; this would allow for future use of larger buses on some key Metrobus corridors based on Metro bus planning assumptions for potential future service needs. The nine bays should be located as closely to each other and the station entrance as possible to minimize walking distances for both Metrorail and Metrobus-to-Metrobus transfers.

[2] The assumption is based on the Small Area Plan's proposed relocation of the bus bays to on-street stops adjacent to new retail and residential development, which would not be suitable locations for bus layover activities, described further in the following section.

[3] WMATA policy currently does not allow use of its bus facilities by private shuttle providers.

Table A-2 Future Bus Facility Needs and Circulation Direction

Route/Direction		Bus Bay in Current Facility	Estimated Facility Needs		
			Terminal Routes in Off-Street Facility Option	On-Street Stops Option	Off-Street Facility Option
Terminal Routes	H1 Potomac Park	C	4 off-street bays	4 bays southbound through study area 5 bays northbound through study area	9 off-street bays
	H2/H3/H4 Crosstown Line	B			
	H6 Fort Lincoln	C			
	R4 Highview	A			
	Proposed D.C. Circulator	--			
Through Routes	80 Kennedy Center	J	2 bays southbound through study area 3 bays northbound through study area		
	80 Fort Totten	E			
	G8 Avondale	H			
	G8 Farragut Square	D			
	H8/H9 Brentwood	G			
	H8/H9 Mount Pleasant	F			
	Proposed Metro Express 80 NB	--			
	Proposed Metro Express 80 SB	--			
Total Revenue Service Bays		**9**	**9**	**9**	**9**
Total Layover Spaces		**3**	**7**	**7**	**7**
TOTAL BUS SPACES		**12**	**16**	**16**	**16**

Future Facility Needs for On-Street and Off-Street Facilities

Table A-2 summarizes the bus bay and layover needs with regard to the direction of service of each bus route. A preliminary analysis of the existing bus route alignments near the Brookland-CUA Metrorail station indicates that the nine bus bays should be divided by direction of service. Assuming that the bus bays are arranged along 9th Street, four bays (including two bays able to accommodate articulated buses) should be placed southbound along 9th Street, and five bays (including two or three bays able to accommodate articulated buses) should be placed northbound along 9th Street.

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Appendix B:
POTENTIAL BUS RE-ROUTING

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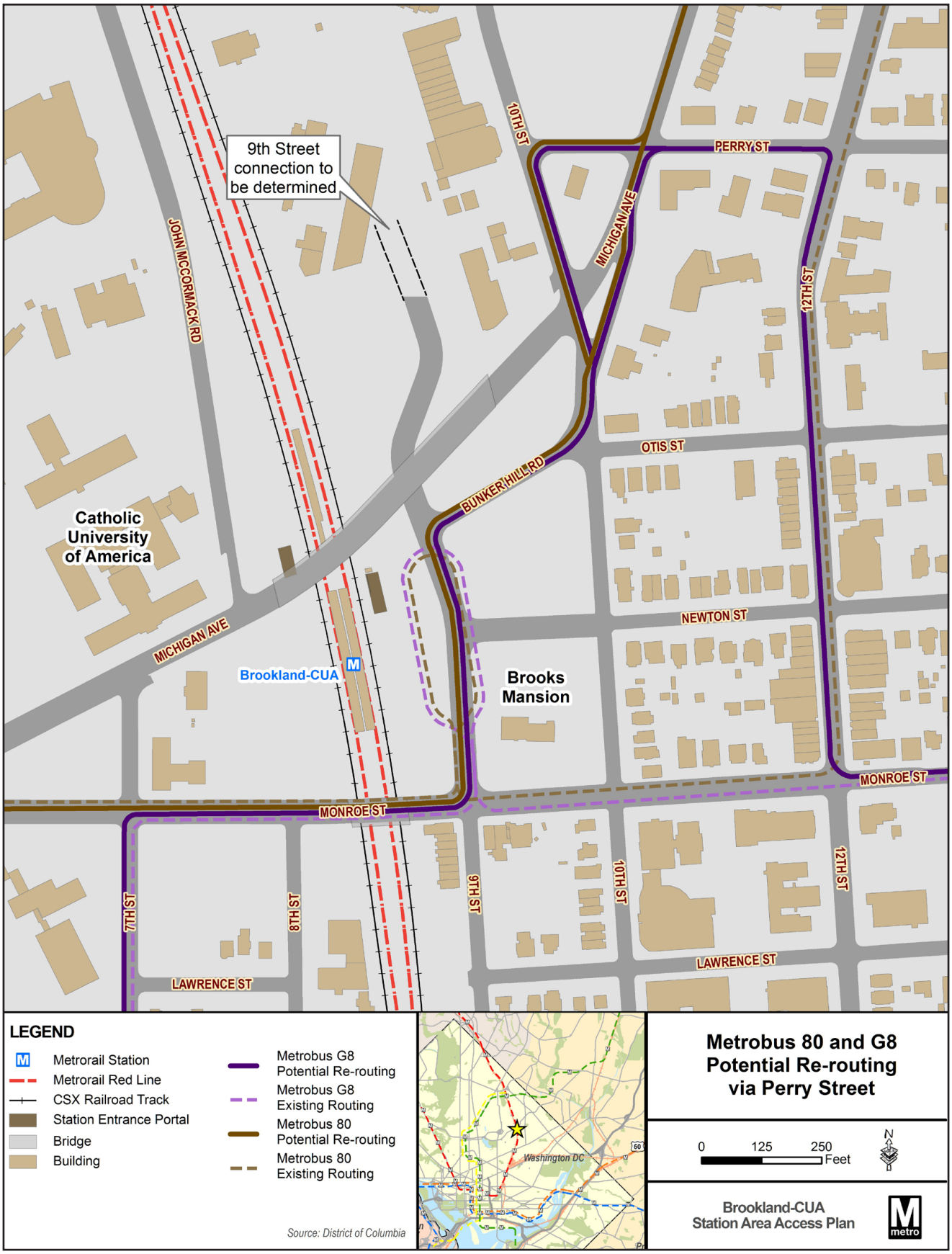
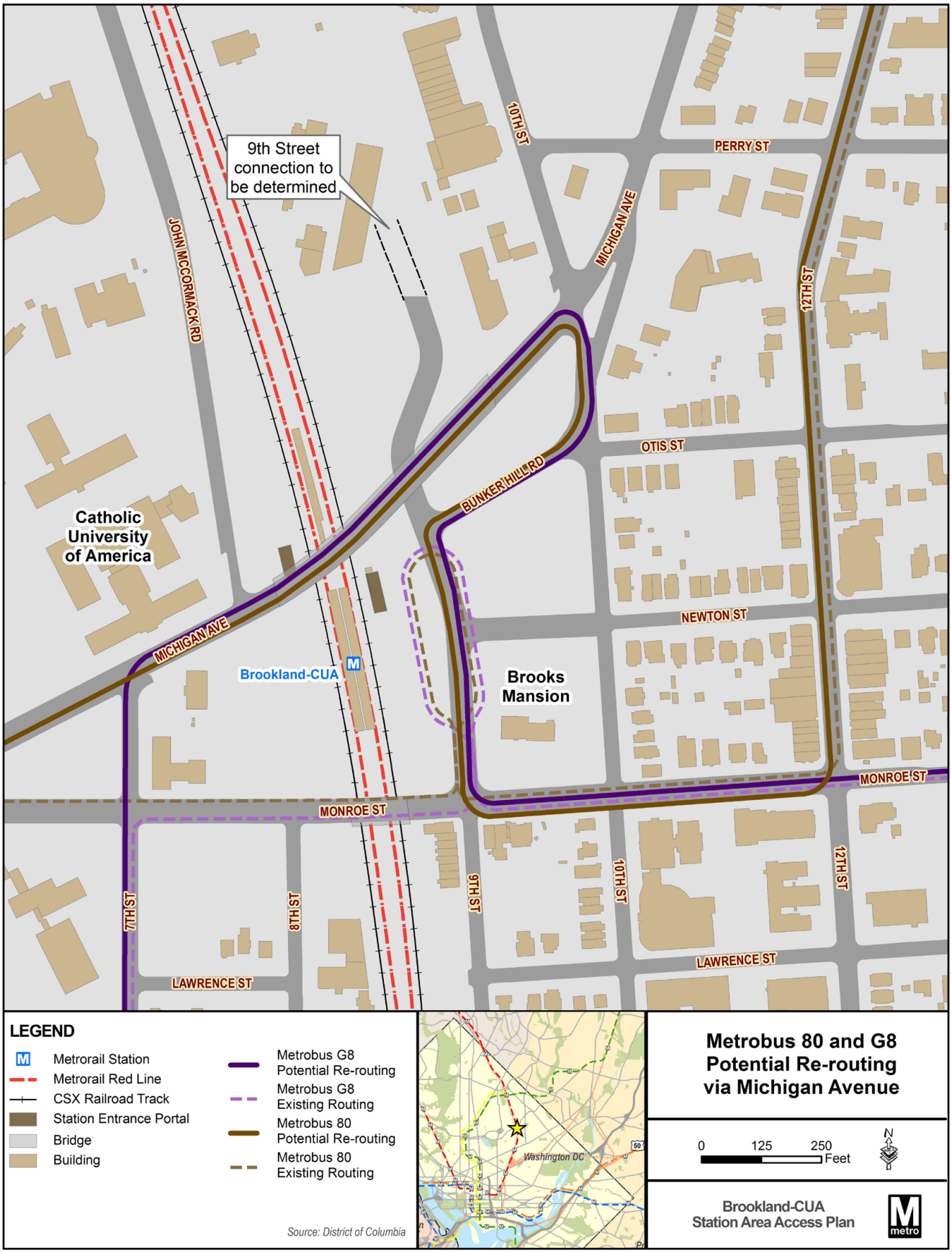

9th Street connection to be determined
JOHN MCCORMACK RD
10TH ST
PERRY ST
MICHIGAN AVE
12TH ST
OTIS ST
BUNKER HILL RD
Catholic University of America
NEWTON ST
MICHIGAN AVE
Brookland-CUA
Brooks Mansion
MONROE ST
MONROE ST
7TH ST
8TH ST
9TH ST
10TH ST
12TH ST
LAWRENCE ST
LAWRENCE ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Bridge
Building
Metrobus G8 Potential Re-routing
Metrobus G8 Existing Routing
Metrobus 80 Potential Re-routing
Metrobus 80 Existing Routing
Source: District of Columbia
Washington DC
Metrobus 80 and G8 Potential Re-routing via Perry Street
0
125
250
Feet
N
Brookland-CUA Station Area Access Plan


9th Street connection to be determined
JOHN MCCORMACK RD
10TH ST
PERRY ST
MICHIGAN AVE
12TH ST
OTIS ST
BUNKER HILL RD
Catholic University of America
NEWTON ST
MICHIGAN AVE
Brookland-CUA
Brooks Mansion
MONROE ST
MONROE ST
7TH ST
8TH ST
9TH ST
10TH ST
12TH ST
LAWRENCE ST
LAWRENCE ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Bridge
Building
Metrobus G8 Potential Re-routing
Metrobus G8 Existing Routing
Metrobus 80 Potential Re-routing
Metrobus 80 Existing Routing
Source: District of Columbia
Washington DC
Metrobus 80 and G8 Potential Re-routing via Michigan Avenue
0 125 250 Feet
N
Brookland-CUA Station Area Access Plan

Appendix C:
OFF-STREET BUS FACILITY ALTERNATIVE 1 CIRCULATION AND FACILITY NEEDS

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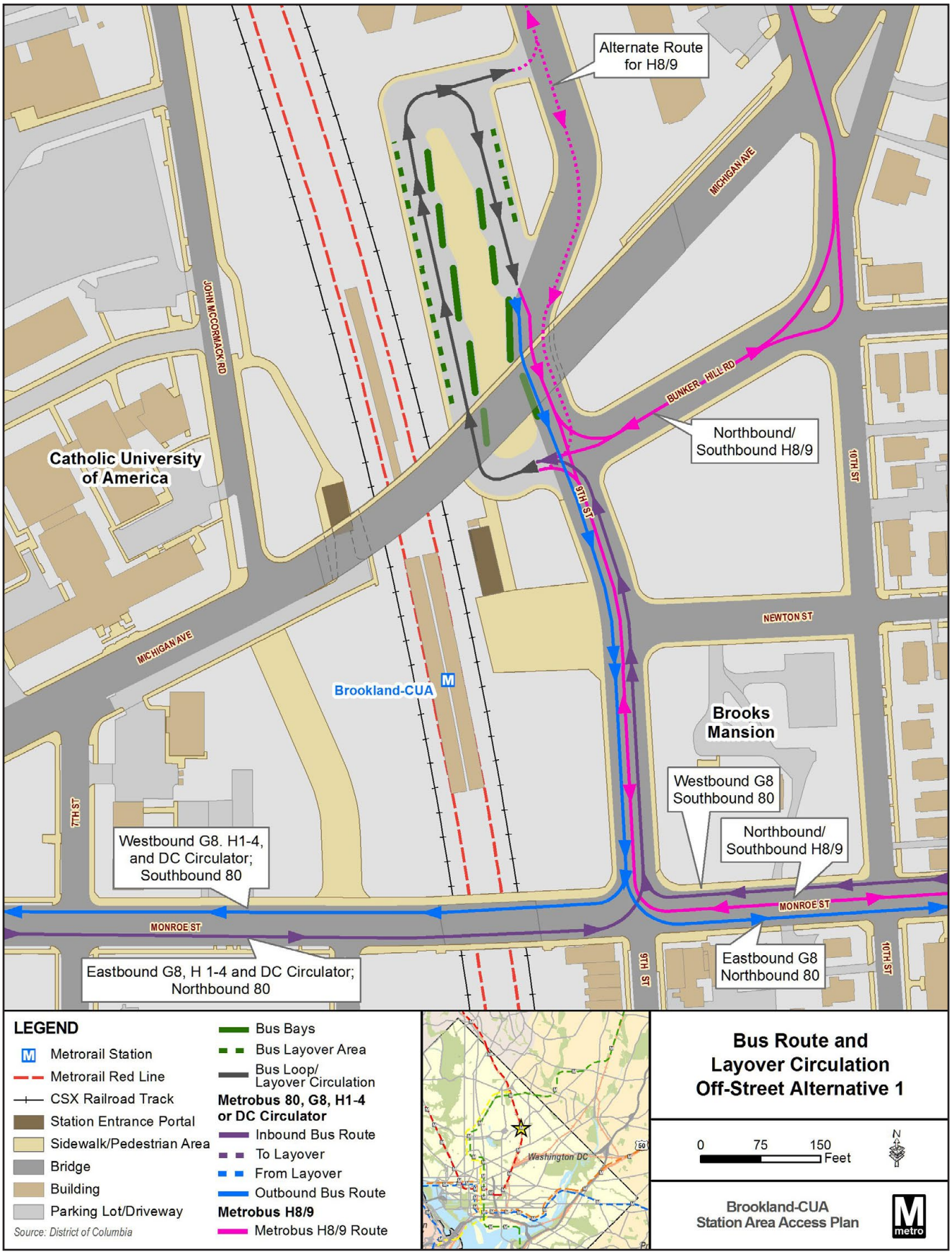
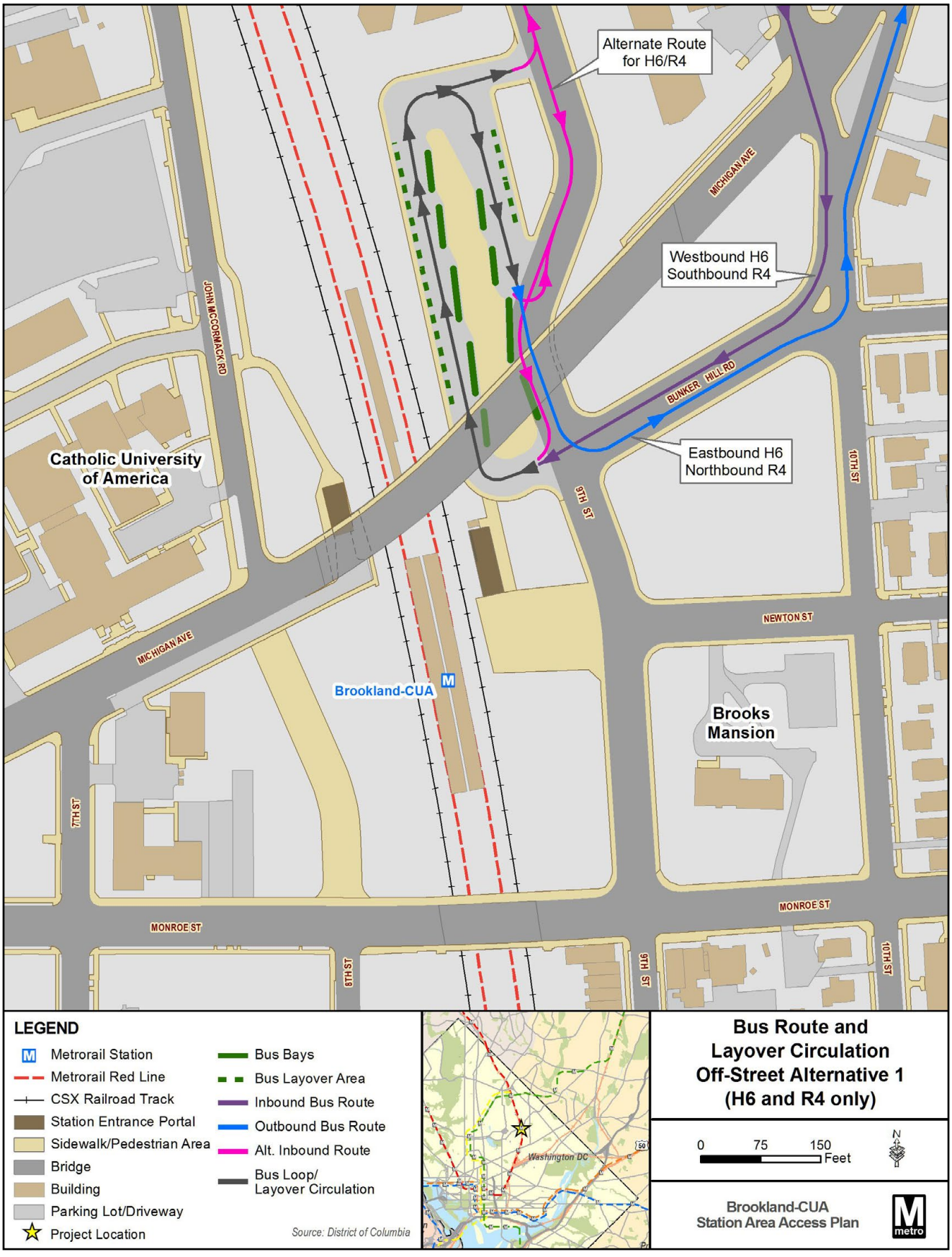
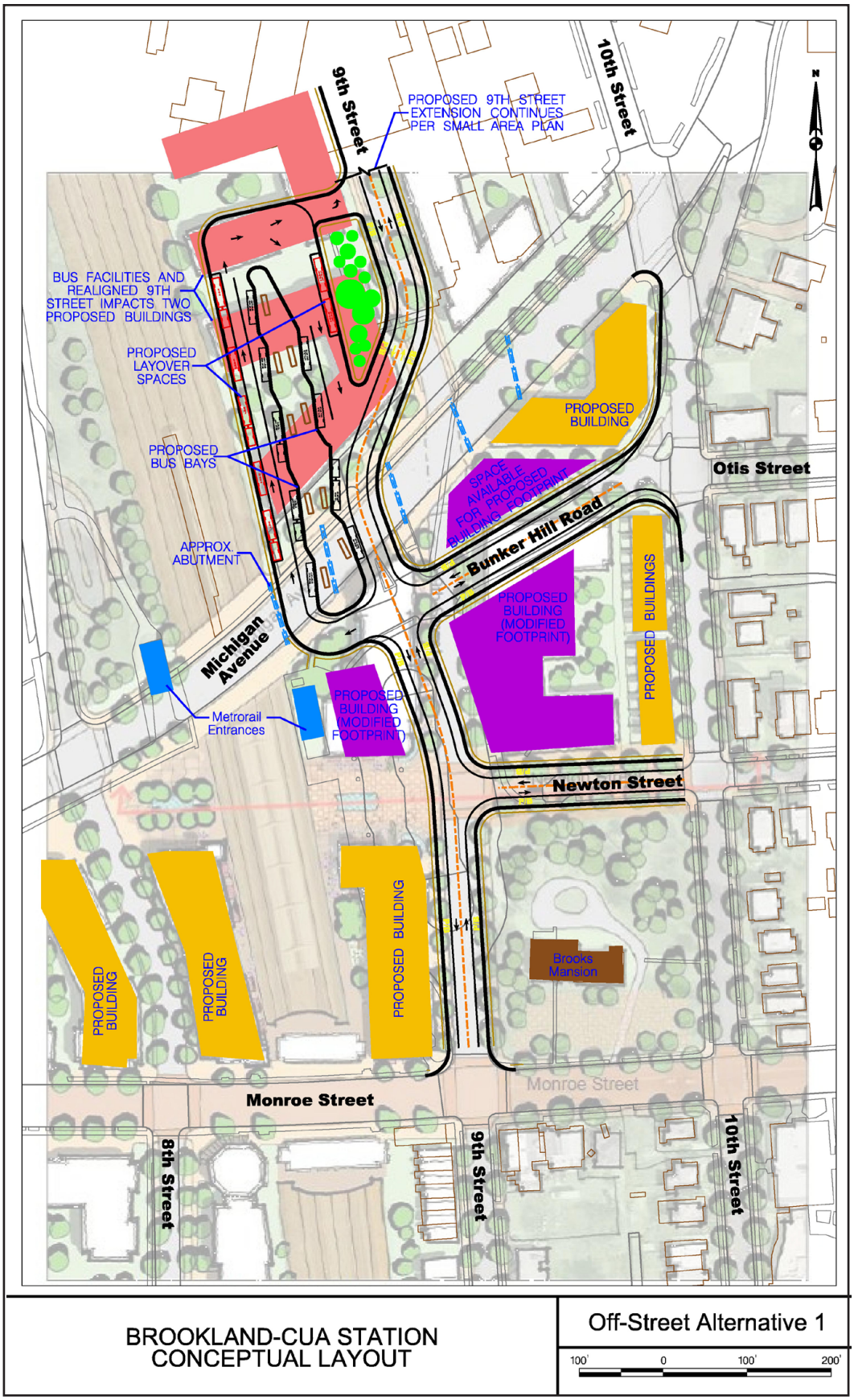

Alternate Route for H8/9
MICHIGAN AVE
JOHN MCCORMACK RD
BUNKER HILL RD
Northbound/ Southbound H8/9
Catholic University of America
9TH ST
10TH ST
NEWTON ST
MICHIGAN AVE
Brookland-CUA
Brooks Mansion
Westbound G8 Southbound 80
Northbound/ Southbound H8/9
7TH ST
Westbound G8. H1-4, and DC Circulator; Southbound 80
MONROE ST
MONROE ST
Eastbound G8, H 1-4 and DC Circulator; Northbound 80
6TH ST
Eastbound G8 Northbound 80
10TH ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Sidewalk/Pedestrian Area
Bridge
Building
Parking Lot/Driveway
Source: District of Columbia
Bus Bays
Bus Layover Area
Bus Loop/ Layover Circulation
Metrobus 80, G8, H1-4 or DC Circulator
Inbound Bus Route
To Layover
From Layover
Outbound Bus Route
Metrobus H8/9
Metrobus H8/9 Route
Washington DC
Bus Route and Layover Circulation Off-Street Alternative 1
0 75 150 Feet
N
Brookland-CUA Station Area Access Plan


Alternate Route for H6/R4
Westbound H6 Southbound R4
Eastbound H6 Northbound R4
Catholic University of America
Brookland-CUA
Brooks Mansion
MICHIGAN AVE
JOHN MCCORMACK RD
BUNKER HILL RD
9TH ST
10TH ST
NEWTON ST
MONROE ST
7TH ST
8TH ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Sidewalk/Pedestrian Area
Bridge
Building
Parking Lot/Driveway
Project Location
Bus Bays
Bus Layover Area
Inbound Bus Route
Outbound Bus Route
Alt. Inbound Route
Bus Loop/ Layover Circulation
Source: District of Columbia
Washington DC
Bus Route and Layover Circulation Off-Street Alternative 1 (H6 and R4 only)
0 75 150 Feet
N
Brookland-CUA Station Area Access Plan


9th Street
10th Street
PROPOSED 9TH STREET EXTENSION CONTINUES PER SMALL AREA PLAN
BUS FACILITIES AND REALIGNED 9TH STREET IMPACTS TWO PROPOSED BUILDINGS
PROPOSED LAYOVER SPACES
PROPOSED BUS BAYS
APPROX. ABUTMENT
PROPOSED BUILDING
SPACE AVAILABLE FOR PROPOSED BUILDING FOOTPRINT
Otis Street
Bunker Hill Road
PROPOSED BUILDING (MODIFIED FOOTPRINT)
PROPOSED BUILDINGS
Michigan Avenue
Metrorail Entrances
PROPOSED BUILDING (MODIFIED FOOTPRINT)
Newton Street
PROPOSED BUILDING
PROPOSED BUILDING
PROPOSED BUILDING
Brooks Mansion
Monroe Street
Monroe Street
8th Street
9th Street
10th Street
BROOKLAND-CUA STATION CONCEPTUAL LAYOUT
Off-Street Alternative 1
100' 0 100' 200'

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Appendix D:
OFF-STREET BUS FACILITY ALTERNATIVE 2 CIRCULATION AND FACILITY NEEDS

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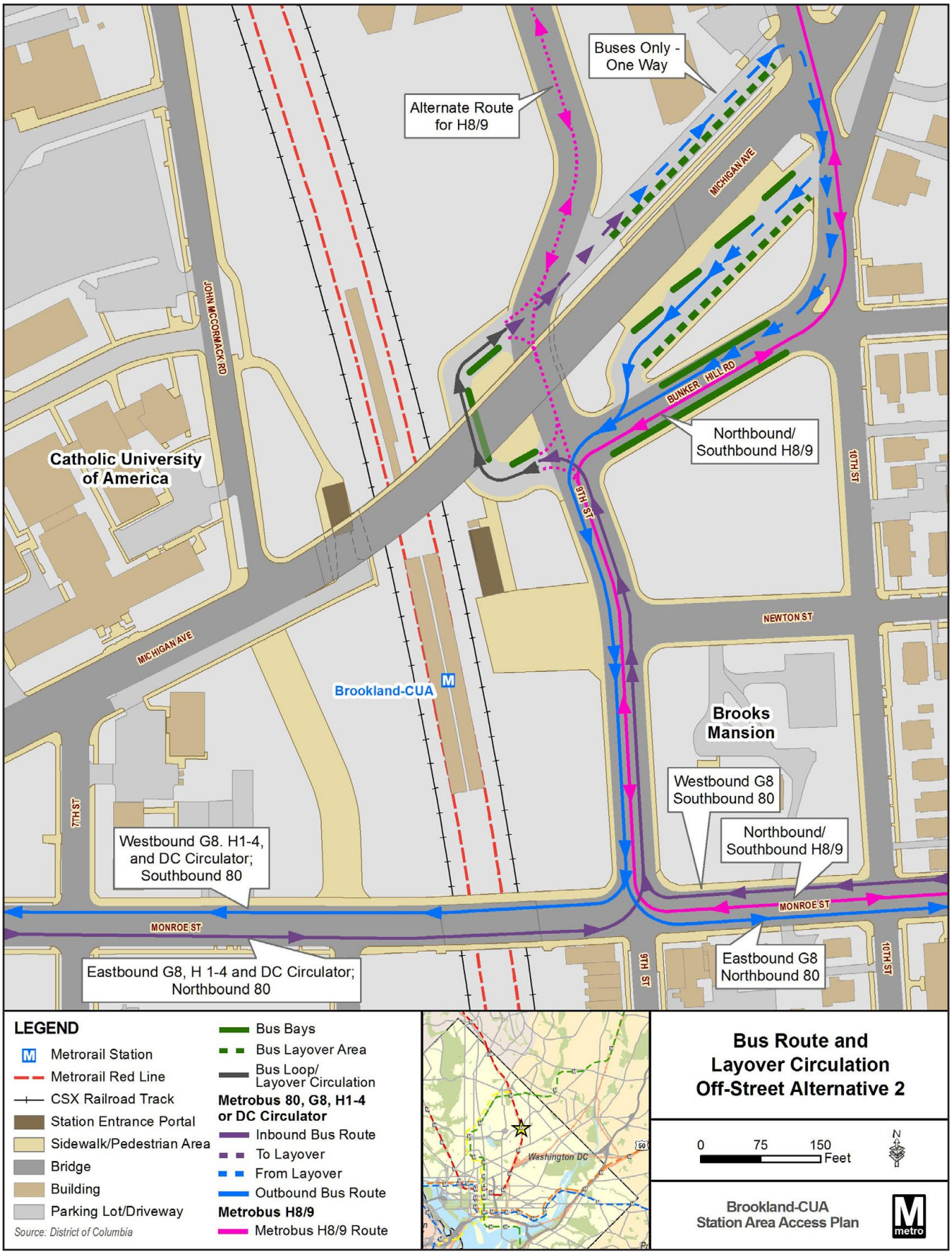
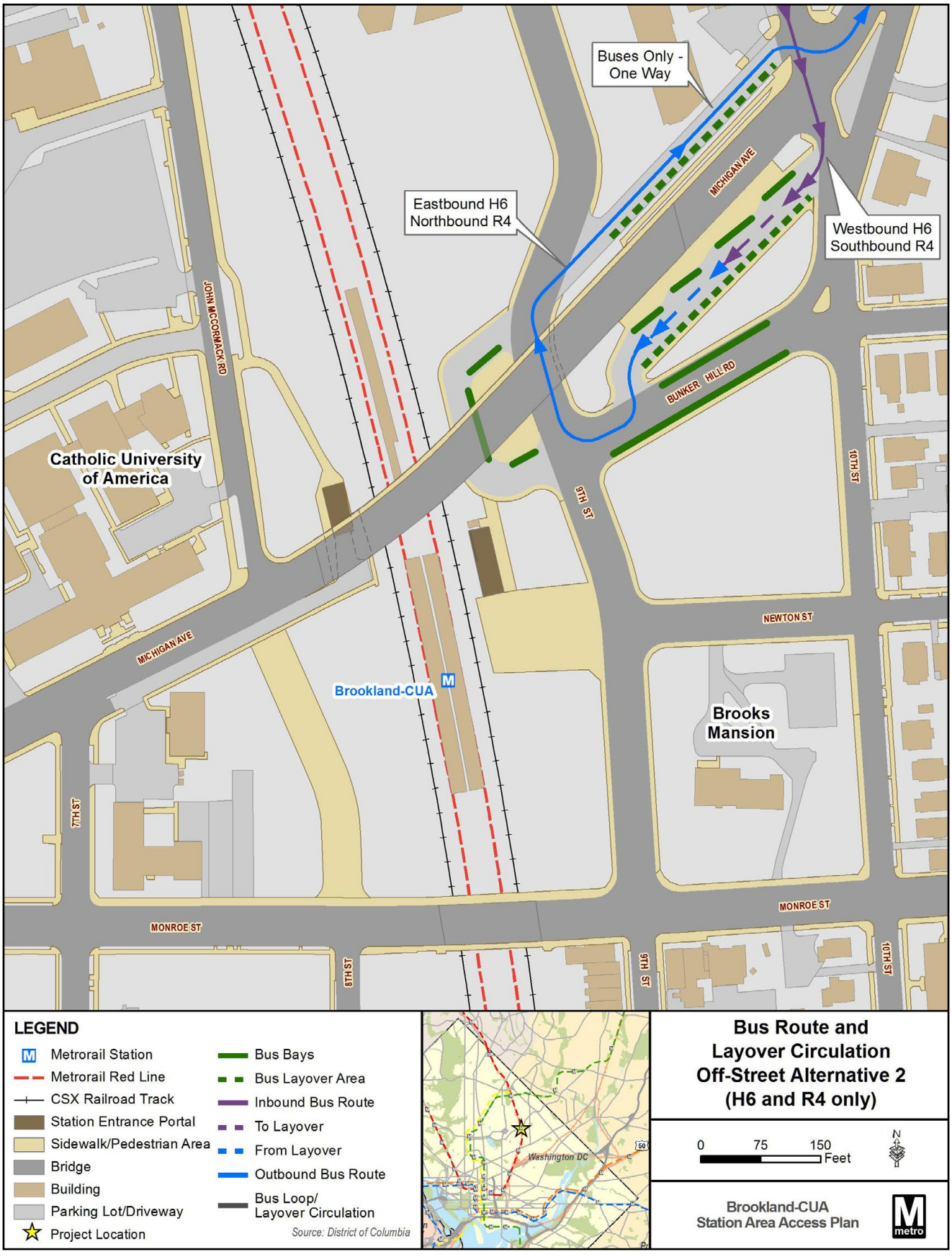
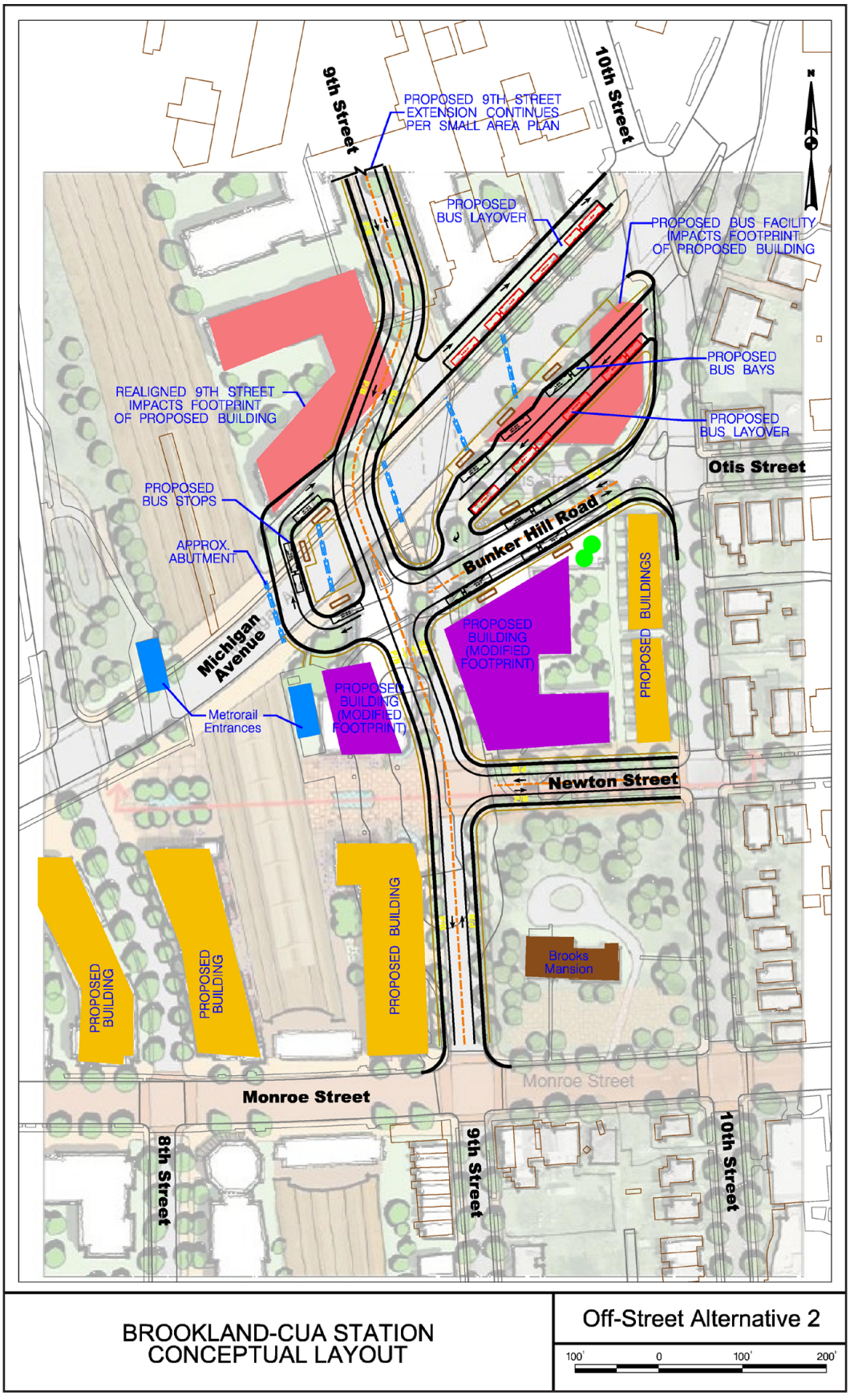

Buses Only - One Way
Alternate Route for H8/9
MICHIGAN AVE
JOHN MCCORMACK RD
BUNKER HILL RD
Northbound/ Southbound H8/9
Catholic University of America
9TH ST
10TH ST
NEWTON ST
MICHIGAN AVE
Brookland-CUA
Brooks Mansion
Westbound G8 Southbound 80
Northbound/ Southbound H8/9
7TH ST
Westbound G8. H1-4, and DC Circulator; Southbound 80
MONROE ST
MONROE ST
Eastbound G8, H 1-4 and DC Circulator; Northbound 80
9TH ST
Eastbound G8 Northbound 80
10TH ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Sidewalk/Pedestrian Area
Bridge
Building
Parking Lot/Driveway
Source: District of Columbia
Bus Bays
Bus Layover Area
Bus Loop/ Layover Circulation
Metrobus 80, G8, H1-4 or DC Circulator
Inbound Bus Route
To Layover
From Layover
Outbound Bus Route
Metrobus H8/9
Metrobus H8/9 Route
Washington DC
Bus Route and Layover Circulation Off-Street Alternative 2
0 75 150 Feet
N
Brookland-CUA Station Area Access Plan


Buses Only - One Way
Eastbound H6 Northbound R4
Westbound H6 Southbound R4
MICHIGAN AVE
JOHN MCCORMACK RD
BUNKER HILL RD
Catholic University of America
9TH ST
10TH ST
NEWTON ST
MICHIGAN AVE
Brookland-CUA
Brooks Mansion
7TH ST
MONROE ST
MONROE ST
8TH ST
9TH ST
10TH ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Sidewalk/Pedestrian Area
Bridge
Building
Parking Lot/Driveway
Project Location
Bus Bays
Bus Layover Area
Inbound Bus Route
To Layover
From Layover
Outbound Bus Route
Bus Loop/ Layover Circulation
Source: District of Columbia
Washington DC
Bus Route and Layover Circulation Off-Street Alternative 2 (H6 and R4 only)
0
75
150
Feet
N
Brookland-CUA Station Area Access Plan


9th Street
10th Street
PROPOSED 9TH STREET EXTENSION CONTINUES PER SMALL AREA PLAN
PROPOSED BUS LAYOVER
PROPOSED BUS FACILITY IMPACTS FOOTPRINT OF PROPOSED BUILDING
PROPOSED BUS BAYS
PROPOSED BUS LAYOVER
REALIGNED 9TH STREET IMPACTS FOOTPRINT OF PROPOSED BUILDING
Otis Street
PROPOSED BUS STOPS
APPROX. ABUTMENT
Bunker Hill Road
PROPOSED BUILDINGS
PROPOSED BUILDING (MODIFIED FOOTPRINT)
Michigan Avenue
Metrorail Entrances
PROPOSED BUILDING (MODIFIED FOOTPRINT)
Newton Street
PROPOSED BUILDING
PROPOSED BUILDING
PROPOSED BUILDING
Brooks Mansion
Monroe Street
Monroe Street
8th Street
9th Street
10th Street
BROOKLAND-CUA STATION CONCEPTUAL LAYOUT
Off-Street Alternative 2
100' 0 100' 200'

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Appendix E:
OFF-STREET BUS FACILITY ALTERNATIVE 3 CIRCULATION AND FACILITY NEEDS

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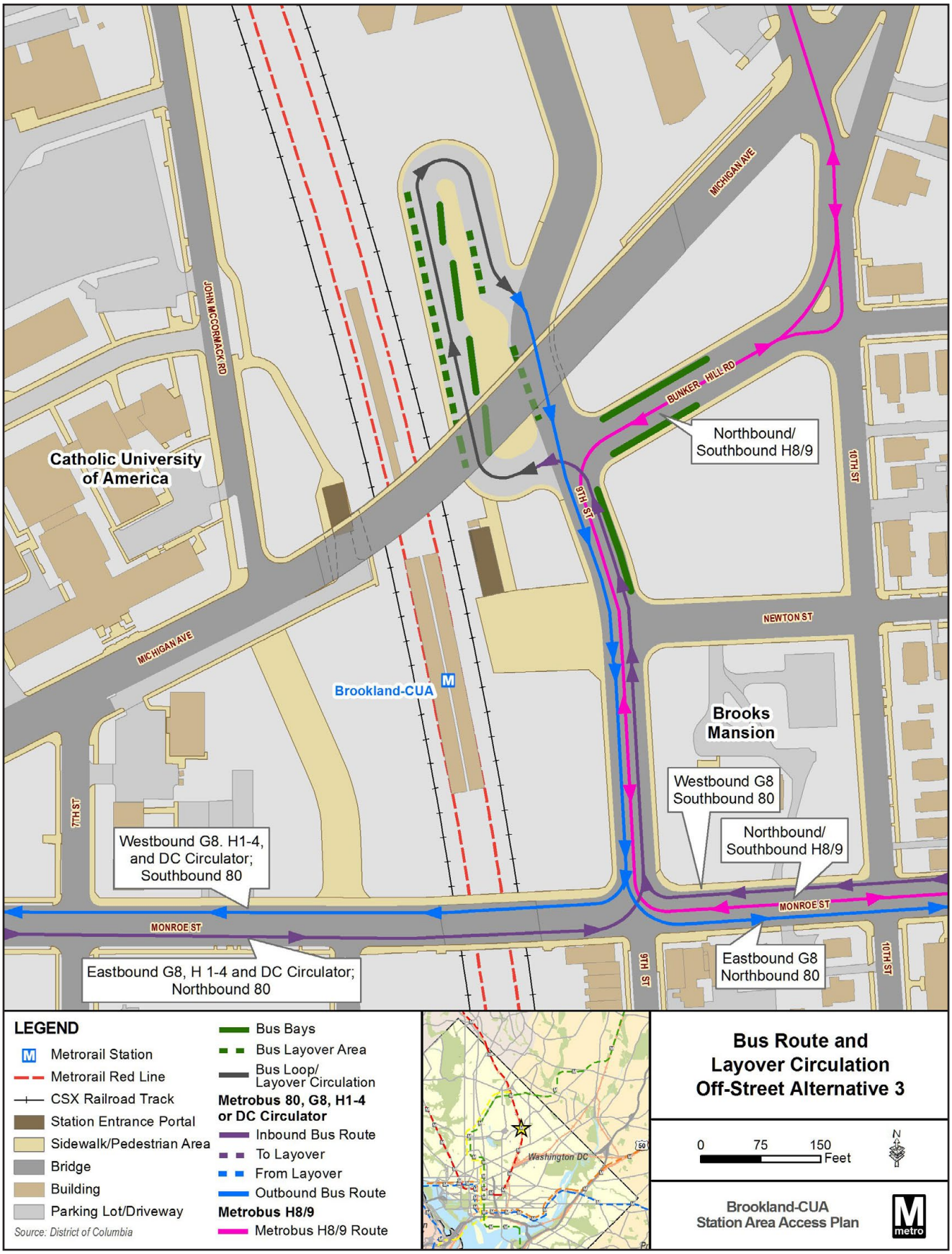
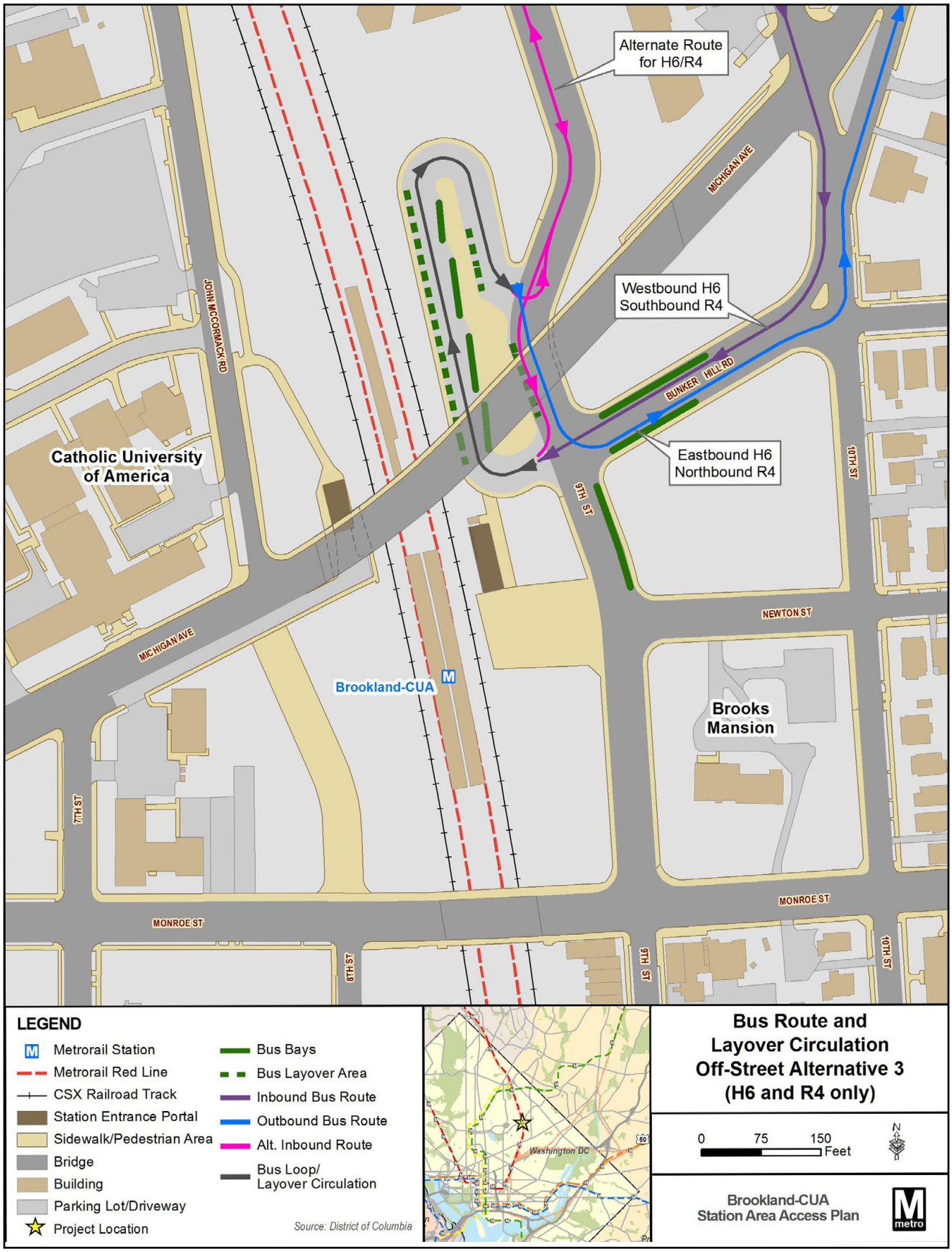
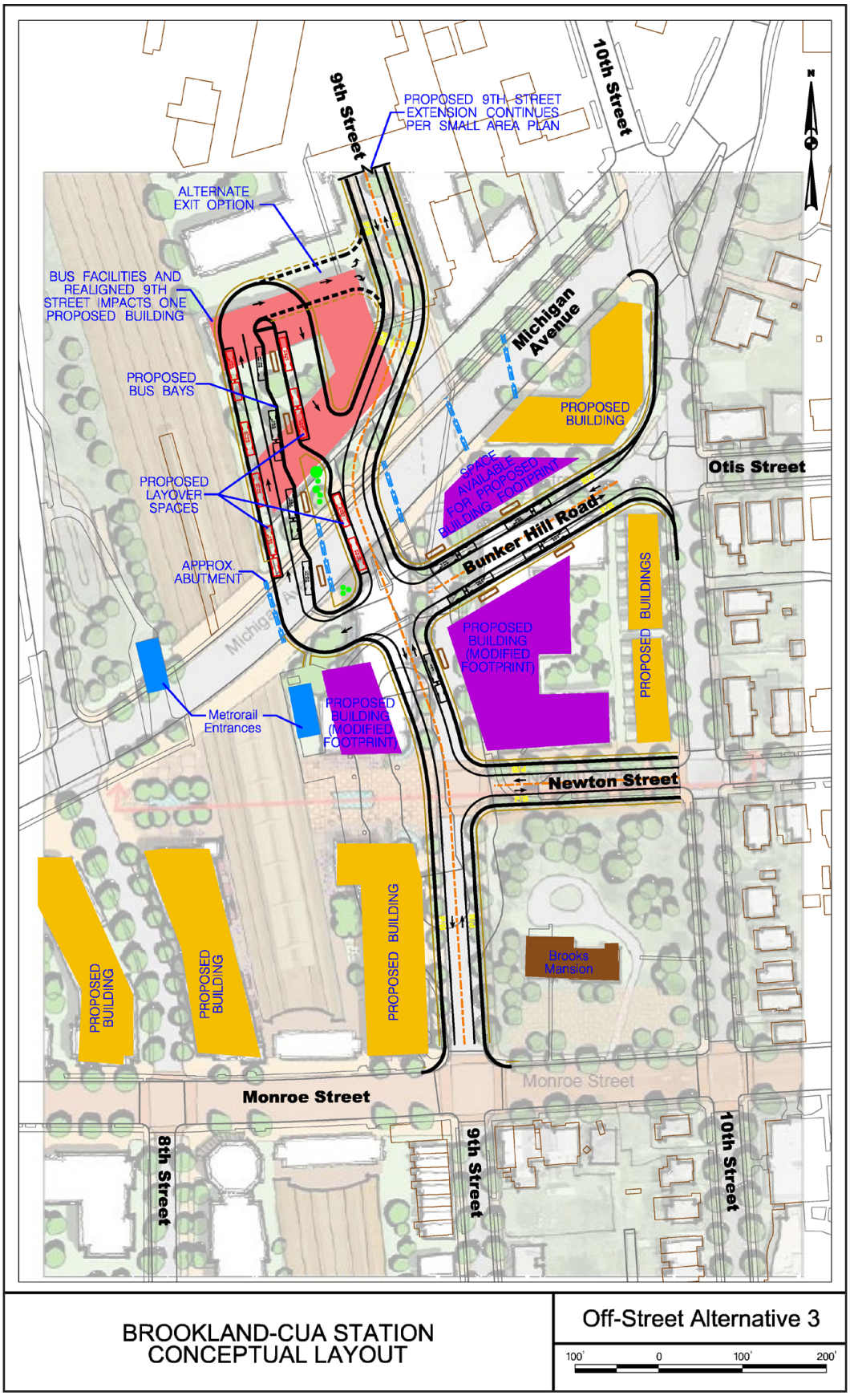

Catholic University of America
JOHN MCCORMACK RD
MICHIGAN AVE
BUNKER HILL RD
Northbound/ Southbound H8/9
10TH ST
9TH ST
NEWTON ST
Brookland-CUA
Brooks Mansion
Westbound G8 Southbound 80
Northbound/ Southbound H8/9
7TH ST
Westbound G8. H1-4, and DC Circulator; Southbound 80
MONROE ST
Eastbound G8, H 1-4 and DC Circulator; Northbound 80
Eastbound G8 Northbound 80
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Sidewalk/Pedestrian Area
Bridge
Building
Parking Lot/Driveway
Source: District of Columbia
Bus Bays
Bus Layover Area
Bus Loop/ Layover Circulation
Metrobus 80, G8, H1-4 or DC Circulator
Inbound Bus Route
To Layover
From Layover
Outbound Bus Route
Metrobus H8/9
Metrobus H8/9 Route
Washington DC
Bus Route and Layover Circulation Off-Street Alternative 3
0 75 150 Feet
N
Brookland-CUA Station Area Access Plan


Alternate Route for H6/R4
Westbound H6 Southbound R4
Eastbound H6 Northbound R4
Catholic University of America
Brookland-CUA
Brooks Mansion
MICHIGAN AVE
JOHN MCCORMACK RD
BUNKER HILL RD
NEWTON ST
MONROE ST
7TH ST
8TH ST
9TH ST
10TH ST
LEGEND
Metrorail Station
Metrorail Red Line
CSX Railroad Track
Station Entrance Portal
Sidewalk/Pedestrian Area
Bridge
Building
Parking Lot/Driveway
Project Location
Bus Bays
Bus Layover Area
Inbound Bus Route
Outbound Bus Route
Alt. Inbound Route
Bus Loop/ Layover Circulation
Source: District of Columbia
Washington DC
Bus Route and Layover Circulation Off-Street Alternative 3 (H6 and R4 only)
0 75 150 Feet
N
Brookland-CUA Station Area Access Plan


9th Street
10th Street
PROPOSED 9TH STREET EXTENSION CONTINUES PER SMALL AREA PLAN
ALTERNATE EXIT OPTION
BUS FACILITIES AND REALIGNED 9TH STREET IMPACTS ONE PROPOSED BUILDING
PROPOSED BUS BAYS
PROPOSED LAYOVER SPACES
APPROX ABUTMENT
Michigan Avenue
PROPOSED BUILDING
SPACE AVAILABLE FOR PROPOSED BUILDING FOOTPRINT
Otis Street
Bunker Hill Road
PROPOSED BUILDINGS
PROPOSED BUILDING (MODIFIED FOOTPRINT)
Metrorail Entrances
PROPOSED BUILDING (MODIFIED FOOTPRINT)
Newton Street
PROPOSED BUILDING
PROPOSED BUILDING
PROPOSED BUILDING
Brooks Mansion
Monroe Street
Monroe Street
8th Street
9th Street
10th Street
BROOKLAND-CUA STATION CONCEPTUAL LAYOUT
Off-Street Alternative 3
100' 0 100' 200'

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Appendix F:
DETAILED CONCEPTUAL COST ESTIMATES BY ALTERNATIVE

Table F-1 On-Street Bus Stops Alternative (Options A and B) Conceptual Cost Estimate

Description of Improvements	Unit Price	Unit	Quantity	Raw Total
Sidewalks (Concrete)	$ 15	SF	-	-
Continuous Concrete Bus Pad	$ 85	SY	-	-
Road Pavement (Asphalt)	$ 160	TON	-	-
Bus Shelters with signage	$ 11,000	EA	9	99,000
Pavement markings	$ 3	LF	-	-
Curbs	$ 50	LF	-	-
Lighting	$ 4,200	EA	-	-
Individual On-Street Bus Pads	$ 13,000	EA	15	195,000
ADA Ramps	$ 2,500	EA	-	-
New Signs	$ 500	EA	-	-
Michigan Ave and 10th Street Intersection improvements	$ -	LS	-	-
			On Street Alternative Raw Value	**$294,000**

Note: all costs in 2012 dollars.

Table F-2 Off-Street Bus Facility Alternative 1 Conceptual Cost Estimate

Description of Improvements	Unit Price	Unit	Quantity	Raw Total
Sidewalks (Concrete)	$ 15	SF	23,244	348,660
Continuous Concrete Bus Pad	$ 85	SY	2,295	195,075
Road Pavement (Asphalt)	$ 160	TON	1,186	189,816
Bus Shelters with signage	$ 11,000	EA	9	99,000
Pavement markings	$ 3	LF	1,000	3,000
Curbs	$ 50	LF	1,850	92,500
Lighting	$ 4,200	EA	3	12,600
Individual On-Street Bus Pads	$ 13,000	EA	0	0
ADA Ramps	$ 2,500	EA	2	5,000
New Signs	$ 500	EA	8	4,000
Michigan Ave and 10th Street Intersection improvements	$ -	LS	23,244	348,660
			Off Street Alternative 1 Raw Value	**$949,651**

Note: all costs in 2012 dollars.

Table F-3 Off-Street Bus Facility Alternative 2 Conceptual Cost Estimate

Description of Improvements	Unit Price	Unit	Quantity	Raw Total
Sidewalks (Concrete)	$ 15	SF	17,457	261,855
Continuous Concrete Bus Pad	$ 85	SY	1,495	127,075
Road Pavement (Asphalt)	$ 160	TON	369	59,039
Bus Shelters with signage	$ 11,000	EA	9	99,000
Pavement markings	$ 3	LF	1,600	4,800
Curbs	$ 50	LF	1,200	60,000
Lighting	$ 4,200	EA	6	25,200
Individual On-Street Bus Pads	$ 13,000	EA	6	78,000
ADA Ramps	$ 2,500	EA	5	12,500
New Signs	$ 500	EA	10	5,000
Michigan Ave and 10th Street Intersection improvements	$ -	LS	0	0
			Off Street Alternative 2 Raw Value	**$732,469**

Note: all costs in 2012 dollars.

Table F-4 Off-Street Bus Facility Alternative 3 Conceptual Cost Estimate

Description of Improvements	Unit Price	Unit	Quantity	Raw Total
Sidewalks (Concrete)	$ 15	SF	16,831	252,465
Continuous Concrete Bus Pad	$ 85	SY	1,353	115,024
Road Pavement (Asphalt)	$ 160	TON	831	133,020
Bus Shelters with signage	$ 11,000	EA	9	99,000
Pavement markings	$ 3	LF	1,000	3,000
Curbs	$ 50	LF	1,500	75,000
Lighting	$ 4,200	EA	5	21,000
Individual On-Street Bus Pads	$ 13,000	EA	5	65,000
ADA Ramps	$ 2,500	EA	3	7,500
New Signs	$ 500	EA	8	4,000
Michigan Ave and 10th Street Intersection improvements	$ -	TON	218	34,803
			Excluding Alternate Exit	**$775,008**
			Off Street Alternative 3 Raw Value	**$809,811**

Note: all costs in 2012 dollars.

Appendix G:
INITIAL AND REFINED ELEVATOR OPTIONS

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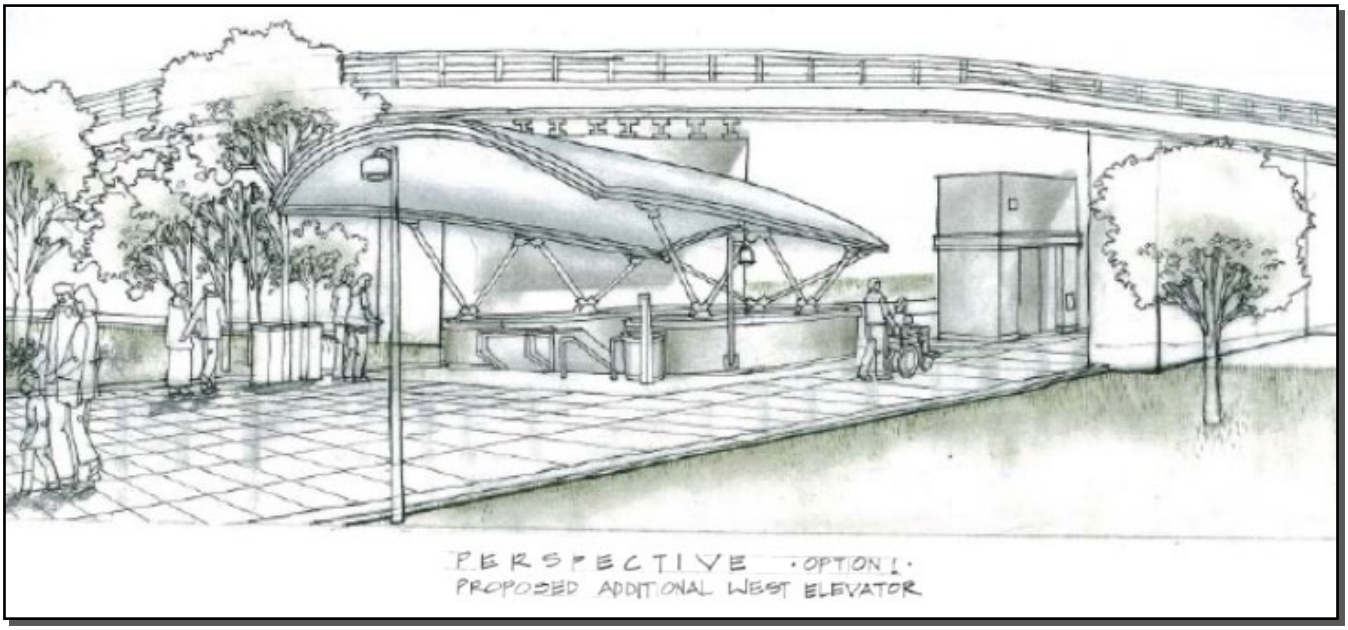
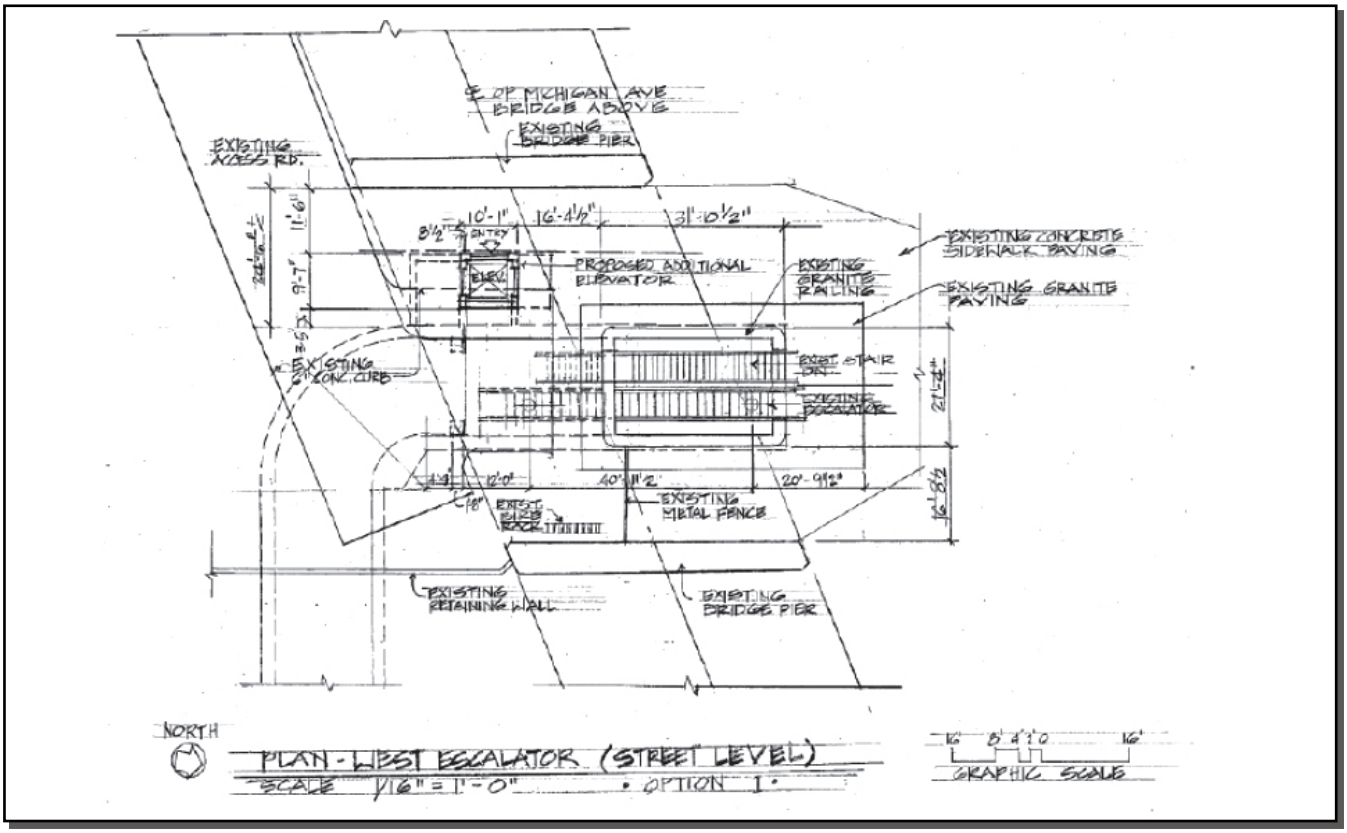
Figure G-1 Option 1 Perspective Drawing (Entrance Level)



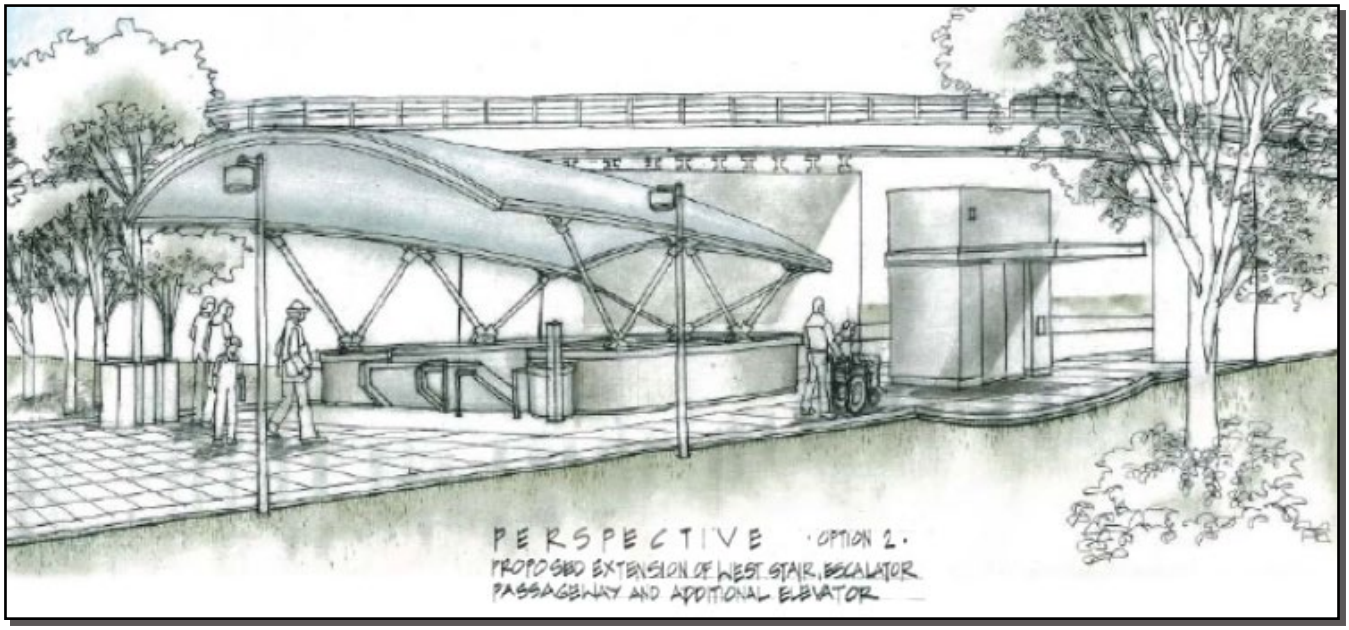
Source: Draft Brookland-CUA Station Access Study, WMATA, January 2011.

Figure G-2 Option 1 Plan Drawing (Mezzanine and Entrance Levels)



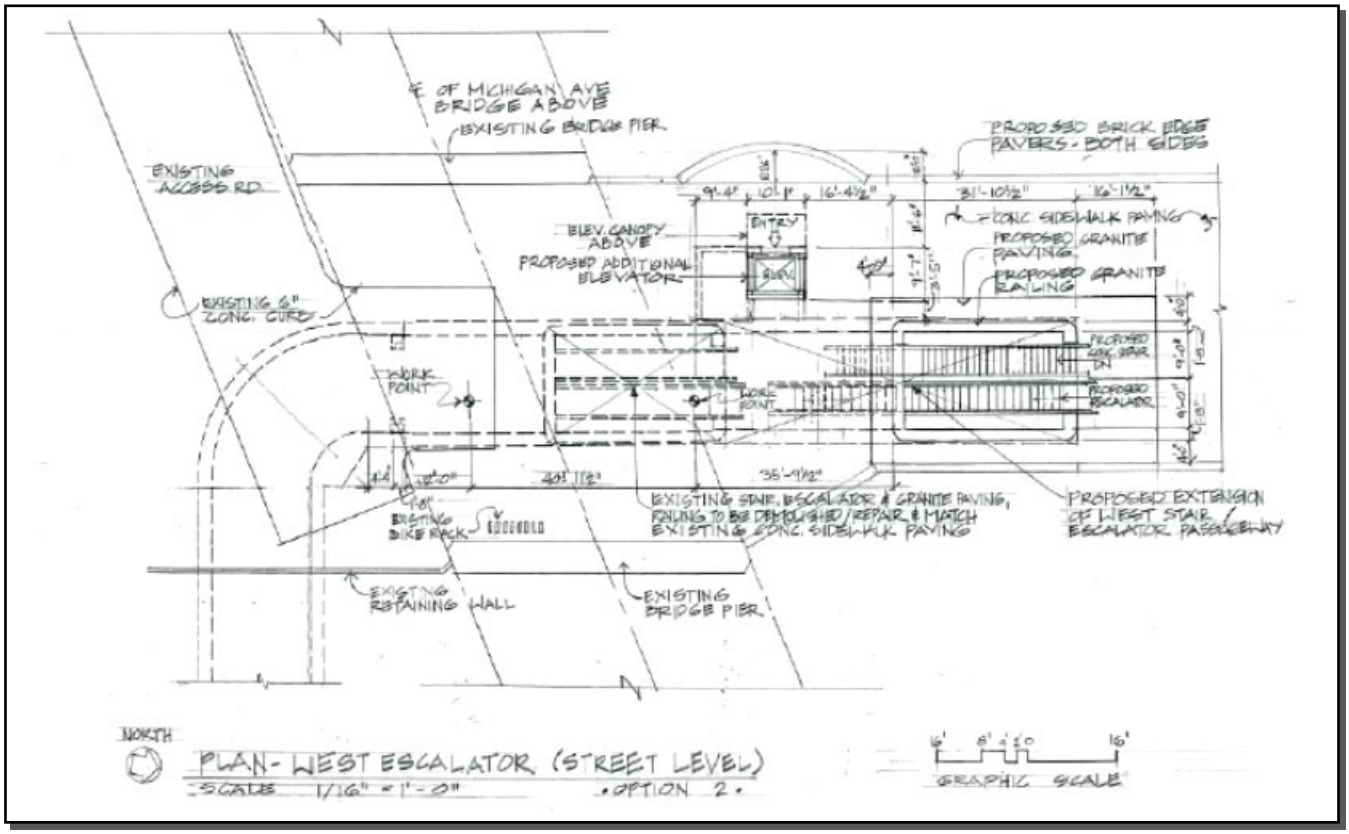
Source: Draft Brookland-CUA Station Access Study, WMATA, January 2011.

Figure G-3 Option 2 Perspective Drawing (Entrance Level)



Source: Draft Brookland-CUA Station Access Study, WMATA, January 2011.

Figure G-4 Option 2 Plan Drawing (Mezzanine and Entrance Levels)



Source: Draft Brookland-CUA Station Access Study, WMATA, January 2011.

Figure G-5 Option 3A Plan Drawing (Entrance Level)

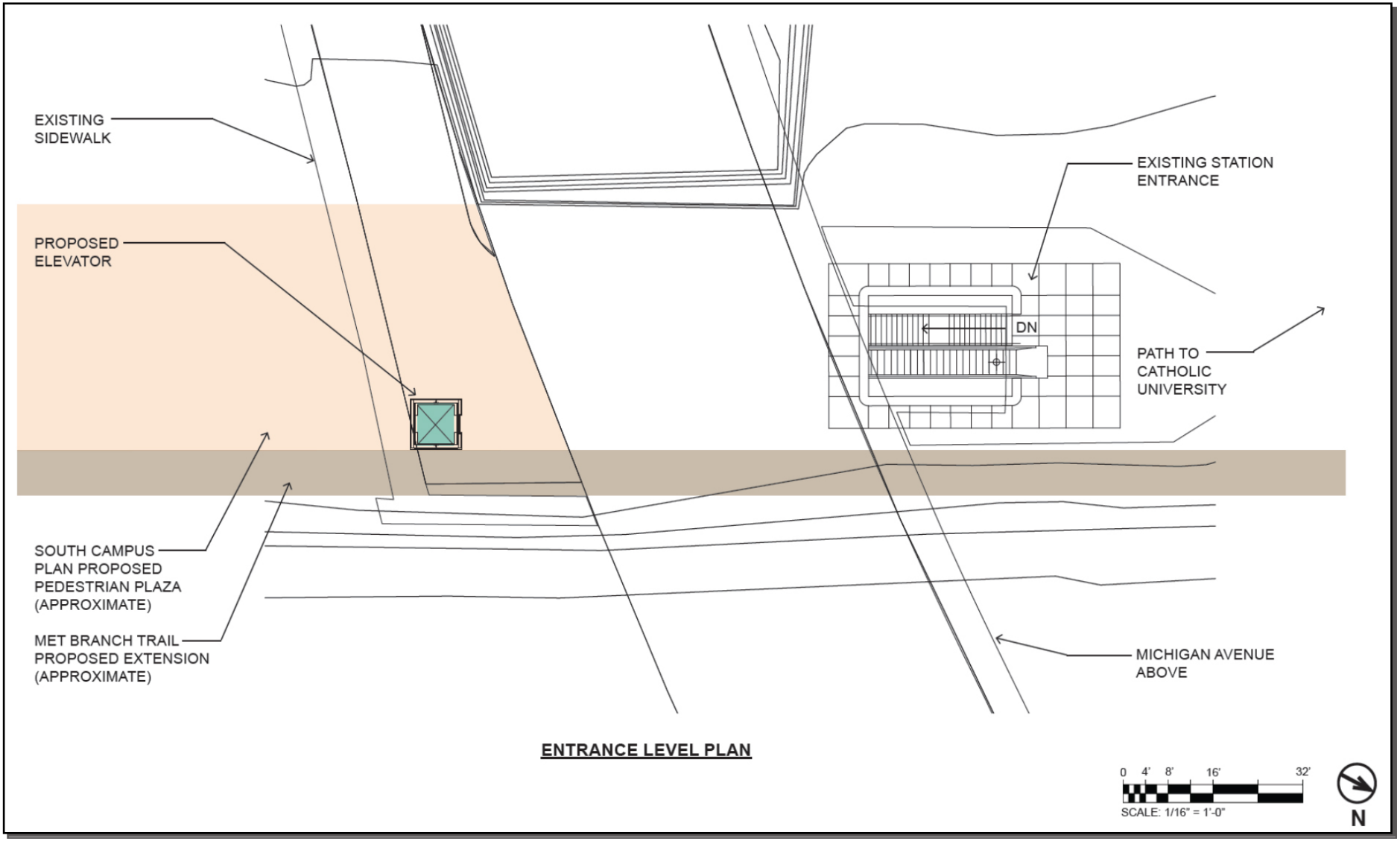


Figure G-6 Option 3A Plan Drawing (Mezzanine Level)

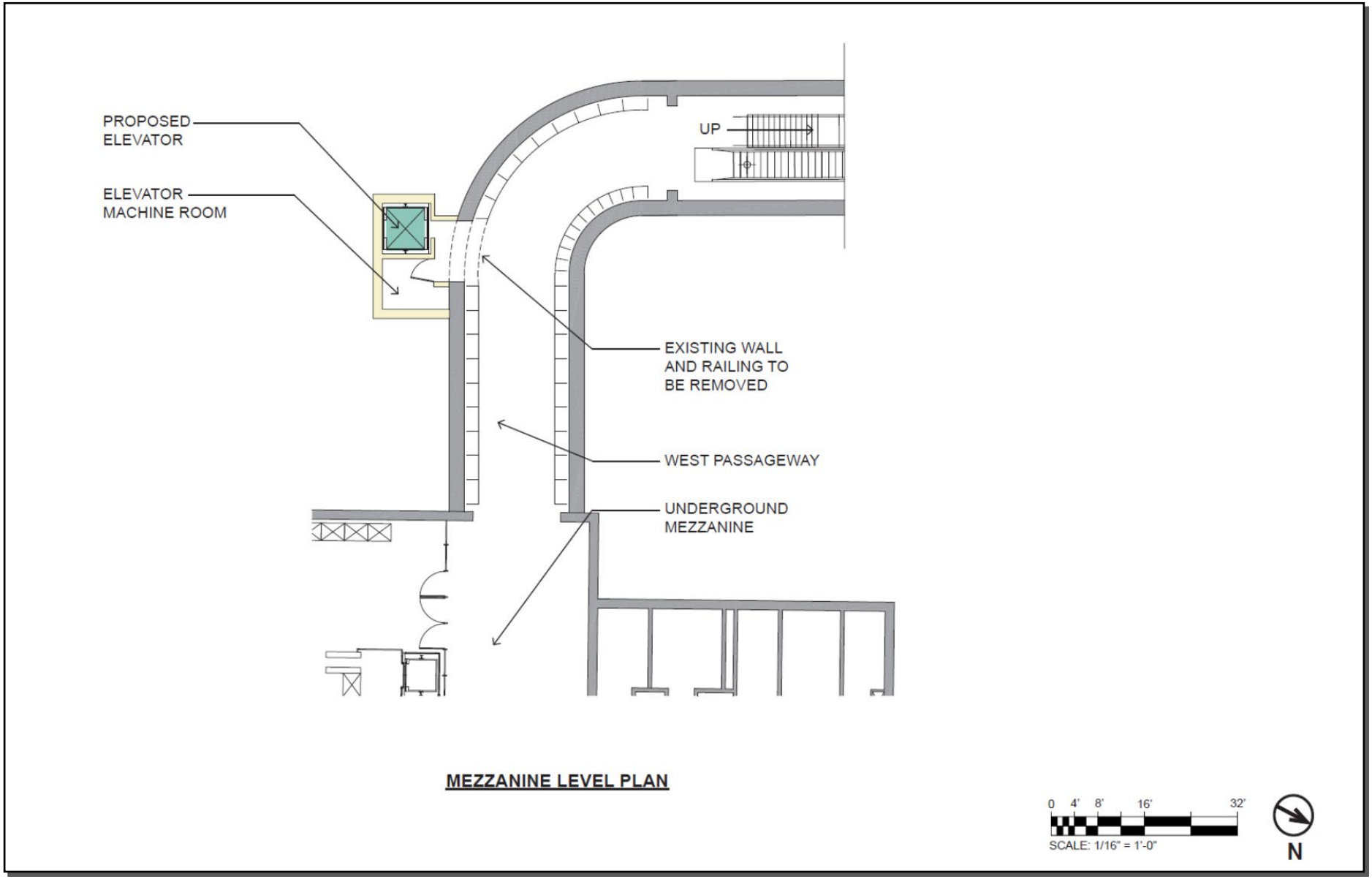


Figure G-7 Option 3A Plan Drawing (Mezzanine Level)

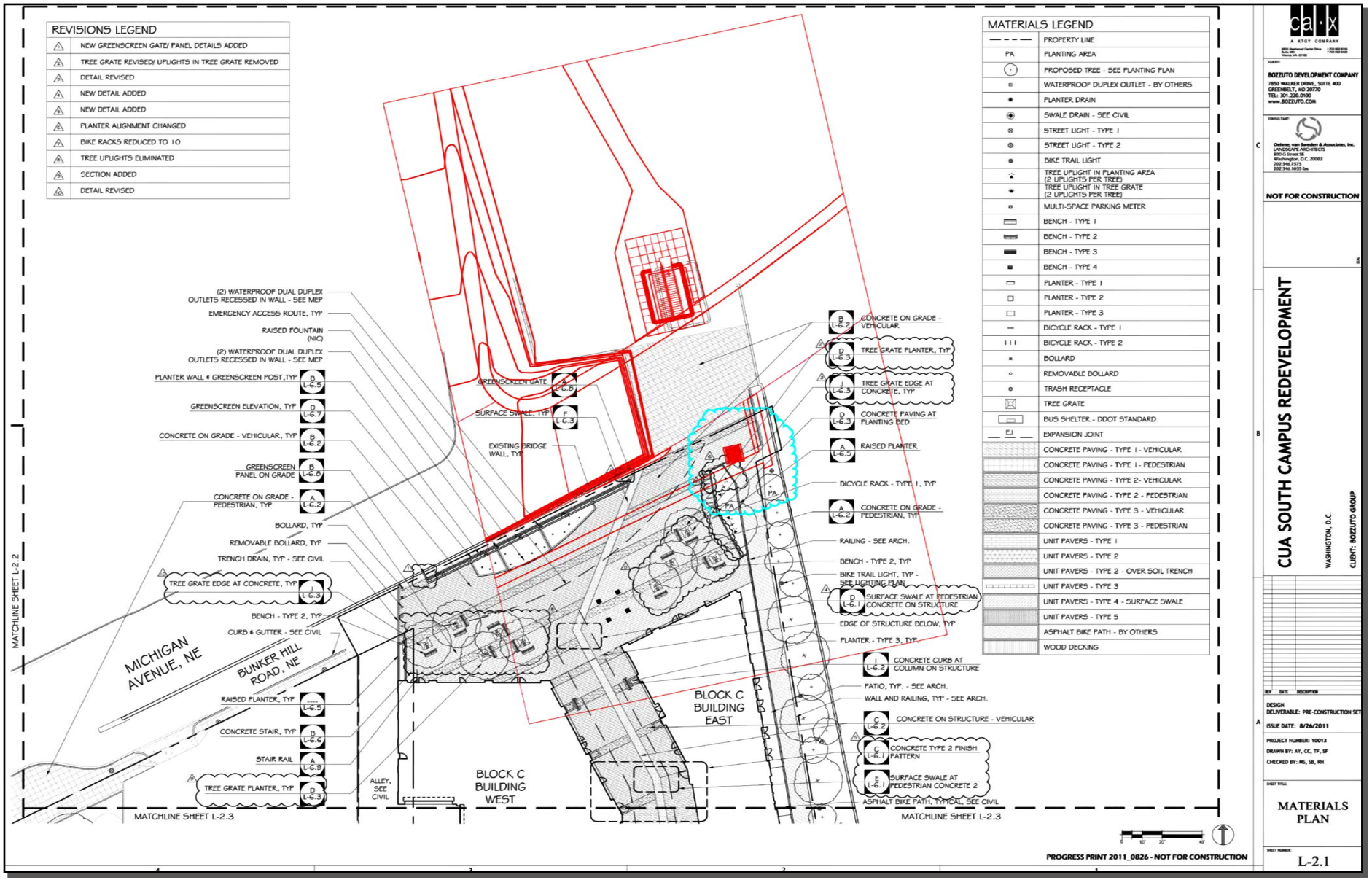


Figure G-8 Option 3B Plan Drawing (Entrance Level)

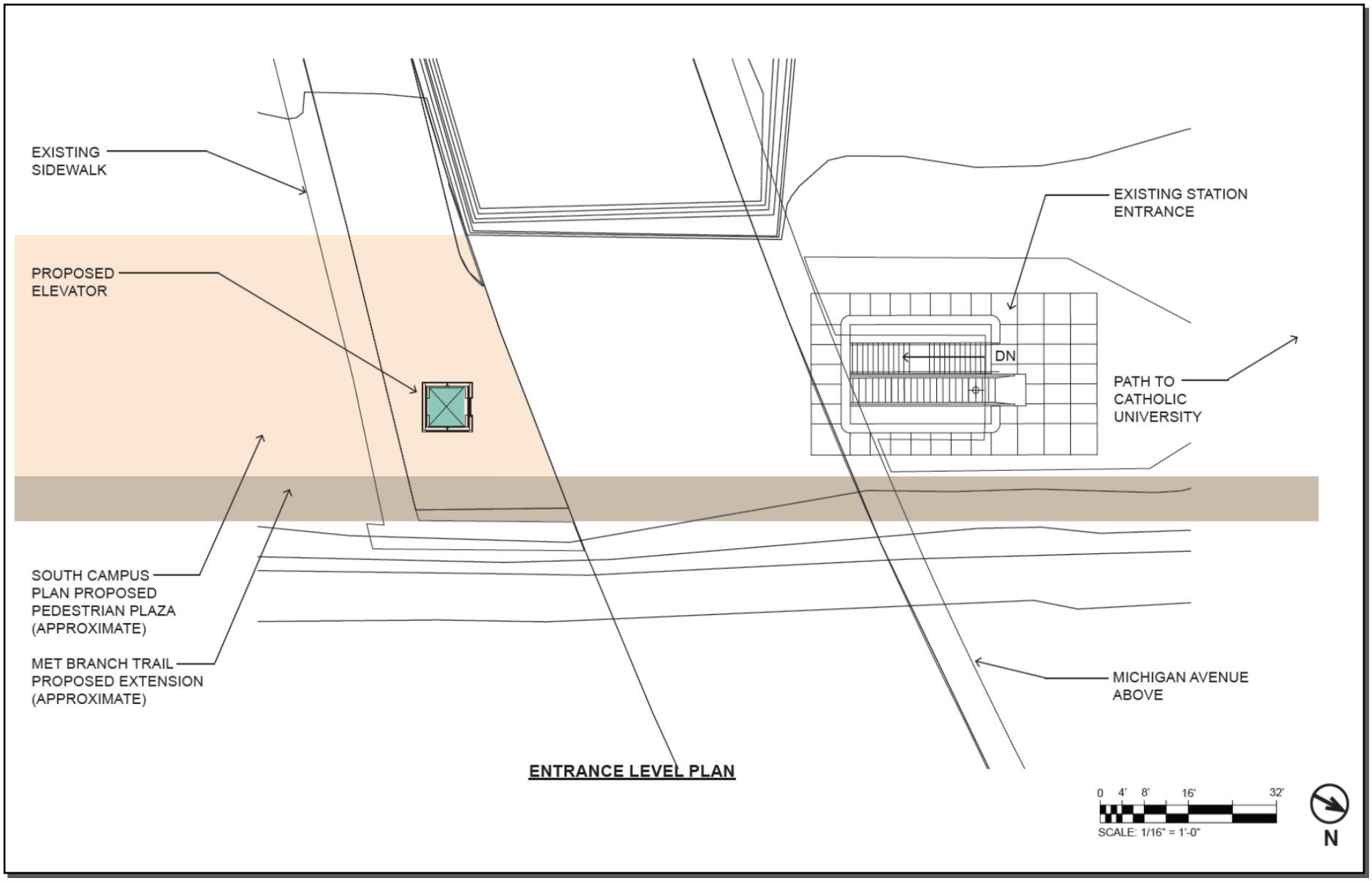


Figure G-9 Option 3B Plan Drawing (Mezzanine Level)

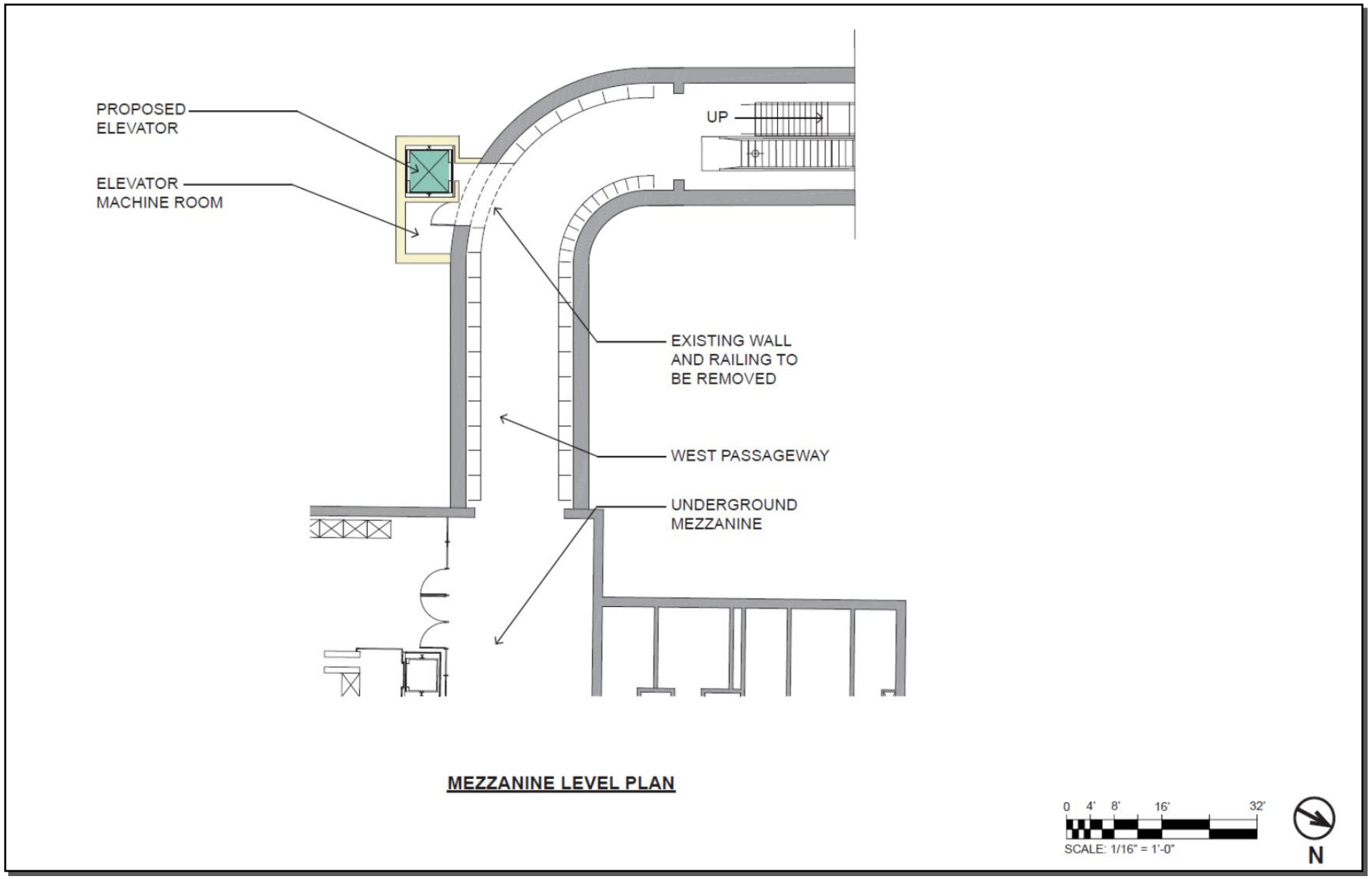


Figure G-10 Option 3B Overlay on South Campus Development Landscape Plan