

# Multimodal Transportation Assessment

## PenPlace

Arlington, VA

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## Executive Summary

The following report is a Multimodal Transportation Assessment (MMTA) for the PenPlace development in National Landing, and more specifically within the Pentagon City area of Arlington, Virginia.

### Site Location and Study Area

The proposed development site is located in the Pentagon City neighborhood of Arlington, Virginia and is bounded by Army Navy Drive to the north, S Eads Street to the east, 12<sup>th</sup> Street S to the south, and S Fern Street to the west, as shown in Figure 3. The general extents of the study area are S Hayes Street to the west, Route 1 to the east, I-395 to the north, and 15<sup>th</sup> Street S to the south.

The vehicular study area consists of 22 intersections along S Hayes Street, S Fern Street, S Eads Street, Army Navy Drive, 12<sup>th</sup> Street S, 13<sup>th</sup> Street S, 14<sup>th</sup> Street S, 15<sup>th</sup> Street S, and I-395, as vetted and approved by Arlington County and VDOT during the scoping process.

The proposed development site currently consists of an undeveloped parcel and a former hotel on the northwest corner of the site. The site is zoned as C-O-2.5: Mixed Use District and is shown as a mix of high-medium residential and medium office-apartment-hotel land use in the General Land Use Plan (GLUP).

### Proposed Project

The proposed development is the second phase of Amazon's new headquarters in Pentagon City. The Metropolitan Park 6, 7, and 8 project, approved in 2019, is the first phase of Amazon's new headquarters and consisted of two buildings with approximately 2.1 million square feet of office space and 55,000 square feet of neighborhood-serving ground floor retail space. It is envisioned that there will be transportation synergies between the PenPlace and Metropolitan Park projects, including but not limited to eastbound and westbound median transit stops near 12<sup>th</sup> Street S and S Elm Street, significant new bicycle amenities and infrastructure in and surrounding the two projects, and amenities that facilitate pedestrian movement and connectivity between the two projects.

The proposed development will consist of four (4) buildings with approximately 2.8 million square feet of office space, 388,000 square feet of amenity space, 14,500 square feet of daycare, 82,600 square feet of neighborhood-serving ground floor retail space, and 27,000 square feet of community space.

The southeastern building (Tower 1) will include a total of approximately 937,675 square feet of office space, approximately 28,964 square feet of retail, and 274 secure long-term bicycle spaces.

The southwestern building (Tower 2) will include a total of approximately 911,163 square feet of office space, approximately 24,336 square feet of retail, and 244 secure long-term bicycle spaces.

The northwestern building (Tower 3) will include a total of approximately 928,240 square feet of office space, approximately 14,527 square feet of daycare space, 27,000 square feet of community space, and 312 secure long-term bicycle spaces.

The northeastern building (Helix Building) will include a total of approximately 388,272 square feet of amenity space and approximately 8,546 square feet of retail. Secure long-term bicycle spaces will be provided in the southeastern building (Tower 1), the southwestern building (Tower 2), and the northwestern building (Tower 3).

Three (3) retail pavilions will include a total of approximately 20,763 square feet of retail.

The proposed development will provide 1,984 parking spaces in a below-grade parking garage shared between the four (4) buildings. Vehicular access to the shared below-grade parking garage will be provided via Army Navy Drive, S Fern Street, and S Eads Street. Loading access to the below-grade shared loading area will be provided via Army Navy Drive. The number of parking spaces on-site will accommodate the practical needs of the site.

The proposed development will provide seven (7) large loading berths and six (6) van parking stalls, for a total of 13 loading spaces, in the loading area shared by the four (4) buildings on the B2 level of the parking garage. The number of loading facilities on-site will accommodate the practical needs of the site. While the loading dock and ramp have been designed to accommodate a WB-67, trucks of this size will be very infrequent. The arrival of a WB-67 would be scheduled and permitted during off-peak only.

A number of significant infrastructure improvements are being proposed as part of this development:



1. Improving pedestrian facilities along the perimeter of the site to meet or exceed Arlington County and ADA standards;
2. The signalization of two (2) existing intersections and the addition of one (1) new signalized intersection within the vicinity of the proposed development, providing access to the on-site loading facilities and below-grade garage, allowing streets to function as a complete network rather than a series of major corridors for commuter traffic, and providing signalized pedestrian crossings where none currently exist;
3. The reconfiguration of S Eads Street adjacent to the site, to include southbound protected bicycle lanes and on-street parking; and
4. The reconfiguration of S Fern Street adjacent to the site, to include northbound protected bicycle lanes between Army Navy Drive and 12<sup>th</sup> Street S and southbound protected bicycle lanes between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway, new striped medians, and on-street parking.
5. The reconfiguration of the Army Navy Drive and S Eads Street intersection to add a northbound thru lane.
6. The reconfiguration of the 12<sup>th</sup> Street S and S Eads Street intersection to add a dedicated southbound left-turn lane.
7. The reconfiguration of the 12<sup>th</sup> Street S and S Fern Street intersection to add a dedicated southbound left-turn lane.

## Policies and Goals

The Arlington County Master Transportation Plan (MTP) adopted in 2011 and updated in 2019, outlines goals to improve various modes of transportation throughout the County. Similarly, the Crystal City Sector Plan, adopted by the County Board in 2010, developed a series of goals and objectives specifically for Crystal City. Although the PenPlace development is located in Pentagon City, just outside of the Sector Plan's extents, this development achieves several of the goals and policies of both the MTP, Sector Plan, and other guiding documents for the County.

The Pentagon City Plan, which was released as a draft in November 2021, and accompanying transportation analysis, which was released in October 2021, identifies potential improvements to the multi-modal transportation system to better accommodate additional trips generated by future redevelopment. The analysis that is being conducted as part of this MMTA is being coordinated with the County so as to complement the transportation analysis being conducted as part of the Pentagon City PDSP.

There are a number of other transportation related initiatives such as the Army Navy Drive Complete Street Project and the S

Eads Street Complete Street Project that are discussed in more detail later in this report.

## Multi-Modal Overview

### Transit

The subject site is well-served by transit:

- The site is located 0.2 miles from the Pentagon City Metro Station, 0.5 miles from the Pentagon Metro Station, and 0.6 miles from the Crystal City Metro Station, which are served by the Blue and Yellow lines.
- The Pentagon City Metro is served by 10 bus routes provided by Metrobus, Metroway, ART, and other regional bus routes. The Pentagon Metro Station is served by 21 bus routes provided by Metrobus, ART, and other regional bus routes. The Crystal City Metro is served by eight (8) bus routes provided by Metrobus, Metroway, ART, and other regional bus routes.
- There are 16 bus stops within a quarter-mile of the site. These stops are directly served by WMATA (Metrobus), Metroway, Arlington Transit (ART), OmniRide, Fairfax Connector, and Loudoun County Commuter routes.
- Metroway is a premium bus service that connects the Pentagon City, Crystal City, and Potomac Yards neighborhood (National Landing), as well as the Braddock Road neighborhood in Alexandria, VA. Metroway buses travel in mixed traffic adjacent to the site along 12th Street and in other segments; however, there are also sections of the route in Crystal City and Potomac Yards where Metroway buses operate in dedicated bus-only lanes. The nearest stop to the site is at the corner of 12th Street S and S Hayes Street adjacent to the Pentagon City Metro entrance at the end of the Metroway line. All buses from that stop proceed south to Crystal City and the Braddock Road Metro Station.
- The Crystal City VRE station is located approximately 0.5 miles southeast of the proposed development site on the east side of Crystal Drive.

Bus stops adjacent to the site are well used, with the Columbia Pike-Pentagon City line seeing the highest boardings and alightings at bus stops near the site.

Improvements to transit facilities will be made as part of the 12<sup>th</sup> Street S Complete Street project and Pentagon City Transitway Extension project. As part of the 12<sup>th</sup> Street Complete Street project, improvements will include dedicated center-running transit-only lanes extending along 12<sup>th</sup> Street S from S Army-Navy Drive to S Hayes Street. Two (2) median bus stops will be added near the intersection of 12<sup>th</sup> Street S and S Elm Street,

adjacent to the site. As part of the Crystal Drive segment of the Transitway Extension to Pentagon City project, improvements will initially include curbside rush hour bus-only lanes from 15<sup>th</sup> Street S to 12<sup>th</sup> Street S and Long Bridge Drive and five (5) new transitway stations, with two (2) additional stations included in later phases.

As part of the proposed development, one (1) existing bus stop adjacent to the site on S Eads Street and Army Navy Drive will be relocated to the far side of the S Eads Street and 11<sup>th</sup> Street S/Site Driveway intersection.

## Bicycle

The site has access to several on- and off-street bicycle facilities, including bicycle lanes on S Eads Street, S Hayes Street, and 15<sup>th</sup> Street S, which connect to the Mt. Vernon Trail to the east and Four Mile Run Trail to the south. These in turn provide regional access to destinations within Virginia and the District. Several of the existing bicycle facilities have been identified by the Arlington County Master Transportation Plan and Crystal City Sector Plan to be upgraded in the future.

The recently adopted Bicycle Element of the Arlington County Master Transportation Plan identifies Army Navy Drive, between 12<sup>th</sup> Street S and S Joyce Street, and 15<sup>th</sup> Street S as Primary Bicycling Corridors. The plan makes the following recommendations for roadways in the vicinity of the site:

- Bi-directional, protected bicycle lanes along Army Navy Drive from S Joyce Street to 12<sup>th</sup> Street S.
- Construct an off-street cycle track connecting the planned Army Navy Drive protected bicycle lane at 12<sup>th</sup> Street S to 18<sup>th</sup> Street S and the Crystal City Metrorail station.
- Upgrade the existing bicycle lanes on S. Joyce Street and 15<sup>th</sup> Street South between Army Navy Drive and S. Hayes Street to include more separation from motor vehicle traffic.
- Develop an enhanced bicycle facility on S. Fern Street between the Pentagon reservation and 18<sup>th</sup> Street South. The proposed development will provide a northbound protected bike lane along the eastern side between Army Navy Drive and 12<sup>th</sup> Street S and a southbound protected bike lane along the western side between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway.

While the PenPlace development is located in Pentagon City, just outside of the Crystal City Sector Plan's extents, the plan makes the following recommendations for roadways in the vicinity of the site:

- Extending on-street routes along S Fern Street;
- Adding on-street routes along 12<sup>th</sup> Street S from S Hayes Street to S Clark Street; and
- Adding bicycle lanes along Army Navy Drive between S Hayes Street and 12<sup>th</sup> Street S.

A number of planned or approved projects will improve bicycle infrastructure and connectivity in the vicinity of the proposed development:

- As part of the Army Navy Drive Complete Street project, separated two-way bicycle lanes (cycle track) will be installed along the south side of Army Navy Drive between S Joyce Street and 12<sup>th</sup> Street S.
- As part of the S Eads Street Complete Street project, buffered bicycle lanes will also be installed the east side of S Eads Street from Army Navy Drive to 12<sup>th</sup> Street S.
- As part of the S Eads Street Protected Bicycle Lanes Extension and Metropolitan Park 6, 7, 8 project, protected bicycle lanes will be installed along both sides of S Eads Street from 12<sup>th</sup> Street S to 15<sup>th</sup> Street S and the S Eads Street and 15<sup>th</sup> Street S intersection will be reconfigured as a protected intersection.
- As part of the 12<sup>th</sup> Street South Complete Street project, shared lanes are planned from S Eads Street to Clark Street/Long Bridge Drive, connecting to the existing bicycle lanes on Crystal Drive east of the site.
- As part of the 12<sup>th</sup> Street S/S Clark-Bell Street Realignment project, an off-street trail will be installed along the west side of S Clark Street.
- As part of the Metropolitan Park 6, 7, 8 project, separated bicycle lanes will be installed along the west side of S Eads Street from 12<sup>th</sup> Street S to 15<sup>th</sup> Street S, protected bicycle lanes will be provided along both sides of 15<sup>th</sup> Street S between S Elm Street and Route 1, and a protected intersection will be provided at S Eads Street and 15<sup>th</sup> Street S. Protected intersections improve sightlines and provide more separation between bicycles and vehicles.

Plans for the proposed development include protected southbound bicycle lanes along the western side of S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, protected northbound bike lanes along the eastern side of S Fern Street between Army Navy Drive and 12<sup>th</sup> Street S, and protected southbound bike lanes along the western side of the S Fern Street between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway.

While 502 long-term bicycle parking spaces are required, the proposed development will significantly exceed zoning

requirements for bicycle parking by providing a total of 830 long-term bicycle parking spaces for office, and retail use on the ground floor of each building. The proposed development will provide:

- 274 spaces in the southeastern building (Tower 1);
- 244 spaces in the southwestern building (Tower 2); and
- 312 spaces in the northwestern building (Tower 3).

Secure long-term bicycle spaces for the northeastern building (Helix) will be provided in the southeastern building (Tower 1), the southwestern building (Tower 2), and the northwestern building (Tower 3).

Each bicycle room will contain lockers, showers, and bicycle repair stations, making cycling to and from the proposed development convenient and user-friendly. The proposed development will also provide 176 short-term bicycle parking spaces within and along the perimeter of the site on Army Navy Drive, 12<sup>th</sup> Street South, S Fern Street and S Eads Street.

On-site bicycle facilities including the amount of long- and short-term bicycle parking, and the amount of bicycle storage and lockers exceeds County requirements and will encourage commuting by bicycles to and from the proposed development.

## Pedestrian

The site is surrounded by a well-connected pedestrian network. Pedestrian facilities around the site provide a quality walking environment. There are a number of gaps in infrastructure, such as temporary asphalt sidewalks adjacent to the site on the east side of S Eads Street, the north side of 12<sup>th</sup> Street S, and the east side of S Fern Street. In addition, there are sidewalks closed due to construction south of the site along 13<sup>th</sup> Street S, 15<sup>th</sup> Street S, S Elm Street, and S Eads Street. Some barriers exist east of the site due to Route 1 and north of the site due to I-395, but overall, there is good connectivity and facilities.

A number of planned and approved projects will improve pedestrian infrastructure and connectivity in the vicinity of the proposed development. This includes improvements to sidewalks and streetscape as part of the S Eads Complete Street project, adding crosswalks and shortening existing crosswalks on Army Navy Drive as part of the Army Navy Drive Complete Streets project, and the conversion of Route 1 into an urban at-grade boulevard as part of the Route 1 Multimodal Improvements Study.

As a result of the proposed development, pedestrian facilities along the perimeter of the site will be enhanced by improving sidewalks adjacent to the site so that they meet or exceed Arlington County and ADA standards. The proposed development will improve pedestrian connectivity by providing three (3) signalized intersections, including signalized pedestrian crosswalks.

The proposed development will result in new or improved sidewalks along the perimeter of the site. This will be particularly impactful along segments where sidewalks do not meet County and ADA standards. New pedestrian facilities are expected to meet or exceed County requirements with an emphasis on pedestrian safety and comfort. This includes sidewalks that meet or exceed the width requirements, crosswalks at all necessary locations, curb ramps with detectable warnings, and additional design elements such as curb extensions. In addition, the construction of a series of interconnected plazas consisting of both active and passive open spaces will further improve pedestrian connectivity and porosity, breaking up a superblock. Consistent with the Pentagon City Plan, the proposed development will also provide an east-west multimodal path through the site that improves pedestrian connectivity and site porosity. Pedestrians are seen as the primary users of the PenPlace's internal spaces. The combination of aesthetically-pleasing design elements creates a pedestrian environment that is safe, functional, and visually appealing.

## Vehicular

The site is well connected via several principal arterials such as Route 1, VA-27 (Washington Boulevard), VA-244 (Columbia Pike), and VA-110. The arterials create connections to I-395, I-66, George Washington Memorial Parkway, and ultimately the Capital Beltway (I-495) and I-95. These principal arterial roadways bring vehicular traffic within half-mile of the site, at which point minor arterials, collectors, and local roads can be used to access the site directly.

Consistent with a number of Arlington County policies and goals, the proposed development will limit on-site parking by providing a total of 1,984 parking spaces. The amount of on-site parking will meet the practical needs of the site while promoting the use of non-auto modes of travel to and from the proposed development.

## Existing Simulation Model Calibration

Compared to typical macroscopic analysis tools, such as Synchro, VISSIM is a microsimulation modelling tool that measures the performance of individual vehicles as they travel through the network while accounting for the influence of other vehicles, transit, pedestrians, and cyclists. Given the multimodal nature of Pentagon City and planned improvements, particularly streets directly adjacent to the site where a cycle track, protected bicycle lanes, and dedicated transit lanes will be in place, VISSIM was determined to be the appropriate analysis tool for this development as agreed upon during the scoping process.

The base VISSIM model provided by Arlington County was reviewed and updated based on the study area characteristics, available data, and VDOT TOSAM criteria.

Model calibration is the process of performing adjustments to the model to better simulate local driving behavior and operational performance. The calibration process typically compares field data (volumes, speed, travel time, queue length, etc.) to the simulation output so that the model represents actual traffic conditions in the study area. A model that is appropriately calibrated improves the model's ability to assess the future conditions of the study area. The calibration criteria were scoped and approved by Arlington County. The turning movement volumes at signalized intersections and travel time field measurements, provided by Arlington County, were utilized as metrics to recalibrate the base VISSIM model.

Some model parameters were adjusted to reflect actual network performance and driver behaviors. The models were run with adjusted parameters and the outputs were examined against field measurements.

The VISSIM modeling calibration used in this analysis met the calibration acceptance targets in 100% of cases, which is consistent with VDOT TOSAM guidance.

## Travel Demand Assumptions

Mode split (also called mode share) is the percentage of travelers using a particular type (or mode) of transportation when traveling. The main source of mode split information for this report was based on Census data using Transportation Analysis Districts (TADs) and data contained in the 2016 State of the Commute, the Crystal City Multimodal Transportation Study, the WMATA Ridership Survey, and the Arlington County Mode Share Assumptions for Pentagon City. The following mode splits were assumed in the analysis:

- Office
  - Auto – 30%, Transit – 54%, Bicycle – 6%, Walk – 10%
- Amenity Use
  - Auto – 30%, Transit – 54%, Bicycle – 6%, Walk – 10%
- Daycare
  - Auto – 50%, Transit – 20%, Bicycle – 5%, Walk – 25%
- Neighborhood Retail
  - Auto – 5%, Transit – 15%, Bicycle – 5%, Walk – 75%
- Community
  - Auto – 50%, Transit – 20%, Bicycle – 5%, Walk – 25%

Weekday peak hour trip generation is calculated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) Trip Generation, 10<sup>th</sup> Edition.

Office trip generation is based on the development program of 2.8 million square feet. Office trip generation was calculated based on ITE Land Use 710 (General Office Building), using the setting/location of Center City Core, splitting trips into different modes using assumptions outlined in the mode split section of this report.

Amenity trip generation is based on the development program of 388,000 square feet. The amenity use will include support space for the site, including the Helix building, and is anticipated to generate minimal additional trips during the morning and afternoon peak hours. The amenity space will primarily be used off-peak and by office users already on-site. The Helix building will be opened to the public several days per month for public tours but will be closed to the public on a typical weekday. Amenity office trip generation was based on ITE Land Use 580 (Museum) to be conservative, using the setting/location of General Urban/Suburban, splitting trips into different modes using assumptions outlined in the mode split section of this report.

Daycare trip generation is based on the development program of 14,500 square feet. Daycare trip generation was calculated based on ITE Land Use 565 (Day Care Center), using the setting/location of General Urban/Suburban, splitting trips into different modes using assumptions outlined in the mode split section of this report.

Neighborhood retail trip generation is based on the development program of 82,600 square feet of neighborhood-serving ground floor retail. Retail trip generation was calculated based on ITE's

baseline vehicular trips for Land Use 820 (Shopping Center), using the setting/location of General Urban/Suburban (limited data is available for person trips), splitting trips into different modes using assumptions outlined in the mode split section of this report.

Community space trip generation is based on the development program of 27,000 square feet. Community space trip generation was calculated based on ITE Land Use 495 (Recreational Community Center), using the setting/location of General Urban/Suburban, splitting trips into different modes using assumptions outlined in the mode split section of this report.

At the request of VDOT, Local and Regional trip distribution was based primarily on data collected from StreetLight, by mapping the general home location of commuters to Pentagon City and the general work locations of residents in Pentagon City. StreetLight metrics are derived from a combination of two types of locational data: navigation-GPS data and Location-Based Services (LBS) data, including historical data, with a sample size of approximately 23% of the adult population. This data is then transformed into contextualized, aggregated, and normalized travel patterns that can be used to create origin and destination analyses. The results of the Home and Work Analysis were then used to define the major roadways used for regional trips, and the distribution of trips with an origin or destination in neighborhoods proximate to PenPlace. This analysis results in an assignment of trips to the roadway network.

### Future Improvements

A number of planned transportation improvements in the vicinity of the PenPlace development are expected to be complete by 2025 and 2031. The full list of improvements is detailed in the report, but examples include:

- Army Navy Drive Complete Street
- 12th Street S Complete Street
- 15th Street S/S Clark-Bell Street Realignment
- Crystal City Transitway Extension
- Route 1 Multimodal Improvements Study

### Future Traffic Operations

A capacity analysis was developed to compare the future roadway network without the proposed development. Intersection capacity analysis were performed for the morning and afternoon peak hours at study area intersections. VISSIM version 11.00-14 was used to analyze the study area

intersections using an agreed upon set of Measures of Effectiveness (MOEs).

Traffic projections for 2025 and 2031 are based on existing volumes, plus traffic generated by approved nearby background developments, regional growth on the roadway, and traffic generated by the proposed PenPlace development.

This study uses a hybrid approach to estimate traffic growth factors by utilizing the MWCOG model results and approved local background developments. The process begins with collecting turning movement counts for each study intersection, and adding trips generated by approved local background developments to the turning movements at the study intersections. Since that accounts for local background growth, a regional growth rate is also applied to accounts for trips generated outside the study area. The regional growth rate is estimated by deducting the trips generated by approved local background from the MWCOG traffic projections for a given year. This process is conducted to avoid double-counting the trips generated by the approved local background developments. In locations where the MWCOG model growth was higher than the growth based on background developments, the difference was applied to through volumes, as outlined in the report; if the growth rates determined by the MWCOG model were lower than those determined by the background developments, no additional growth rate was applied. This procedure, rather than a growth rate, determined by only the MWCOG model was used to provide more specificity at study intersections. The methodology of using background development trips is consistent with other MMTAs in Arlington County and has been vetted and approved by the County and VDOT.

### Mitigations

As described in the Geometry and Operations section of this report, the proposed development will include several improvements to adjacent roadways, including the signalization of three (3) intersections and the addition of protected bike facilities.

Based on the results of the VISSIM analysis, potential mitigation measures were explored at study area intersections and included the following recommendations for both 2025 and 2031 Mitigated Future Conditions (detailed in Table 1 and Figure 1):

- Adjustments to signal timings at nine (9) intersections
- Modifications to signal phasing and adjustments to signal timings at seven (7) intersections

- Signal modifications at seven (7) intersections
- Re-striping at eight (8) intersections
- Relocating one (1) existing bus stop along S Eads Street
- Adding new signals at three (3) intersections, including Army Navy Drive/Parking Lot/Site Driveway, S Eads Street/11th Street S/Site Driveway, and S Fern Street/Site Driveway
- Providing a protected southbound bike lane along S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, a northbound protected bike lane along S Fern Street between Army Navy Drive and 12<sup>th</sup> Street S, and a southbound bike lane along S Fern Street between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway

With the recommended mitigations in place, the VISSIM analysis shows, at the majority of intersections in the network, the vehicular delay results under the 2025 and 2031 Mitigated Future scenarios, with added site traffic and recommended mitigation measures, are comparable to that under the 2025 and 2031 Background scenarios. Nevertheless, as can be expected of urban infill there are still certain locations that are projected to experience delay and queuing issues where traffic is concentrated, especially along Army Navy Drive and S Eads Street, which funnel traffic to/from I-395, where congestion exists today. A comparison of the level of service (LOS) between scenarios is provided in Figure 73 and Figure 74 for 2025 and Figure 75 and Figure 76 for 2031.

It is important to note that VISSIM is a microscopic analysis rather than a macroscopic analysis. Mitigation measures are recommended such that the results are comparable or better than the Background conditions throughout the network. The recommended mitigation measures are in place to address targeted issues at specific intersections, as well as increase the vehicular throughput of the overall network, particularly at exterior intersections that are responsible for metering vehicles entering the network. Due to the increased number of vehicles being processed in the network compared to Background conditions, there may be locations where delays are higher than that seen under Background conditions.

Most vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. As part of the proposed PenPlace project, a Transportation Management Plan (TMP) will be provided based on the County's requirements, and a framework for a TMP is included in this report, to further reduce

vehicular trips generated by the proposed development during peak period travel times.

### Transportation Management Plan

A Transportation Management Plan (TMP) will be provided for the project based on the County's requirements, and a framework for a TMP is included in this report. This TMP will include typical components such as the establishment of a TMP coordinator, the distribution of transit literature, the establishment of ride-sharing programs, and the on-site sale of discounted fare media. Management measures taken by the PenPlace project can be monitored and adjusted as needed to continually create opportunities to reduce the amount of vehicular traffic generated by the site.

### Summary and Recommendations

This report concludes that the proposed development has many positive elements contained within its design that minimize potential transportation impact, including:

- The proposed development's close proximity to the Pentagon City Metro Station, Pentagon Metro Station, Crystal City Metro and VRE Stations, and multiple bus lines.
- Improvements to the pedestrian facilities adjacent to the site that meet or exceed Arlington County and ADA requirements.
- Limited on-site parking, which will promote the use of non-auto modes of travel to and from the proposed development.
- The installation of new signals on Army Navy Drive, S Fern Street, and S Eads Street which provide additional signalized pedestrian crossing points, significantly improving pedestrian infrastructure near the site.
- The inclusion of publicly accessible plazas, parks, a north-south forest walk, and an east-west multimodal path that improve pedestrian circulation and break-up a superblock.
- The provision of protected southbound bike lanes along the western side of S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, northbound protected bike lanes on S Fern Street S between Army Navy Drive and 12<sup>th</sup> Street S, and southbound protected bike lanes on S Fern Street between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway.
- The inclusion of secure-long-term bicycle parking significantly exceeding zoning requirements.
- The installation of short-term bicycle parking spaces within and around the perimeter of the site that meet zoning requirements.

- The inclusion of shower and locker facilities within each building that meet or exceed zoning requirements.
- A Transportation Management Plan (TMP) that aims to reduce the demand of single-occupancy, private vehicles to/from the proposed development during peak period travel times or shifts single-occupancy vehicular demand to off-peak periods.

**Table 1: Summary of Recommended Mitigation Measures**

| Intersection                              | Peak Hour | 2025/2031 Mitigated Future Scenario |  |   |  |
|---|-----------|-------------------------------------|--|---|--|
|   |           | Signal Timings                      | Signal Phasing   | Restriping/Geometric Change   | New Signal   |
| 1. S Hayes St & Army Navy Dr <sup>1</sup> | AM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified NBL from leading to lagging phase</li> </ul>   | <ul style="list-style-type: none"> <li>NB Approach: Modified to include dual left-turn lanes</li> <li>SB Approach: Modified to include dual left-turn lanes</li> </ul>  | ---  |
|   | PM        | Yes                                 |  |   |  |
| 2. S Fern St & Army Navy Dr               | AM        | Yes                                 | ---  | <ul style="list-style-type: none"> <li>NB Approach: Modified to convert the thru/right lane to a right-turn lane</li> <li>SB Approach: Modified to convert the thru/right lane to a right-turn lane</li> </ul>  | ---  |
|   | PM        | Yes                                 |  |   |  |
| 3. Parking Lot & Army Navy Dr             | AM        | ---                                 | <ul style="list-style-type: none"> <li>Modified to include protected EBR phasing</li> </ul>  | <ul style="list-style-type: none"> <li>Added NB approach</li> <li>EB Approach: Modified to add left/thru lane and a right-turn lane</li> </ul>  | <ul style="list-style-type: none"> <li>New signal added</li> </ul> |
|   | PM        |                                     |  |   |  |
| 4. S Eads St & Army Navy Dr               | AM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified SBL from protected-permissive to permissive</li> <li>Modified NBL from leading to lagging phase</li> </ul>           | <ul style="list-style-type: none"> <li>NB Approach: Modified to include an additional thru lane</li> <li>Relocate SB bus stop to the far side of the S Eads Street and 11th Street S/Site Driveway intersection</li> </ul>  | ---  |
|   | PM        | Yes                                 |  |   |  |
| 5. 110 Ramp & Army Navy Dr                | AM        | <i>No mitigation required</i>       |  |   |  |
|   | PM        |                                     |  |   |  |
| 6. S Eads St & 11th St                    | AM        | ---                                 | ---  | <ul style="list-style-type: none"> <li>Added EB approach</li> <li>NB Approach: Modified to add a left-turn lane providing access into site</li> <li>SB Approach: Modified to convert the thru lane to a left/thru lane; and add a right-turn lane providing access into site</li> </ul> | <ul style="list-style-type: none"> <li>New signal added</li> </ul> |
|   | PM        |                                     |  |   |  |
| 7. 12th St & S Hayes St                   | AM        | Yes                                 | ---  | ---   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 8. 12th St & S Fern St                    | AM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified NBL from permissive to protected-permissive</li> <li>Modified SBL from permissive to protected-permissive</li> </ul> | <ul style="list-style-type: none"> <li>SB Approach: Modified to add a left-turn lane</li> </ul>   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 9. 12th St & S Elm St                     | AM        | Yes                                 | ---  | ---   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 10. 12th St & S Eads St                   | AM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified SBL from permissive to protected-permissive</li> </ul>   | <ul style="list-style-type: none"> <li>SB Approach: Modified to add a left-turn lane</li> </ul>   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 11. 12th St & Army Navy Dr                | AM        | Yes                                 | ---  | ---   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 12. 12th St & S Clark St/Long Bridge Dr   | AM        | Yes                                 | ---  | ---   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 13. 13th St & S Fern St                   | AM        | <i>No mitigation required</i>       |  |   |  |
|   | PM        |                                     |  |   |  |
| 14. 13th St & S Eads St                   | AM        | Yes                                 | ---  | ---   | ---  |
|   | PM        | Yes                                 |  |   |  |
| 15.                                       | AM        | <i>No mitigation required</i>       |  |   |  |



| Intersection                                     | Peak Hour | 2025/2031 Mitigated Future Scenario |  |   |  |
|--|-----------|-------------------------------------|--|---|--|
|  |           | Signal Timings                      | Signal Phasing   | Restriping/Geometric Change   | New Signal   |
| 14th St & S Fern St                              | PM        |                                     |  |   |  |
| 16. 15th St & S Fern St                          | AM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified SBL from permissive to protected-permissive</li> </ul>   | ---   | ---  |
|  | PM        | Yes                                 |  |   |  |
| 17. 15th St & S Elm St                           | AM        | Yes                                 | ---  | ---   | ---  |
|  | PM        | Yes                                 |  |   |  |
| 18. 15th St & S Eads St                          | AM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified EBL from permissive to protected-permissive (leading protected phase)</li> <li>Modified WBL from permissive to protected-permissive (leading protected phase)</li> </ul> | ---   | ---  |
|  | PM        | Yes                                 |  |   |  |
| 19. S Eads St & I-395 Ramps (South) <sup>2</sup> | AM        | Yes                                 | ---  | ---   | ---  |
|  | PM        | Yes                                 | <ul style="list-style-type: none"> <li>Modified NBL from protected to protected-permissive</li> </ul>  |   |  |
| 20. S Eads St & I-395 Ramps (North)              | AM        | Yes                                 | ---  | ---   | ---  |
|  | PM        | Yes                                 | ---  |   |  |
| 21. 14th St & S Eads St                          | AM        | Yes                                 | ---  | ---   | ---  |
|  | PM        | Yes                                 | ---  |   |  |
| 22. S Fern St & Site Driveway                    | AM        | ---                                 | ---  | <ul style="list-style-type: none"> <li>Added WB approach</li> <li>NB Approach: Modified to convert the thru lane to a thru/right lane providing access into site</li> <li>SB Approach: Modified to include a left-turn lane providing access into site</li> </ul> | <ul style="list-style-type: none"> <li>New signal added</li> </ul> |
|  | PM        |                                     |  |   |  |

<sup>1</sup> A meeting was conducted with VDOT on November 19, 2021 regarding the proposed restriping at the S Hayes St/Army Navy Drive intersection.

<sup>2</sup> Discussions with Transurban regarding the proposed phasing changes at the S Eads Street/I-395 HOT Lanes (South) intersection are ongoing.

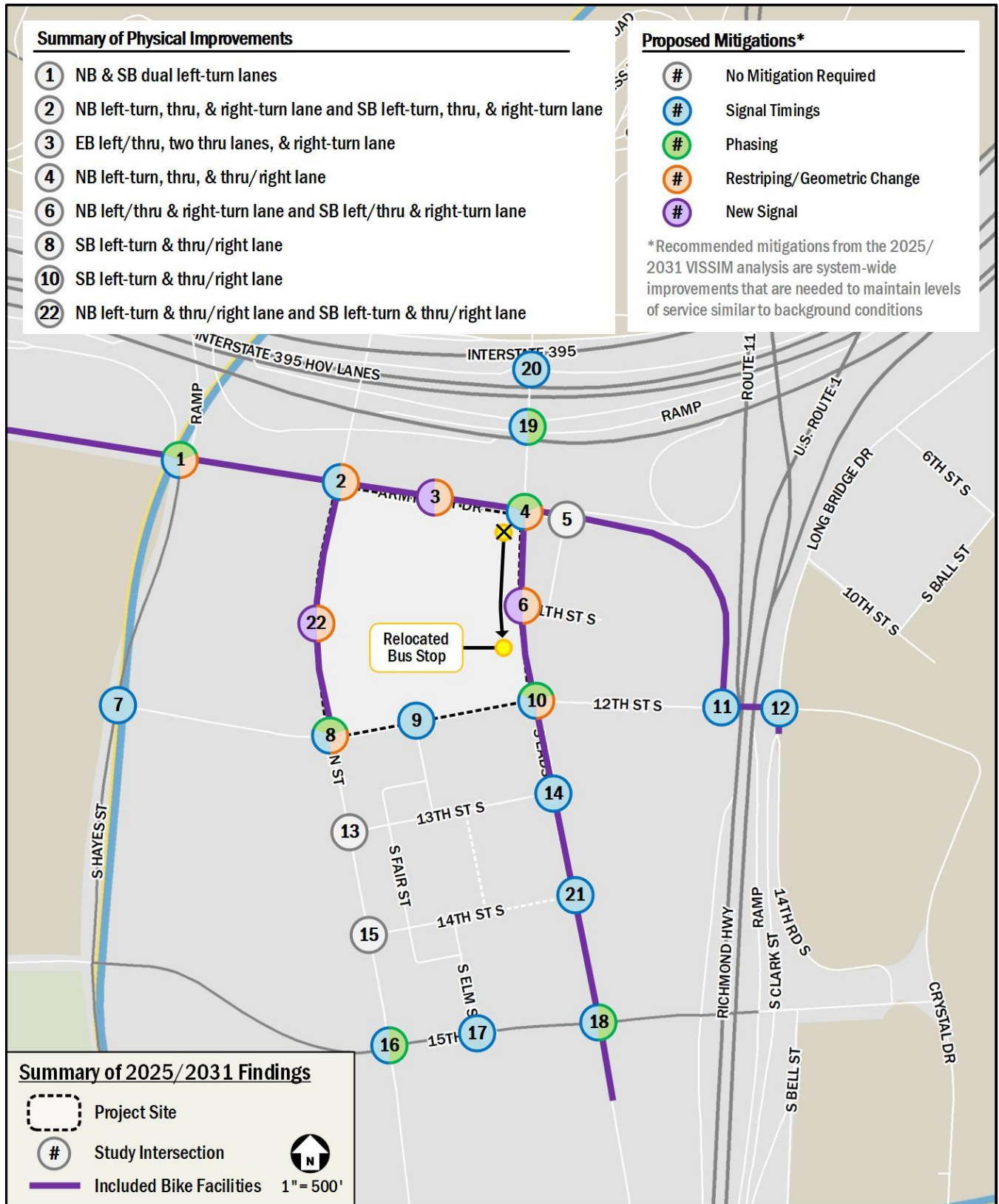


Figure 1: Summary of 2025/2031 Mitigated Future Scenario Findings

## Introduction

This report presents the findings of a Multimodal Transportation Assessment (MMTA) conducted for the proposed PenPlace development in Arlington, VA. The site currently consists of vacant space and a hotel, and the proposed development will improve the site by adding approximately 2.8 million square feet of office space, 388,000 square feet of amenity uses, 14,500 square feet of daycare, 82,600 square feet of neighborhood-serving ground floor retail space, and 27,000 square feet of community space. The proposed project build-out year is 2025.

This site is currently zoned C-O-2.5 and is shown as a mix of high-medium residential and medium office-apartment-hotel land uses in the General Land Use Plan (GLUP).

### **Purpose of Study**

This purpose of this study is to evaluate the transportation network in the vicinity of the site and identify any potential transportation impacts that may result from the proposed redevelopment. Elements of this report include a description of the proposed development, an evaluation of the existing multi-modal network, and findings of a microscopic vehicular analysis (using VISSIM).

The scope of the analysis contained within this report was extensively discussed with and agreed to with Arlington County and VDOT staff. The general methodology of the analysis follows national, Arlington County, and VDOT guidelines on the preparation of evaluations of site development.

### **Study Tasks**

The following tasks were completed as part of this study.

- A scoping meeting was held on October 27, 2020 with representatives from Arlington County, with a follow-up meeting held on November 13, 2020. A scoping meeting was held on November 17, 2020 with representatives from both Arlington County and the Virginia Department of Transportation (VDOT). An updated scope dated September 30, 2021, was submitted by Gorove Slade to Arlington County and VDOT. This scope includes discussions about the parameters of the study and relevant background information. A copy of the signed scoping document is included in Appendix A.
- Field reconnaissance in the vicinity of the site was performed to collect information related to the existing traffic controls, signal timings, roadway geometry, traffic flow characteristics, sidewalk conditions, bicycle facilities, and

transit stop amenities. Notes related to the site visit are included in Appendix B.

- Traffic counts at the study area intersections were conducted by Arlington County in 2019 and early 2020 during the morning and evening peak periods.
- As outlined in the scoping document, a number of proposed developments in the vicinity of the site were assumed to be in place for the Future (2025) and Future (2031) Conditions.
- Proposed site traffic volumes were generated based on the methodology outlined in Trip Generation, 10<sup>th</sup> Edition published by the Institute of Transportation Engineers (ITE).
- Intersection capacity analysis were performed for the morning and afternoon peak hours at study area intersections. VISSIM version 11.00-14 was used to analyze the study area intersections using an agreed upon set of Measures of Effectiveness (MOEs).
- A Transportation Management Plan (TMP) framework was developed as a TMP will be necessary to meet County requirements.

### **Project Summary**

#### **Site Location**

The project site is located in the Pentagon City area of Arlington, Virginia.

Figure 2 shows the regional location of the project. The project site is bounded by Army Navy Drive to the north, S Eads Street to the east, 12<sup>th</sup> Street S to the south, and S Fern Street to the west. The site location is shown in Figure 3.

#### **Parcel Information**

The existing site is currently occupied by vacant space and a hotel. A parcel map showing the location of the property is presented in Figure 4.

#### **General Land Use Plan Recommendations**

According to Arlington County's General Land Use Plan (GLUP), this site is listed as a mix of high-medium residential and medium office-apartment-hotel land uses. The GLUP map for the site is shown in Figure 5. The site is currently zoned C-O-2.5: Mixed-Use District. The zoning map is shown in Figure 6.

## Proposed Site Plan

The proposed development site currently consists of vacant space and a hotel. The proposed development will redevelop the site to include four (4) buildings with a total of approximately 2.8 million square feet of office space 388,000 square feet of amenity uses, 14,500 square feet of daycare, 82,600 square feet of neighborhood-serving ground floor retail space, and 27,000 square feet of community space. Approximately 1,984 parking spaces will be provided in a below-grade parking garage. Vehicular access to the below-grade parking will be provided via Army Navy Drive, S Fern Street and S Eads Street. Loading access will be provided via Army Navy Drive. The proposed build-out year is 2025. The proposed site plan is shown in Figure 7 and Figure 8.

## Scope and Limits of the Study Area

The study area is generally bounded by S Hayes Street to the west, Route 1 to the east, I-395 to the north, and 15<sup>th</sup> Street S to the south. The following intersections were identified for inclusion in the vehicular study area, as shown in Figure 9.

1. Army Navy Drive and S Hayes Street/I-395 Ramp
2. Army Navy Drive and S Fern Street
3. Army Navy Drive and Parking Lot
4. Army Navy Drive and S Eads Street
5. Army Navy Drive and VA 110 Off-Ramp
6. 11<sup>th</sup> Street S and S Eads Street
7. 12<sup>th</sup> Street S and S Hayes Street
8. 12<sup>th</sup> Street S and S Fern Street
9. 12<sup>th</sup> Street S and S Elm Street
10. 12<sup>th</sup> Street S and S Eads Street
11. 12<sup>th</sup> Street S and Army Navy Drive
12. 12<sup>th</sup> Street S and Long Bridge Drive/S Clark Street
13. 13<sup>th</sup> Street S and S Fern Street
14. 13<sup>th</sup> Street S and S Eads Street
15. 14<sup>th</sup> Street S and S Fern Street
16. 15<sup>th</sup> Street S and S Fern Street
17. 15<sup>th</sup> Street and S Elm Street
18. 15<sup>th</sup> Street S and S Eads Street
19. S Eads Street and I-395 HOT Lanes (South Node)
20. S Eads Street and I-395 HOT Lanes (North Node)
21. 14<sup>th</sup> Street S and S Eads Street (Planned)
22. S Fern Street and Site Driveway (Planned)

## Data Sources

Sources of data for this study include Arlington County, the Virginia Department of Transportation (VDOT), the Institute of Transportation Engineers (ITE) Trip Generation, 10<sup>th</sup> Edition, StreetLight Data, Census Transportation Planning Products

(CTPP), VIKA Virginia, NBBJ, and the office files and field reconnaissance efforts of Gorove Slade Associates, Inc.

## Contents of Study

This report contains nine (9) chapters as follows:

- Study Area Overview  
This chapter reviews the area near and adjacent to the project and includes an overview of the site location.
- Transit  
This chapter summarizes the existing and future transit service adjacent to the site, reviews how the project's transit demand will be accommodated, outlines impacts, and presents recommendations as needed.
- Pedestrian Facilities  
This chapter summarizes existing and future pedestrian access to the site, reviews walking routes to and from the project site, outlines impacts, and presents recommendations as needed.
- Bicycle Facilities  
This chapter summarizes existing and future bicycle access to the site, reviews the quality of cycling routes to and from the project site, outlines impacts, and presents recommendations as needed.
- Project Design  
This chapter reviews the transportation components of the project, including the site plan and access.
- Travel Demand Assumptions  
This chapter outlines the travel demand of the proposed project. It summarizes the expected mode splits, multimodal trip generation, and trip distribution of the project.
- Traffic Operations  
This chapter provides a summary of the existing and future roadway facilities, and existing and future roadway capacity in the study area. It summarizes the distribution and routing assumptions used in the analysis. This chapter highlights the vehicular impacts of the project, including presenting mitigation measures for minimizing impacts as needed.
- Transportation Management Plan  
This chapter outlines the various components of the proposed development's Transportation Management Plan (TMP).
- Summary and Conclusions  
This chapter presents a summary of the recommended mitigation measures by mode and presents overall findings and conclusions.

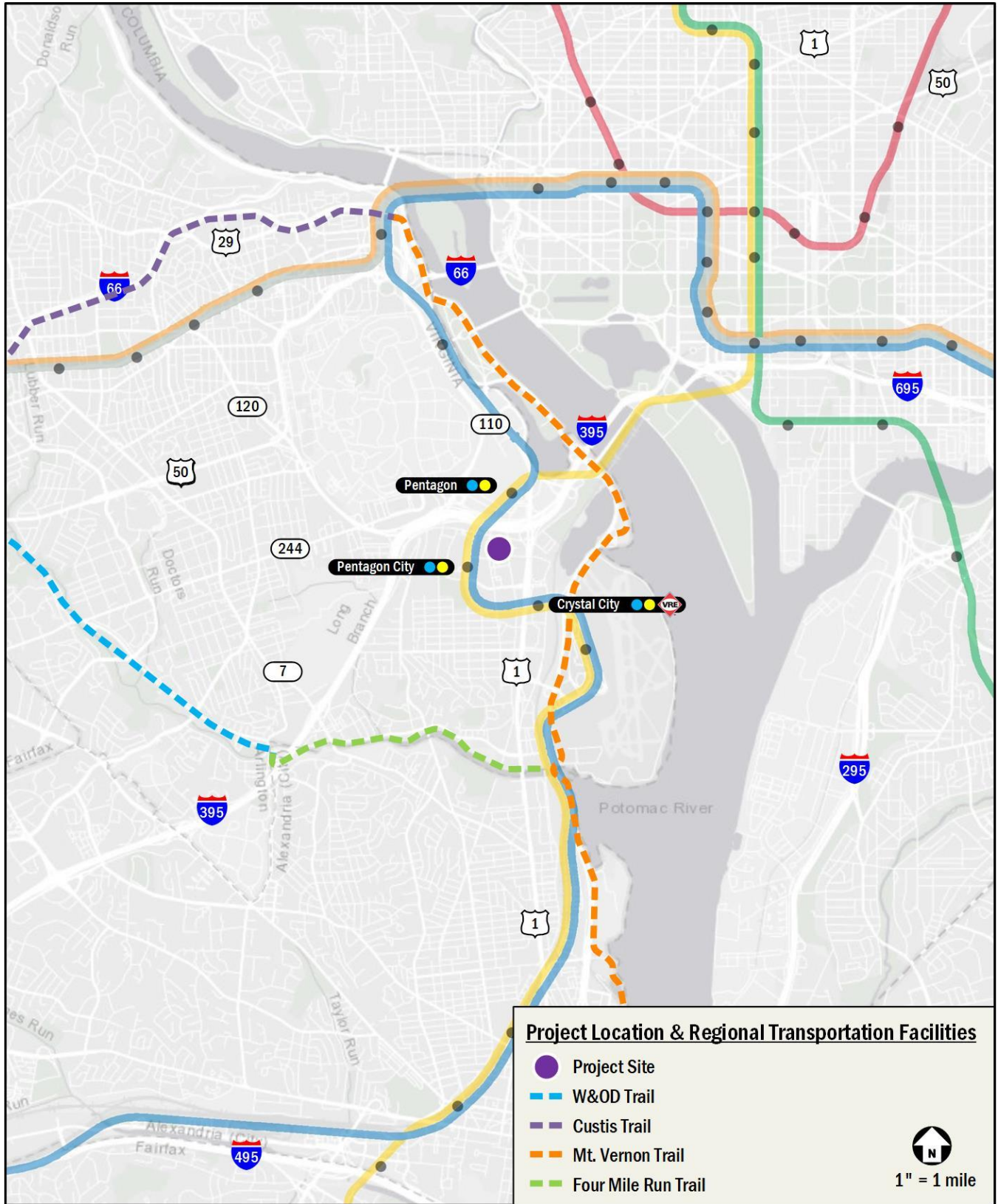


Figure 2: Major Regional Transportation Facilities



Figure 3: Site Location

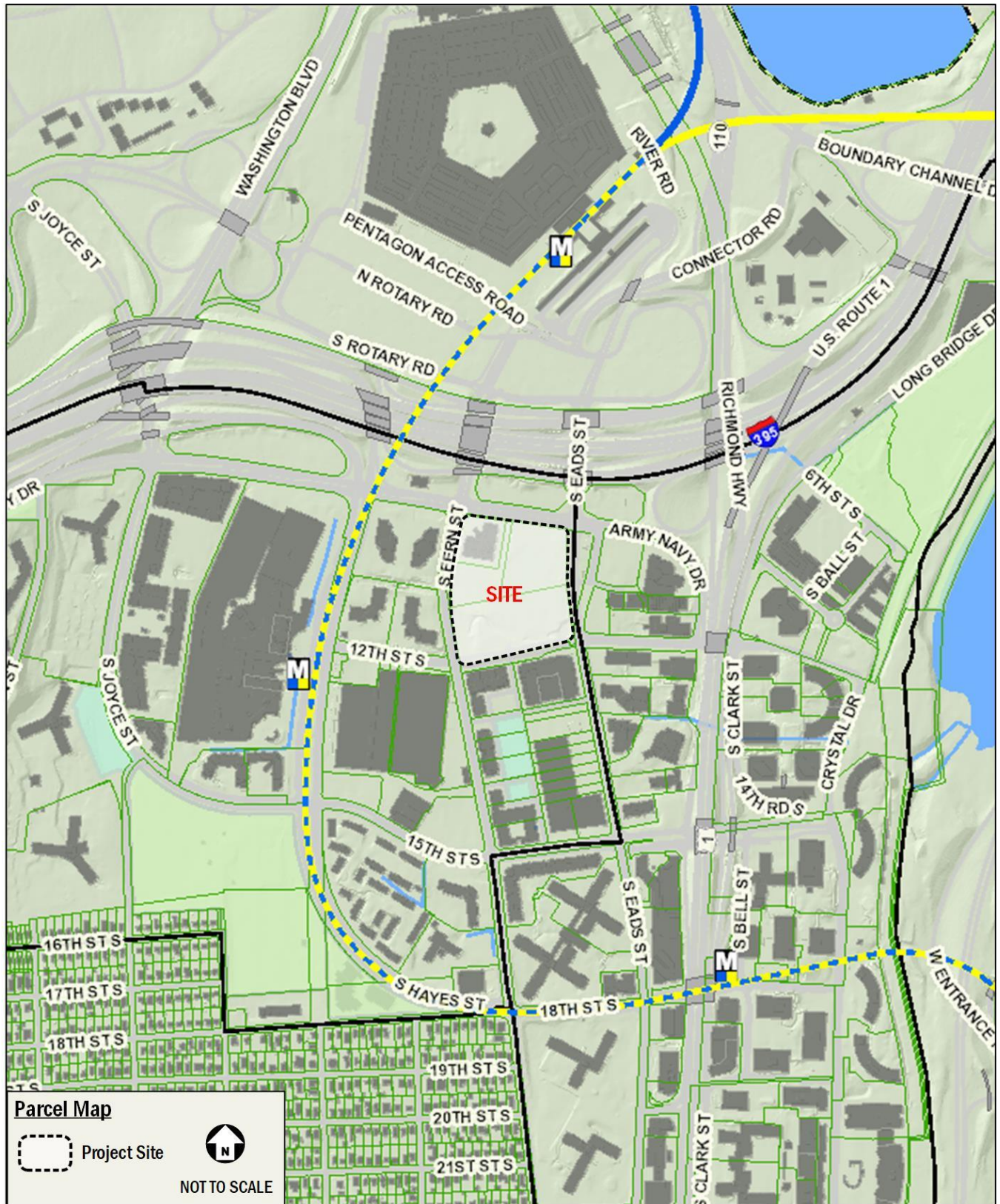


Figure 4: Parcel Map (Source: Arlington County Real Estate Map, September 2016)

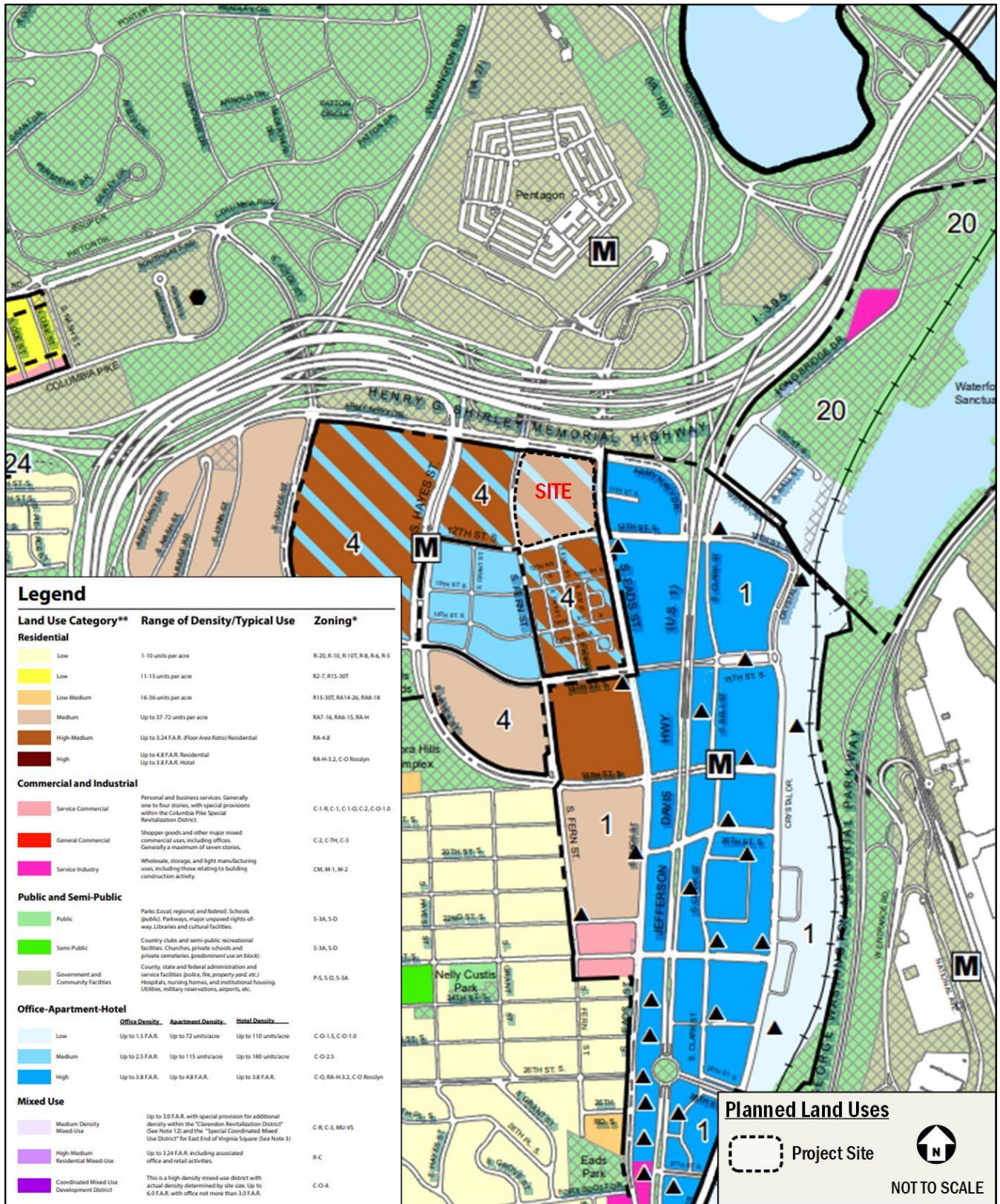
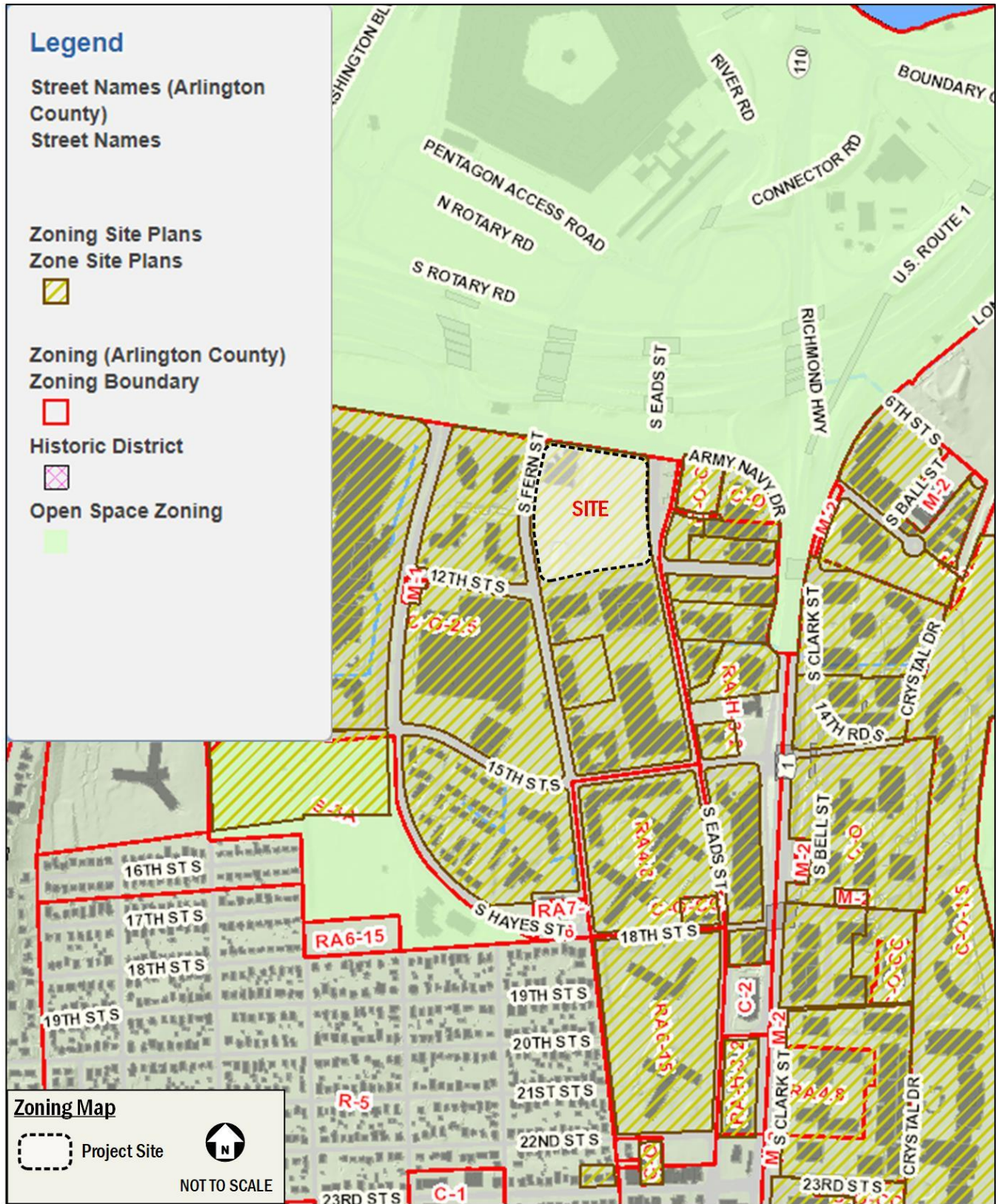


Figure 5: Planned Land Uses (Source: Arlington General Land Use Plan (GLUP), February 2020)





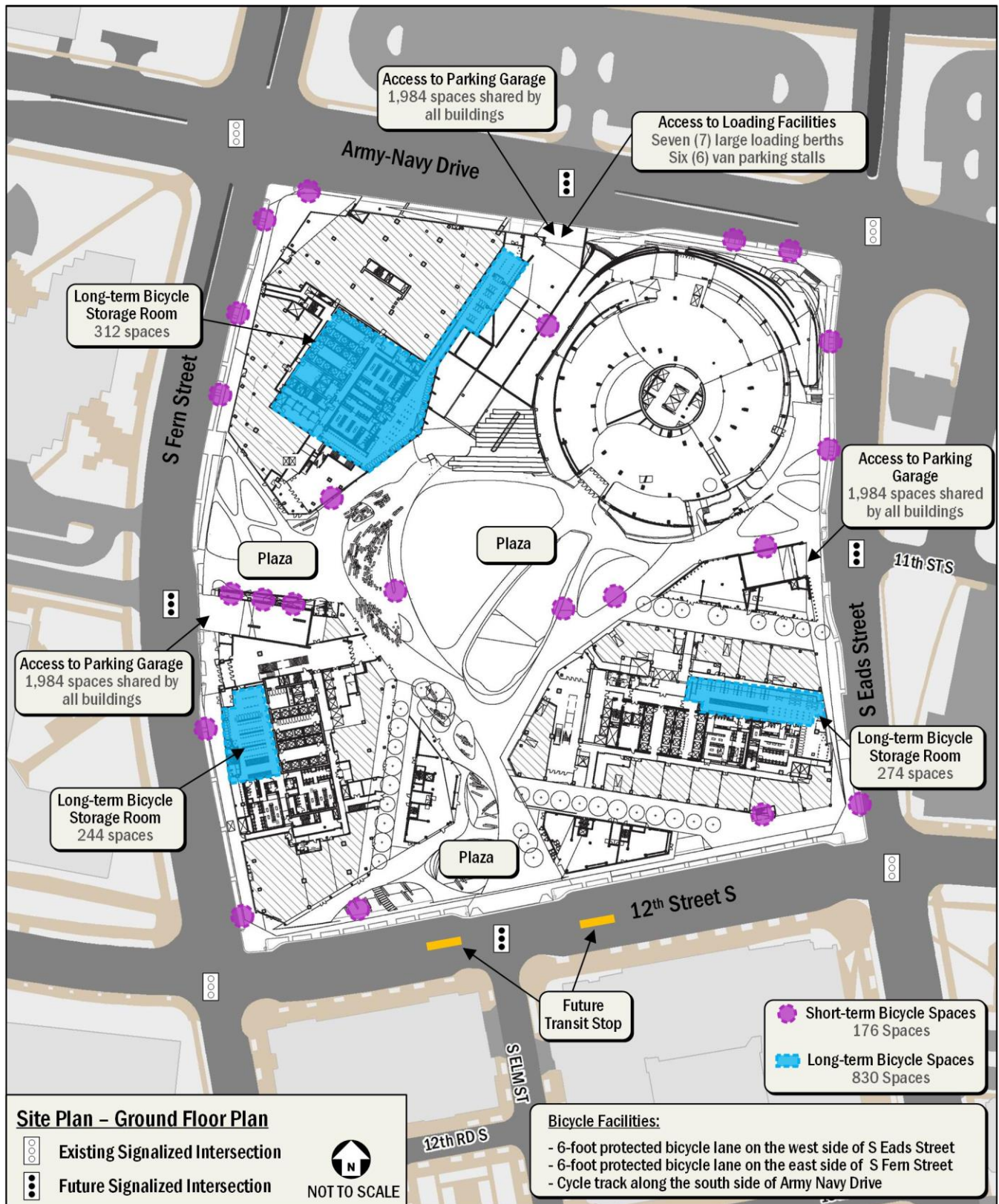


Figure 7: Site Plan – Ground Floor Plan

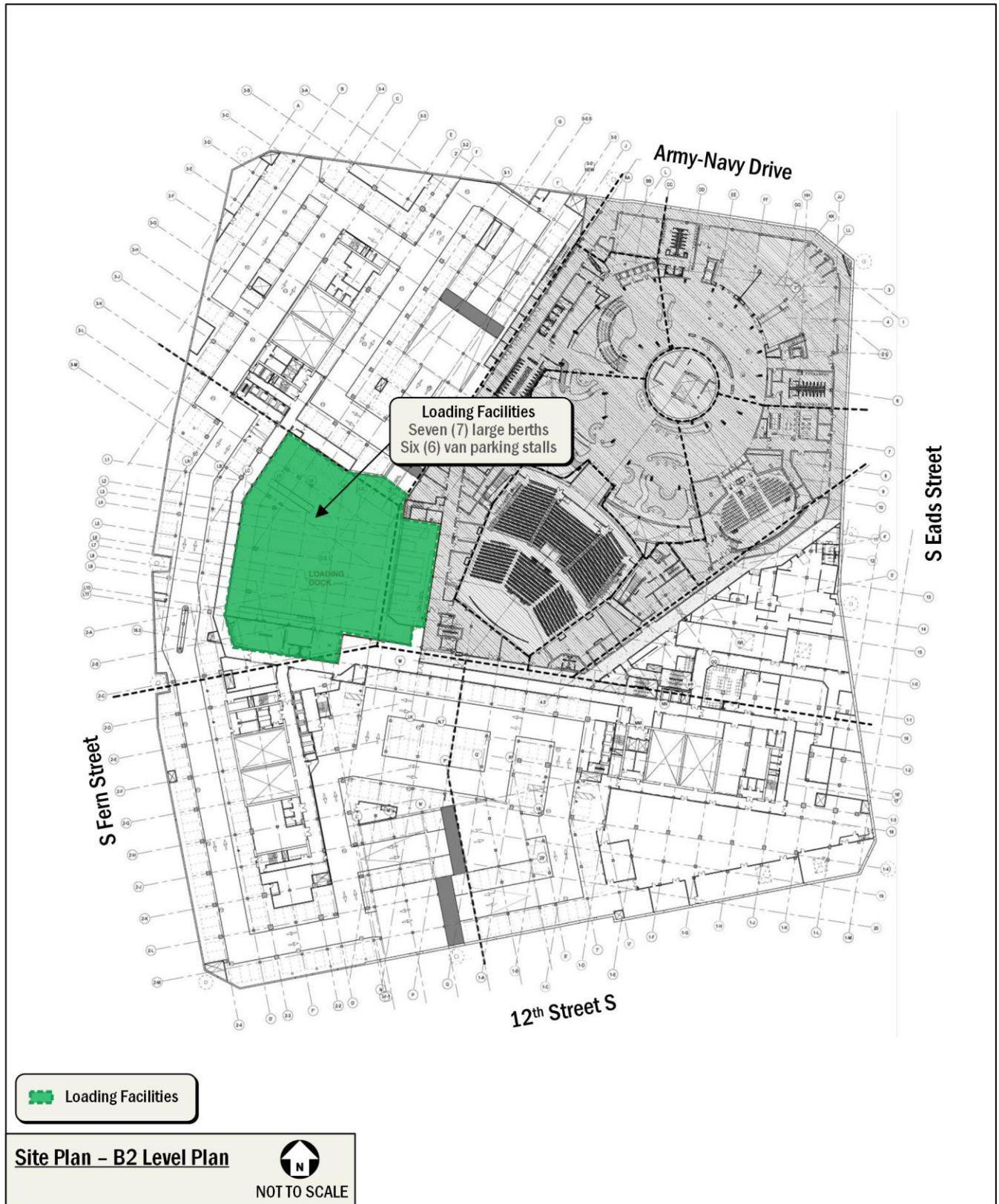


Figure 8: Site Plan – B2 Level Plan

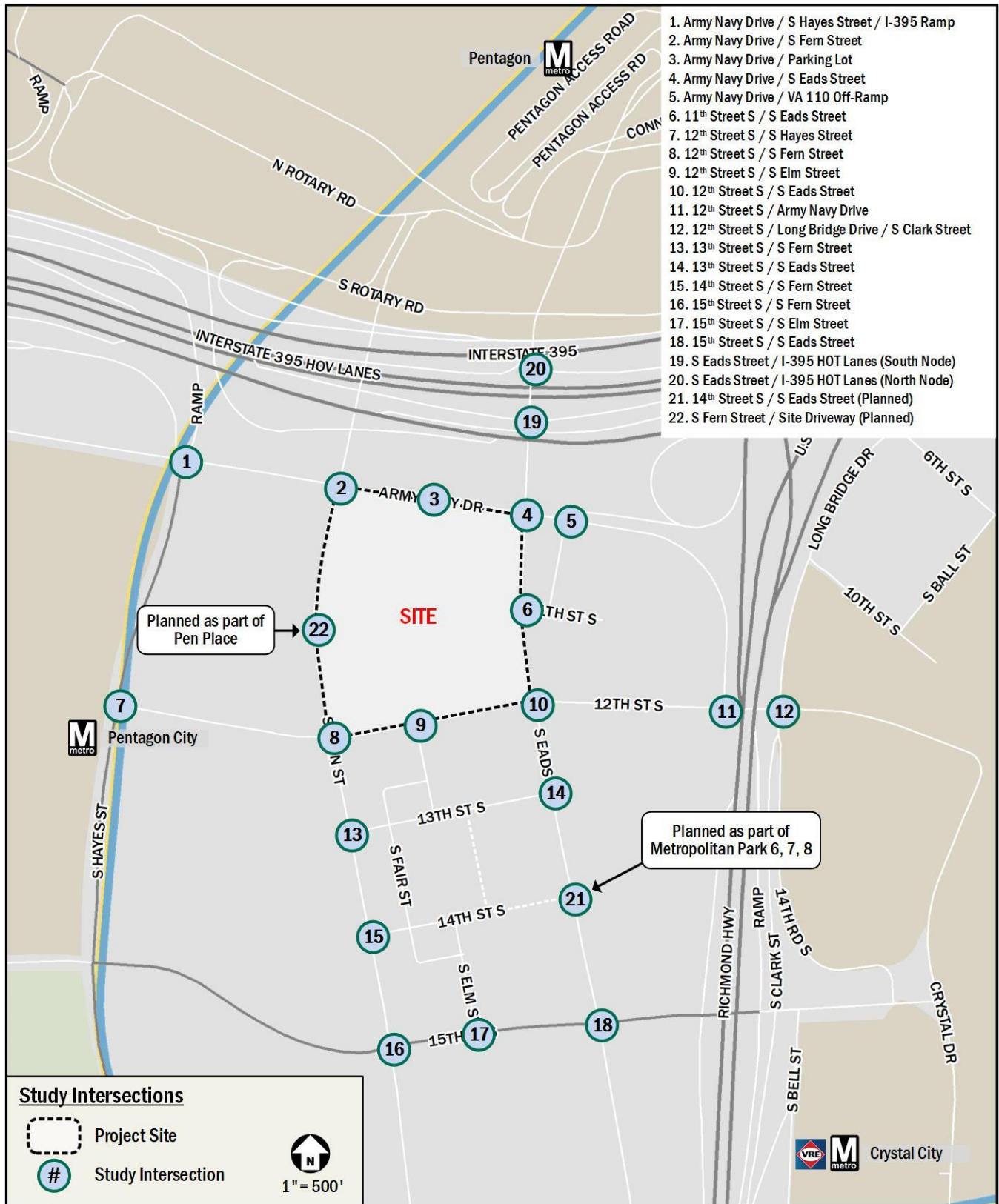


Figure 9: Study Intersections

## Study Area Overview

This chapter reviews the existing conditions of the surrounding transportation network and includes an overview of the site location, including a summary of the major transportation characteristics of the area and of future regional projects. Detailed characteristics of each mode and their subsequent study areas will be defined in the following chapters.

The following conclusions are reached within this chapter:

- The site is surrounded by an extensive regional and local transportation system that will accommodate the employees and patrons of the proposed development.
- The site is well-served by public transportation with access to the Metrorail's Blue and Yellow lines, the VRE, and several local and regional bus lines.
- The site is surrounded by a well-connected pedestrian environment. In the vicinity of the site, sidewalks generally meet standards recommended by the Arlington County Master Transportation Plan with some gaps in the system.
- The site has access to several on- and off-street bicycle facilities, including bicycle lanes on S Eads Street, 12<sup>th</sup> Street S, S Hayes Street, 15<sup>th</sup> Street S, 18<sup>th</sup> Street S, and S Bell Street which connect to the Mt. Vernon Trail to the east and Four Mile Run Trail to the south.
- Several local initiatives will positively impact the study area, including the S Eads Street Complete Street project, Army Navy Drive Complete Street project, the 12<sup>th</sup> Street South Complete Street project, the 15<sup>th</sup> Street Realignment project, and the Route 1 Multimodal Improvements Study.

### Major Transportation Features

#### Overview of Regional Access

Under existing conditions, the proposed development site has ample access to regional vehicular and transit-based transportation options, as shown in Figure 2, that connect the site to destinations within Virginia, the District, and Maryland.

The site is accessible from several principal arterials such as Route 1, VA-27 (Washington Boulevard), VA-244 (Columbia Pike), and VA-110. The arterials create connections to I-395, I-66, George Washington Memorial Parkway, and ultimately the Capital Beltway (I-495) and I-95. These principal arterial roadways bring vehicular traffic within half-mile of the site, at which point minor arterials, collectors, and local roads can be used to access the site directly.

The site has access to the Blue and Yellow Lines via the Pentagon City Metro Station, Pentagon Metro Station, and Crystal City Metro Station, which provide connections to areas in Virginia, the District, and Maryland. The Blue Line connects Springfield, VA with Largo, MD and the Yellow Line connects Huntington, VA with Greenbelt, MD, with both lines providing access to the District core. Both lines provide connections to the Red Line, which provides a direct connection to Union Station, a hub for commuter rail – such as Amtrak, MARC, and VRE – in addition to all additional Metrorail lines, allowing for access to much of the DC Metropolitan area. The site is located approximately 0.5 miles northwest of the Crystal City VRE station.

The proposed development is located approximately 0.6 miles from the Mount Vernon Trail, an 18-mile off-street bicycle trail running along the Potomac River from George Washington's Mount Vernon estate to Theodore Roosevelt Island, just across the river from downtown Washington, DC. The Mount Vernon Trail connects to the W&OD, Four Mile Run, and Custis Trails in Arlington County, as well as the Capital Crescent Trail in Washington, DC, providing regional bicycle connectivity to Rosslyn and the District. A detailed review of existing bicycle infrastructure is provided in a later chapter of this report.

Overall, the site has access to several regional roadways, transit, and bicycle options, making it convenient to travel between the site and destinations in Virginia, the District, and Maryland.

#### Overview of Local Access

There are several local transportation options near the site that serve vehicular, transit, walking, and cycling trips under existing conditions, as shown on Figure 10.

In addition to several principal arterials, the site is served by a local vehicular network that includes several minor arterials and collectors such as 12<sup>th</sup> Street S, Army Navy Drive, Long Bridge Drive, S Eads Street, S Fern Street, S Hayes Street, and 15<sup>th</sup> Street S. In addition, there is an existing network of local roadways that provide access to the site.

Several bus systems provide local transit service in the vicinity of the site, including connections to several neighborhoods within Virginia, the District, and additional Metro stations. As shown in Figure 10, there are multiple bus routes that serve the site. In the

vicinity of the site, the majority of routes travel along Army Navy Drive, S Eads Street, 15<sup>th</sup> Street S, and S Hayes Street.

There are existing bicycle facilities that connect the site to areas within Arlington, Virginia, and the District, most notably the Mount Vernon Trail. There are bicycle lanes on S Eads Street, S Hayes Street, and 15<sup>th</sup> Street S, and protected and buffered bicycle lanes along a portion of S Eads Street south of the site, between 12<sup>th</sup> Street S and 15<sup>th</sup> Street S. There are also signed bicycle routes along Army Navy Drive and S Fern Street. A detailed review of existing and proposed bicycle facilities and connectivity is provided in a later chapter of this report.

In the vicinity of the site, most sidewalks meet Americans with Disabilities Act (ADA) standards and standards recommended by the Arlington County Master Transportation Plan. Anticipated pedestrian routes, such as those to public transportation stops, retail zones, nearby residential areas, and community amenities, provide well-connected pedestrian facilities. A detailed review of existing and proposed pedestrian access and infrastructure is provided in a later chapter of this report.

Overall, the site is surrounded by an extensive local transportation network that allows for efficient transportation options via transit, bicycle, walking, or vehicular modes.

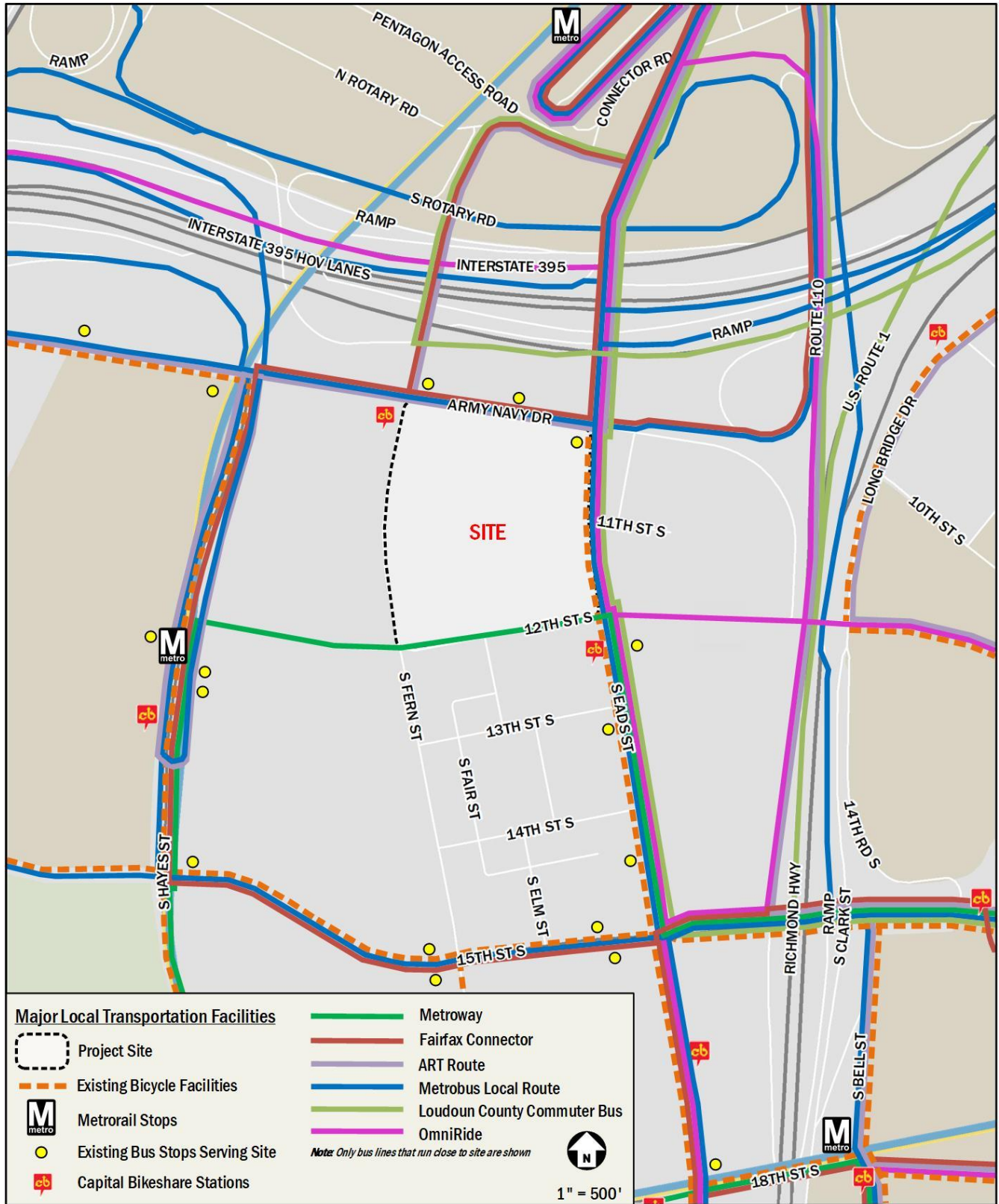


Figure 10: Major Local Transportation Facilities

## **Car-sharing**

Car-sharing service in Arlington is provided by Zipcar. This is a private company that provides registered users access to a variety of automobiles. Zipcar has designated spaces for their vehicles. Four (4) Zipcar locations are located within a quarter-mile of the site. These locations and the number of available vehicles are listed in Table 2.

## **E-Scooters and Dockless E-Bicycles**

Four (4) electric-assist scooter (e-scooter) and electric-assist bicycle (e-bicycle) companies provide Shared Mobility Device (SMD) service in Arlington County: Bird, Helbiz, Lime and Spin. These SMDs are provided by private companies that give registered users access to a variety of e-scooter and e-bicycle options. These devices are used through each company-specific mobile phone application. Many SMDs do not have designated stations where pick-up/drop-off activities occur like with Capital Bikeshare; instead, many SMDs are parked in public space, most commonly in the “furniture zone” (the portion of sidewalk between where people walk and the curb, often where other street signs, street furniture, trees, parking meters, etc. are found). At this time, SMD pilot/demonstration programs are underway in Arlington County, the District, Fairfax County, the City of Alexandria, and Montgomery County.

## **Walk Score and Bike Score**

Walkscore.com is a website that provides scores and rankings for the walking, biking, and transit conditions for an area. This project site is located in an area that has a walk score of 81 (or “Very Walkable”), transit score of 77 (or “Excellent Transit”), and a bicycle score of 86 (or “Very Bikeable”). Figure 11 shows the neighborhood borders in relation to the site location and displays a heat map for walkability and bikeability.

The site is situated in an area with a “Very Walkable” walk score because of the abundance of neighborhood serving retail locations, where daily errands can be completed by walking.

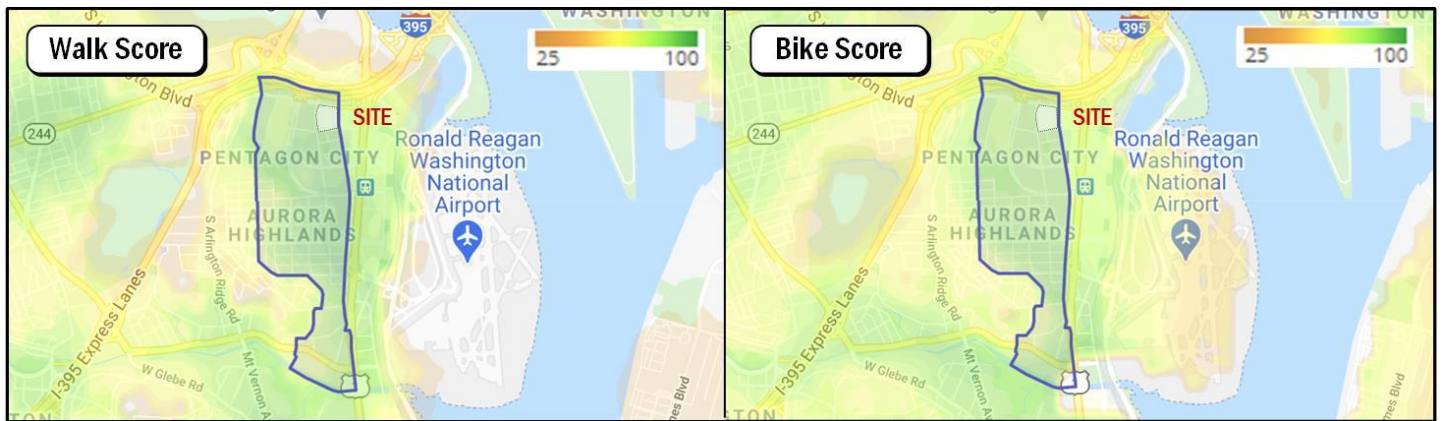
The proposed development is located in an area with an “Excellent Transit” transit score because of its proximity to the Pentagon City Metro Station, Pentagon Metro Station, and Crystal City Metro Station, as well as its proximity to multiple bus lines.

The site is situated in an area with a “Very Bikeable” bicycle score due to its proximity to low volume roadways, a number of bicycle lanes and trails, including the Mount Vernon Trail, and flat topography.



**Table 2: Carshare Locations**

| Carshare Location  | Number of Vehicles |
|--|--------------------|
| <b>Zipcar</b>  |                    |
| Acadia at Metropolitan Park Apartments (13 <sup>th</sup> Street S & S Fair Street) | 1 vehicle          |
| Meridian at Pentagon City (1221 S Eads Street)                                     | 1 vehicle          |
| S Fern Street and 15 <sup>th</sup> Street S  | 2 vehicles         |
| Lenox Club Apartments (12 <sup>th</sup> Street S and Army Navy Drive)              | 1 vehicle          |
| <b>Total</b>   | <b>5 vehicles</b>  |



**Figure 11: Summary of Walk Score and Bike Score**

## Future Projects

There are a few County-wide initiatives, local initiatives, and planned improvements located in the vicinity of the site. These planned projects are summarized below.

### County-wide Initiatives

#### Arlington County Master Transportation Plan (2011)

The Arlington County Master Transportation Plan (MTP), adopted in 2011 and updated in 2019, outlines goals to improve various modes of transportation throughout the County. The MTP identifies goals and objectives for each mode to improve safety and access for all users, particularly for pedestrians, bicyclists, and transit users. The Arlington County Master Transportation Plan's recommended policies for transportation in the County that apply to the PenPlace development are outlined as follows:

- **Streets (2016)** – The County will address the street system and enhance the transportation network by: (1) Utilizing the plan's street typology to guide street planning and ensure each street type supports the general policies of complete streets and adjacent land uses; (2) Including appropriate facilities to meet and balance the needs of all modes; (3) Constructing/converting some local streets to a pedestrian priority or a shared street; (4) Accommodating travel growth through shifts to non-auto modes; (5) Designing streets to favor lower vehicular speeds; and (6) Maintaining a grid-style network to enhance connectivity. The improvements planned surrounding the site as part of the MTP are shown in Figure 12.
- **Transit (2016)** – The County will address the transit system by: (1) Developing a Premium Transit Network of high-frequency service connecting major destinations; (2) Operating a Secondary Transit Network of fixed route services that improves access to destinations across Arlington; (3) Making transit more accessible and convenient to all through enhanced facilities and transit-oriented land use policies; (4) Improving Metrorail services and stations; and (5) Expanding pedestrian access to transit facilities.
- **Pedestrian (2011)** – The County will address the pedestrian system by: (1) Completing the walkway network with appropriate facilities on both sides of arterial streets and at least one side of neighborhood streets; (2) Upgrading existing pedestrian facilities to comply with current standards; (3) Implementing measures aimed at changing motorist behavior to manage vehicular speed and minimize vehicle/pedestrian conflicts; and (4) Developing strategies to encourage more people to walk.

- **Bicycle (2019)** – The County will address the bicycle system by: (1) Making existing streets safer and more comfortable for bicycling by all users; (2) Expanding travel safety education programs; (3) Providing a network of low-traffic-stress bicycle routes that connect all land uses; (4) Accommodating bicycle infrastructure as part of all street improvement projects; (5) Establishing bicycles as a mainstream travel mode; and (6) Encouraging bicycle facilities, including parking, showers, and lockers. The improvements planned for the bicycle facilities surrounding the site as part of the MTP are shown in Figure 13.
- **Parking and Curb Space (2009)** – The County will address the parking system by: (1) Prioritizing the use of curb space, matching the various types of uses to the most appropriate locations; (2) Promoting on-street parking within residential neighborhoods and on commercial streets to calm traffic; (3) Ensuring the minimum parking needs are met and limit excessive parking; (4) Discouraging off-street surface parking; and (5) Allowing reduced parking space requirements for new developments in close proximity to frequent transit service and requiring enhanced TDM measures.
- **Transportation Demand Management (2008)** – The County will address transportation demand management by: (1) Incorporating comprehensive TDM plans for all site plans to minimize vehicular trips and maximize the use of other modes; (2) Exploring strategies and incentives to achieve TDM measures in existing private buildings; and (3) Applying TDM programs to non-work travel, as well as commuting, through marketing strategies.

A number of elements in the proposed development are consistent with these policies:

- **Streets:**
  - Introducing publicly accessible open space and plazas throughout the site, breaking-up a superblock and introducing porosity and connectivity.
- **Pedestrian:**
  - Improvements to the adjacent sidewalks so that they meet or exceed County and ADA standards.
  - The creation of signalized crossings at adjacent intersections.
  - The inclusion of publicly accessible plazas, parks, a north-south forest walk, and an east-west multimodal path that improve pedestrian circulation and porosity.
  - Providing two (2) fewer curb cuts along the perimeter of the site that reduce number of pedestrian crossings.

- **Bicycle:**
  - Short-term bicycle parking will be provided within and along the perimeter of the site.
  - Bicycle rooms will be provided at the ground-level in three (3) buildings on-site, to include secure, long-term parking, showers, and lockers.
  - Protected southbound bike lanes along the western side of S Eads Street between Army Navy Drive and 12th Street S and protected northbound bike lanes along the eastern side of S Fern Street between Army Navy Drive and 12th Street S, protected southbound bike lanes along the western side of S Fern Street between Army Navy Drive and 11th Street S.
- **Parking and Curb Space:**
  - On-site parking will be located in an off-street, below-grade parking garage.
  - On-site parking which meets the practical needs of the site while promoting the use of non-auto modes of travel to and from the proposed development.
- **Transportation Demand Management:**
  - A TMP will be implemented for the development to discourage auto travel and encourage the travel by other modes.

The MTP also identifies the following recommendations in the vicinity of the PenPlace development:

- **Transit:**
  - Expansion of the Crystal City/Potomac Yard transitway into Pentagon City, running adjacent to the development site.
- **Bicycle:**
  - Bi-directional, protected bicycle lanes along Army Navy Drive from S Joyce Street to 12th Street S.
  - Construct an off-street cycle track connecting the planned Army Navy Drive protected bicycle lane from 12th Street S to 18th Street S and the Crystal City Metrorail station.
  - Upgrade the existing bicycle lanes on S Joyce Street and 15th Street S between Army Navy Drive and S Hayes to include more separation from vehicular traffic.
  - Develop enhanced bicycle lanes along S Fern Street from the Pentagon Transit Center to 18th Street S. The proposed development will provide a northbound protected bike lane along the eastern side between

Army Navy Drive and 12th Street S and a southbound protected bike lane along the western side between Army Navy Drive and 11th Street S/Site Driveway.

- Reconstruct 18th Street S between Richmond Highway (Rt. 1) and Crystal Drive to include an enhanced on-street bicycle facility and improve the connection with the Crystal City Connector Trail, also identified in the Crystal City Sector Plan.

In direct relation to the PenPlace development, these recommendations would create additional multi-modal capacity and connectivity to the site.

### **Local Initiatives**

#### **Crystal City Sector Plan (2010)**

The Crystal City Sector Plan, adopted in 2010, outlines the vision to transform Crystal City with more ground floor retail, high-quality office space, and more housing options through improvements to existing street, sidewalk, and bicycle networks. The key transportation-related goals of the Sector Plan include:

- Creating a high-quality public realm that strengthens the sense of community
- Providing a mix of office, residential, retail, cultural, and civic uses
- Preserving the integrity of the single-family neighborhoods
- Enhancing multimodal access and connectivity

The PenPlace development is located in Pentagon City, just outside of the Sector Plan's extents. However, the development is consistent with the outlined goals. The development includes ground floor retail and high-quality office space in all four (4) buildings and provides ample bicycle accommodations on-site. Additionally, recommendations in the Sector Plan may positively impact the connectivity of the development to the surrounding areas. Recommendations include bicycle lanes on Army Navy Drive, Long Bridge Drive, and 12th Street S, cycle tracks on S Clark Street/S Bell Street, and signed bicycle routes on S Fern Street, 12th Street S, and 15th Street S.

#### **Crystal City Multimodal Transportation Study (2010)**

The Crystal City Multimodal Transportation Study is a supporting document of the Crystal City Sector Plan that further evaluates the existing and future multimodal transportation network in Crystal City. The study highlights recommendations to improve accommodations for all travel modes, including a Complete Streets program, with recommendations for sidewalks,

crosswalks, bicycle lanes, transit facilities, on-street parking, and left-turn lanes.

Although the PenPlace development is not located in Crystal City, portions of the study extents are directly related, particularly S Eads Street. The study recommends: (1) 7- to 8-foot-wide parallel parking lanes on sections of S Eads Street; (2) Extension of bicycle lanes along S Eads Street from 15<sup>th</sup> Street S to 23<sup>rd</sup> Street S; and (3) On-street signed bicycle routes along S Eads Street from 15<sup>th</sup> Street S to Army Navy Drive, S Fern Street from 15<sup>th</sup> Street S to 12<sup>th</sup> Street S, and 15<sup>th</sup> Street S from S Fern Street to Crystal Drive.

### **22202 Study (2016)**

In response to community concerns regarding the development impacts in Crystal City and Pentagon City, Arlington County completed a study including transportation material, data, and plans for the 22202 Zip Code. The study presents data on past, present, and projected vehicular traffic and multimodal trends for the entire zip code. Among the data presented in the report is the Journey to Work Mode Split information by census tract, which shows a 35% auto mode split in the Crystal City area and a 28% auto mode split in the Pentagon City area, which supports the mode splits assumed in this report.

### **Planned Improvements**

#### **S Eads Street Complete Street (2014)**

Arlington County began implementing a S Eads Street complete streets project between 12<sup>th</sup> Street S and 23<sup>rd</sup> Street S in 2014. This project included the conversion of the four-lane roadway into three lanes, with two through vehicular travel lanes, a center two-way left turn lane, and new protected bicycle facilities. Pedestrian crossings were improved and parking lanes were reconfigured. The next phase of the project includes improvements along S Eads Street between 12<sup>th</sup> Street S and Army Navy Drive.

In direct relation to the PenPlace development, improvements will include a new protected bicycle lane, sidewalk, streetscape, and lighting near the development on S Eads Street, improving the multimodal connectivity to/from the site.

#### **Army Navy Drive Complete Street (2017)**

The Army Navy Drive Complete Street project will reconfigure Army Navy Drive between S Joyce Street and 12<sup>th</sup> Street S to create a multimodal complete street, featuring enhanced transit, bicycle, and pedestrian facilities. This project will include a

physically separated two-way bicycle lane along the south side of Army Navy Drive, shorter and safer pedestrian crossings, and will accommodate future dedicated transit lanes. Vehicular travel lanes will be reduced where appropriate and will be narrowed for a slower urban context. The project will also extend the Crystal City Potomac Yard Transitway into Pentagon City by adding one dedicated transit lane in each direction along Army Navy Drive between S Joyce Street and S Hayes Street. Vehicular travel lanes will be reduced where appropriate and narrowed to promote a slower, urban environment. The existing raised medians will be re-built as planted medians. The project is expected to be complete by 2024.

In direction relation to the PenPlace development, improvements will include a new separated two-way bicycle lane along the north side of the site on Army Navy Drive, reduced vehicular travel lanes, and enhanced pedestrian facilities near the development, improving the multimodal connectivity to/from the site. Signal timing and phasing at signalized intersections within this project's extent will include modifications to minimize conflicts with the cycle track along the south side of Army Navy Drive, including protected turning movements. Details on roadway reconfigurations and signal timing and phasing at signalized intersections are provided in the Traffic Operations section of this report.

#### **12<sup>th</sup> Street S Complete Street (2016)**

This project is planned in conjunction with the Crystal City Potomac Yard Transitway extension and will include landscaping, sidewalk, curb ramp, crosswalk, and lighting improvements. New transportation facilities include dedicated center-running transit lanes, shared bicycle lanes west of Army Navy Drive, and a two-way cycle track east of Army Navy Drive.

In direct relation to the PenPlace development site, plans for the 12<sup>th</sup> Street S Complete Street project show dedicated center-running transit lanes extending across S Eads Street to the section of 12<sup>th</sup> Street S along the proposed development site frontage. The dedicated transit lanes will require adjustments to the signal operations at the intersections at S Eads Street, S Fern Street, and S Hayes Street. At the time of scoping, signal phasing was under study as part of a dedicated transitway study effort, led by Arlington County, and is set to be finalized. As such, signal timings, phasing, and lane configuration assumptions were based on the signal timings and phasing included in the 2025 No-Build VISSIM files provided by the County and discussions with County staff and lane

configurations included in the Transitway Extension to Pentagon City plans provided by the County.

### **Crystal City Transitway Extension (2019)**

This project is the planned extension of the Crystal City Potomac Yard Transitway north and west into Pentagon City. It will add 1.1 miles to the existing 4.5-mile transitway, providing high-frequency, premium transit service between the Braddock Road Metrorail station and the Pentagon City Metrorail station. The project will be separated into a 12<sup>th</sup> Street S segment, from Long Bridge Drive to S Hayes Street, a Crystal Drive segment, from 15<sup>th</sup> Street S to 12<sup>th</sup> Street S and Long Bridge Drive, and a S Hayes Street segment, from 12<sup>th</sup> Street S to Army Navy Drive.

As part of the 12<sup>th</sup> Street S segment of the project, the project will add dedicated bus lanes, mixed traffic lanes, traffic signal upgrades, and three (3) new transitway stations on 12<sup>th</sup> Street S from the intersection of S Hayes Street and 12<sup>th</sup> Street S to the intersection of Long Bridge Drive and 12<sup>th</sup> Street S. New eastbound and westbound transitway stations will be provided at S Elm Street and a new eastbound station will be provided at S Hayes Street. The 12<sup>th</sup> Street S segment is currently in the concept phase.

As part of the Crystal Drive segment of the project, the project will add curbside rush hour bus-only lanes on Crystal Drive from the intersection of 15<sup>th</sup> Street S and Crystal Drive to the intersection of 12<sup>th</sup> Street S and Long Bridge Drive. The project will also add two (2) new transitway stations. One (1) station will be located on the east side of Crystal Drive at 15<sup>th</sup> Street S and one (1) station will be located on the north side of 12<sup>th</sup> Street S at Long Bridge Drive. The Crystal Drive segment is currently in the design phase, and construction will be coordinated with the 12<sup>th</sup> Street S Complete Street project in 2021/2022.

As part of the S Hayes Street segment of the project, the transitway will connect to WMATA's planned Pentagon City Center bus bays project on Army Navy Drive. The S Hayes Street segment is currently in the design phase.

At the time of scoping, signal phasing was under study as part of a dedicated transitway study effort, led by Arlington County, and is set to be finalized. As such, signal timings, phasing, and lane configuration assumptions were based on the signal timings and phasing included in the 2025 No-Build VISSIM files provided by the County and discussions with County staff and lane configurations included in the Transitway Extension to Pentagon City plans provided by the County.

In direct relation to the PenPlace development, the project will improve transit access to the site from the south by increasing the amount of dedicated rush hour bus-only lanes.

### **15<sup>th</sup> Street S/S Clark-Bell Street Realignment (2010)**

The Crystal City Sector Plan and Crystal City Multimodal Transportation Study recommend improvements to 15<sup>th</sup> Street S to improve vehicular and pedestrian safety and conditions. In accordance with these recommendations, 15<sup>th</sup> Street S between Crystal Drive and S Clark Street and S Bell Street will ultimately be realigned such that a 3/4-acre garden park is created in the median. The project also includes improvements to S Clark-Bell Street, including traffic signals, street lighting, crosswalks, a northbound bicycle lane, street trees, and wider sidewalks. The project is currently in the design stage, with construction to be determined.

In direct relation to the PenPlace development, the project will improve the navigability of Crystal City by converting S Clark-Bell Street from a one-way grade-separated roadway to a two-way at-grade roadway.

### **Route 1 Multimodal Improvements Study (2021)**

The Route 1 Multimodal Improvements Study (Phase 1), published by VDOT in October 2021, aims to identify opportunities for enhanced multimodal connectivity through Pentagon City and Crystal City. The study recommends that Route 1 be integrated within the urban fabric of Pentagon City and Crystal City as a multimodal, urban boulevard consistent with the context of existing and future development.

The study recommends bringing Route 1 down to grade at the existing grade-separated intersections of 15<sup>th</sup> Street S and 18<sup>th</sup> Street S. The recommended at-grade alternative for Route 1 between 12<sup>th</sup> Street S and 23<sup>rd</sup> Street S includes a total of six-lanes plus left turn lanes at 15<sup>th</sup> Street S, no left turn lanes at 18<sup>th</sup> Street S, a wide median, and a wide, urban sidewalk.

Phase 2 of the study is expected to begin in late 2021 and will include an updated analysis of the recommended alternative, a comprehensive TDM strategy to reduce future volumes along Route 1 and mitigate future congestion, and additional exploration of feasibility.

In direct relation to the PenPlace development, the recommended changes to Route 1 would improve safety and accessibility within the Pentagon City neighborhood. Additionally, the improvements identified as part of the Route 1 Multimodal

Improvements Study would enhance multimodal connectivity between Pentagon City and Crystal City.

### **Pentagon City Plan (2019)**

Arlington County initiated the Pentagon City Planning Study in 2019 to help guide future development in Pentagon City and define the capacity for the future growth in the Pentagon City Phased Development Site Plan (PDSP). As part of this project, a transportation analysis was conducted that evaluates a series of preliminary land use scenarios and serves as the foundation for the planning study. The draft report for the study, released in November 2021, identifies potential improvements to the multi-modal transportation system to better accommodate additional trips generated by future redevelopment. Multi-modal improvements recommended by the Pentagon City Plan near the PenPlace site include:

- Minimum 8-10 ft clear zone for passage along sidewalks on S Fern Street, S Eads Street, and 12<sup>th</sup> Street S;
- Creation of the Green Ribbon, which at full build-out would create approximately three (3) miles of new or improved pedestrian walks and four (4) acres of new public park space;
- Public passage for pedestrians and cyclists along the 11<sup>th</sup> Street corridor at the Pen Place site; and

- Enhanced bicycle facilities on S Fern Street, protected bicycle lanes on S Eads Street, a two-way cycle facility along 12<sup>th</sup> Street S under the Route 1 bridge, and protected bicycle lanes along 15<sup>th</sup> Street S.

### **Arlington National Cemetery's Southern Expansion (2019)**

The Arlington National Cemetery's Southern Expansion project will establish a single contiguous parcel of land south of the cemetery by closing, realigning, and relocating local roadways. This project will realign Columbia Pike, modify the S Joyce Street intersection and the Columbia Pike/Washington Boulevard (Route 27) interchange, and replace Southgate Road with a new segment of S Nash Street. Roadway realignment will improve multimodal capacity and safety by adding pedestrian and bicycle facilities as well as street lighting. The realigned Columbia Pike will be rebuilt as a four-lane roadway with sidewalks on both sides and a cycle track on the north side. Construction of this project started in fall 2021 and is anticipated to be completed in 2027.

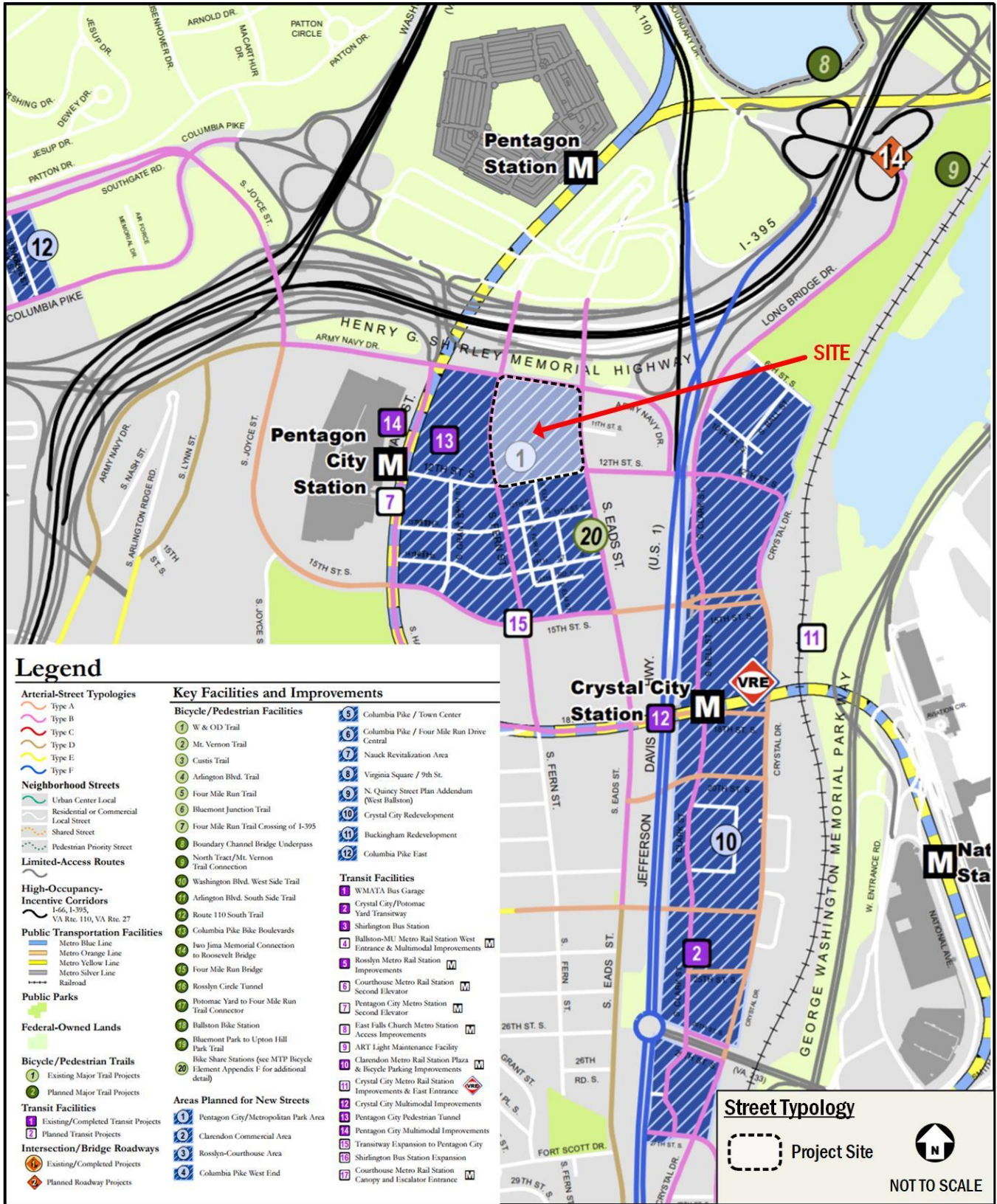


Figure 12: Street Typology (Source: Arlington County Master Transportation Plan, 2019)

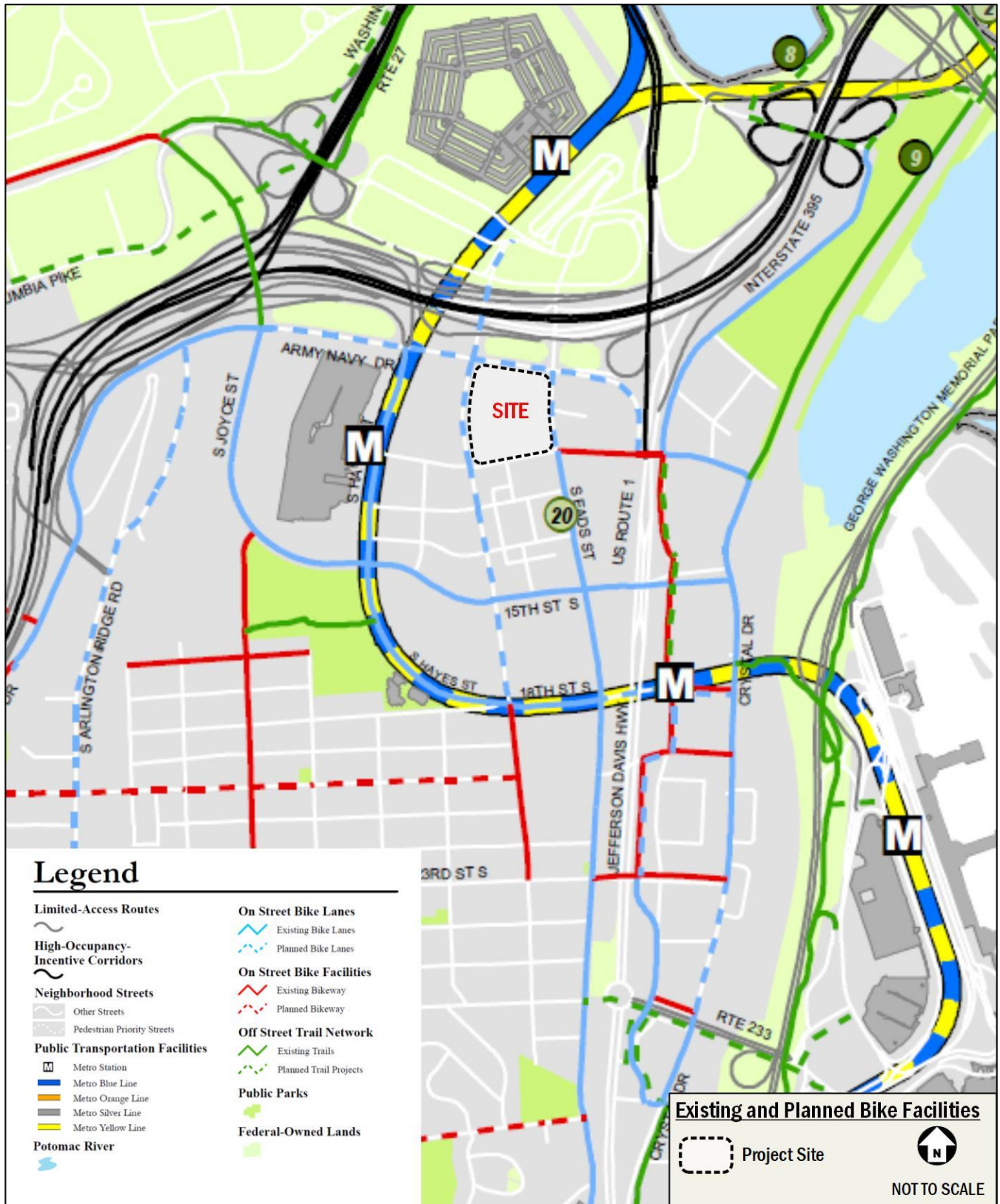


Figure 13: Existing and Planned Bicycle Facilities (Source: Arlington County Master Transportation Plan, 2019)



## Project Design

This chapter reviews the transportation components of the PenPlace development, including the proposed site plan and access points. It includes descriptions of the site's vehicular access, loading, parking, bicycle, and pedestrian facilities.

The proposed development site is located in the Pentagon City area of Arlington, Virginia and is bounded by Army Navy Drive to the north, S Eads Street to the east, 12<sup>th</sup> Street S to the south, and S Fern Street to the west. The site location is shown in Figure 3. The proposed site plan for the redevelopment is shown in Figure 7, and Figure 8.

The proposed development will include redeveloping the existing vacant and hotel space into four (4) buildings and three (3) retail pavilions with a total of approximately 2.8 million square feet of office space, 388,000 square feet of amenity space, 14,500 square feet of daycare, 82,600 square feet of neighborhood-serving ground floor retail space, and 27,000 square feet of community space.

The southeastern building (Tower 1) will include a total of approximately 937,675 square feet of office space, approximately 28,964 square feet of retail, and 274 secure long-term bicycle spaces.

The southwestern building (Tower 2) will include a total of approximately 911,163 square feet of office space, approximately 24,336 square feet of retail, and 244 secure long-term bicycle spaces.

The northwestern building (Tower 3) will include a total of approximately 928,240 square feet of office space, approximately 14,527 square feet of daycare space, approximately 27,000 square feet of community space, and 312 secure long-term bicycle spaces.

The northeastern building (Helix Building) will include a total of approximately 388,272 square feet of amenity office space and approximately 8,456 square feet of retail space. Secure long-term bicycle spaces will be provided in the southeastern building (Tower 1), the southwestern building (Tower 2), and the northwestern building (Tower 3).

Three (3) retail pavilions will include a total of approximately 20,763 square feet of retail.

The loading area will be located on the B2 level of the parking garage and will be shared by the four (4) buildings. A total of seven (7) large loading berths and six (6) van parking stalls will

be provided in the shared loading area. The shared loading area will be accessible from the driveway on Army Navy Drive.

Below-grade parking to approximately 1,984 parking spaces shared by the four (4) buildings will be accessible from driveways on Army Navy Drive, S Fern Street, and S Eads Street. A total of 176 short-term bicycle parking spaces, serving office, amenity, daycare, community, and retail uses for the four (4) buildings will be located within and around the perimeter of the site.

### **PenPlace PDSP**

The PenPlace Phased Development Site Plan (PDSP) is bounded by Army Navy Drive to the north, 12<sup>th</sup> Street S to the south, S Eads Street to the east, and S Fern Street to the west. Key design guidelines of the PenPlace PDSP include:

- A publicly accessible open space feature;
- 12th Street S activation with ground floor retail; and
- Sidewalks along the perimeter of the site.

The proposed PenPlace development is consistent with the guidelines outlined above that are included in the PenPlace PDSP. This includes:

- The inclusion of three (3) publicly accessible plazas that extend throughout the site;
- Providing pedestrian access to the central plaza from every frontage of the site, which is generally consistent with the location and envisioned circulation of the original PDSP;
- The inclusion of 83,000 square feet of neighborhood serving ground-floor retail including two (2) retail pavilions along 12<sup>th</sup> Street S; and
- The inclusion of sidewalks along the perimeter of the site with other pedestrian passageways, including the addition of signalized crosswalks, pedestrian plazas, and multimodal streets to enhance access to the site.

### **Adjacent Roadways**

Consistent with the PenPlace PDSP, the proposed development will provide improved multimodal infrastructure along the adjacent and roadways.

### **Army Navy Drive**

As part of the proposed development and the Army Navy Drive Complete Street project, Army Navy Drive will be improved from S Fern Street to S Eads Street. Army Navy Drive is envisioned to

be an urban, tree-lined street that provides a safe and more comfortable pedestrian environment and accommodates multiple modes. Streetscape elements that contribute to this include a cycle track along the south side of Army Navy Drive, wide sidewalks, and a reduction in vehicular travel lanes that will provide short and safer pedestrian crossings. The proposed development will provide a 10-foot sidewalk and 5-foot tree area along the south side of Army Navy Drive. In addition, the proposed development will signalize the intersection of Army Navy Drive and the Parking Lot/Site Driveway.

Figure 14 shows the typical cross-section and design elements that can be expected along Army Navy Drive as part of the proposed development and the Army Navy Drive Complete Street project. Figure 18 shows the cycle track proposed for Army Navy Drive.

### **S Eads Street**

As part of the proposed development and other approved development on the east side of S Eads Street, S Eads Street will be improved from Army Navy Drive to 12<sup>th</sup> Street S. S Eads Street is envisioned to be an urban, tree-lined street that provides a safe pedestrian environment, safe and convenient curbside management, and accommodates multiple modes. Streetscape elements that contribute to this include protected bicycle lanes along both sides of S Eads Street, on-street parking lanes along both sides of S Eads Street, and wide sidewalks. The proposed development will provide a 10-foot sidewalk, a 5-foot tree area, and a 6-foot protected bicycle lane on the west side of S Eads Street from 12<sup>th</sup> Street S to Army Navy Drive. In addition, the proposed development will signalize the intersection of S Eads Street and 11<sup>th</sup> Street S.

Improvements on the east side of the street will be completed by others.

Figure 15 shows the typical cross-section and design elements that can be expected along S Eads Street when fully complete. Figure 18 shows the protected bicycle lanes proposed for S Eads Street.

### **S Fern Street**

As part of the proposed development, S Fern Street is envisioned to be an urban, tree-lined street that provides a safe pedestrian environment, safe and convenient curbside management, and accommodates multiple modes. Streetscape elements that contribute to this include protected bicycle lanes along S Fern Street, on-street parking lanes along the east side

of S Fern Street, and wide sidewalks. The proposed development will provide a 10-foot sidewalk, 5-foot tree area along the east side of the S Fern Street, a 6-foot protected bicycle lane on the east side of S Fern Street from 12<sup>th</sup> Street S to Army Navy Drive, and a 6-foot protected bicycle lane on the west of S Fern Street from Army Navy Drive to 11<sup>th</sup> Street S/Site Driveway. In addition, the proposed development will signalize the intersection of S Fern Street and the site driveway. Improvements on the west side of the street will be completed by others as development occurs.

Figure 16, shows the typical cross-section and design elements that can be expected along sections of S Fern Street when fully complete. Figure 18 shows the protected bicycles lanes proposed for S Fern Street.

### **12<sup>th</sup> Street S**

As part of the proposed development and the 12<sup>th</sup> Street S Complete Street project, 12<sup>th</sup> Street S will be improved from S Fern Street to S Eads Street. 12<sup>th</sup> Street S is envisioned to be an urban, tree-lined street that provides a safe and more comfortable pedestrian environment, and accommodates multiple modes. Streetscape elements that contribute to this include on-street parking lanes, wide sidewalks, eastbound and westbound dedicated center bus lanes, and two (2) median bus stops. The proposed development will provide a 12-foot sidewalk and 5-foot tree area on the north side of 12<sup>th</sup> Street S from S Fern Street to S Eads Street. Figure 17 shows the typical cross-section and design elements that can be expected along 12<sup>th</sup> Street S when fully constructed.

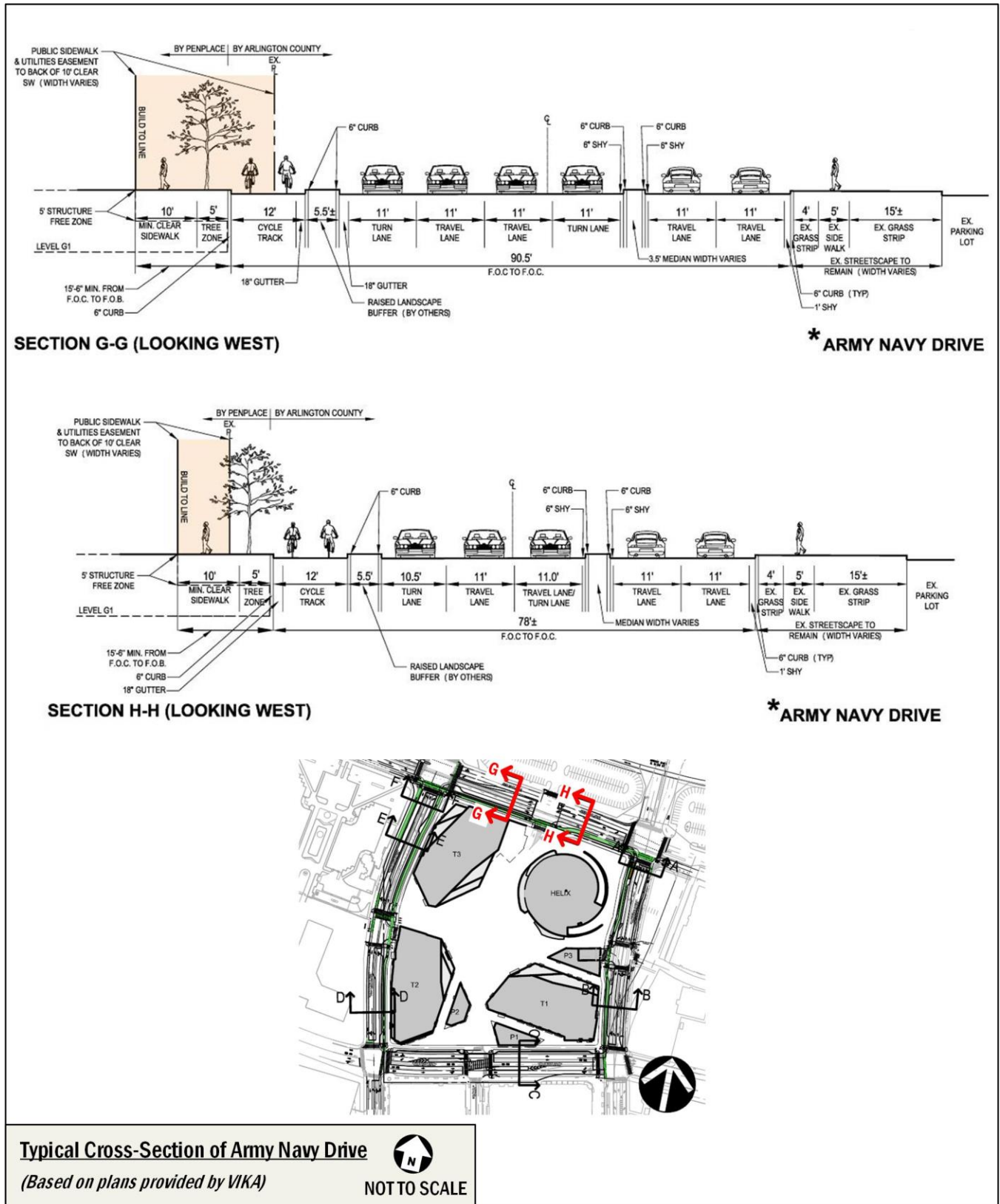


Figure 14: Typical Cross-Section of Army Navy Drive

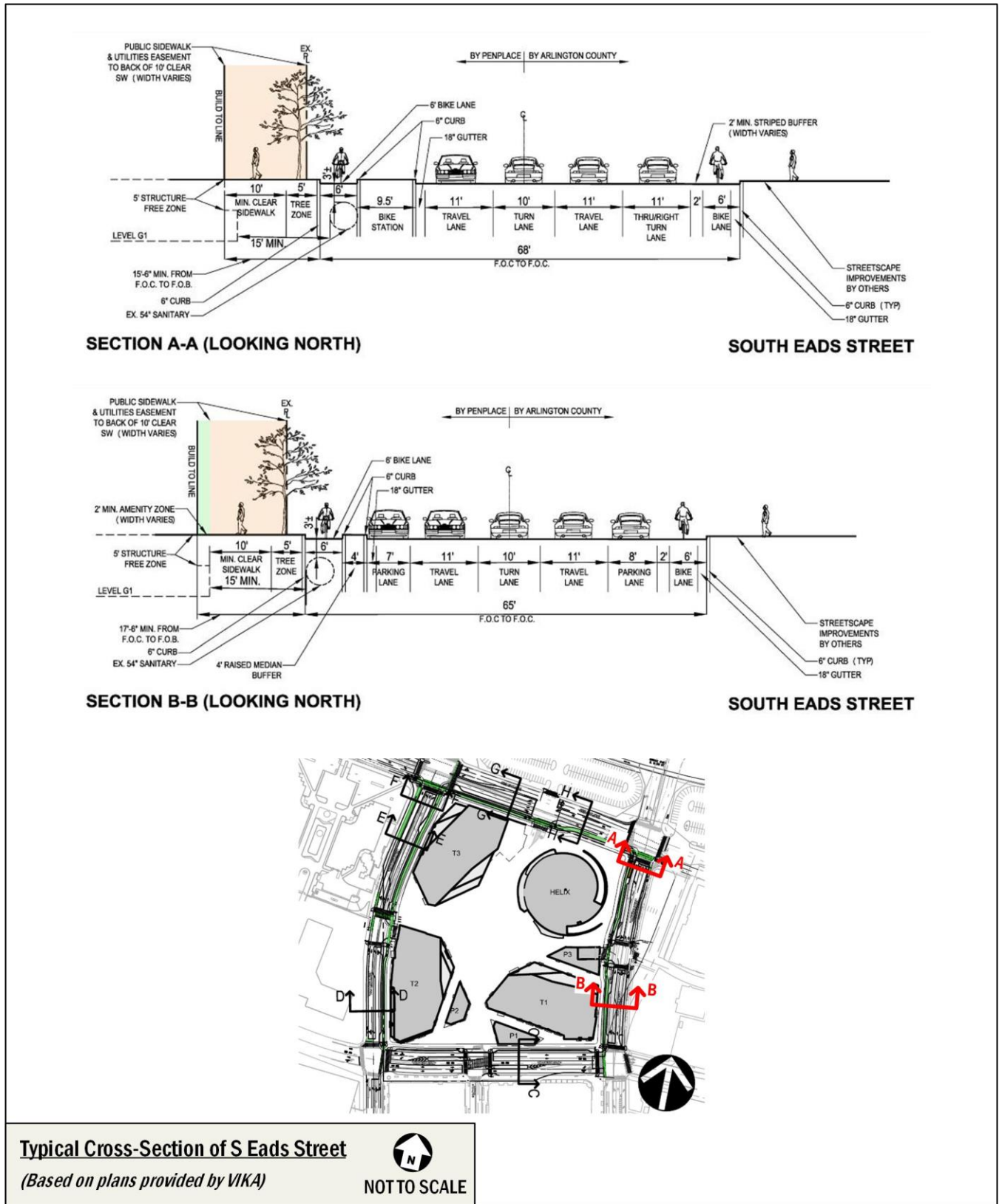


Figure 15: Typical Cross-Section of S Eads Street

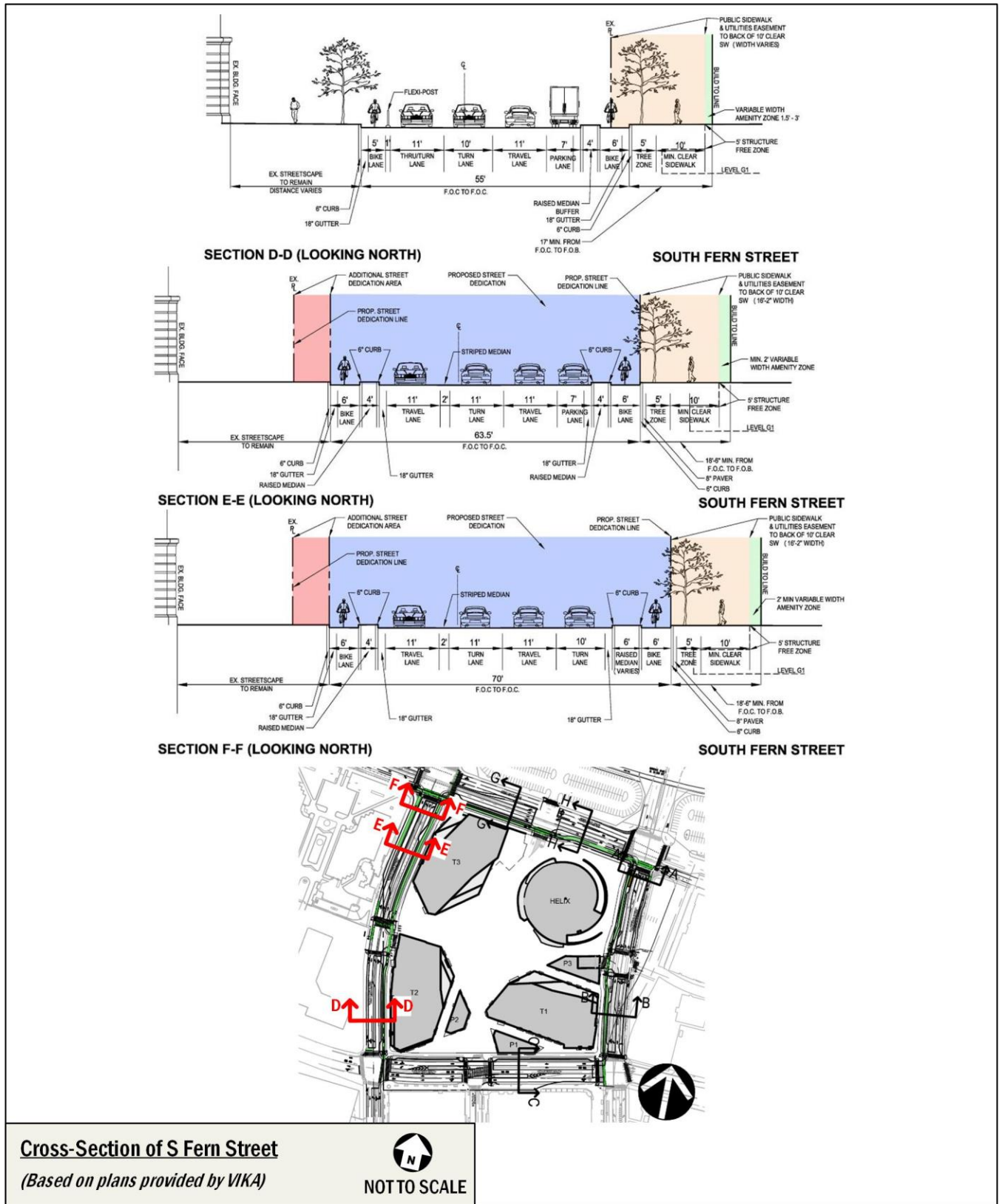


Figure 16: Typical Cross-Section of S Fern Street

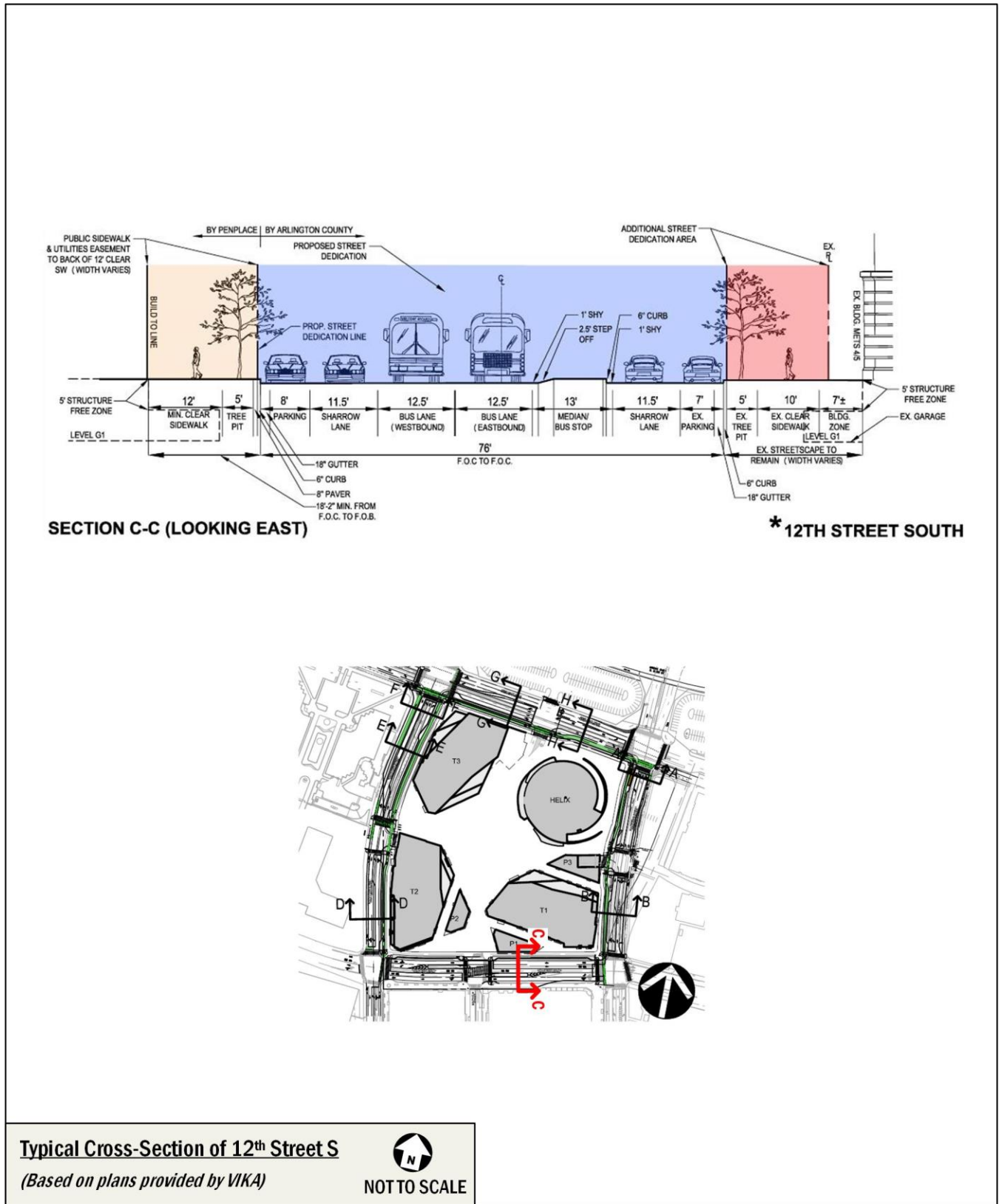


Figure 17: Typical Cross-Section of 12<sup>th</sup> Street S

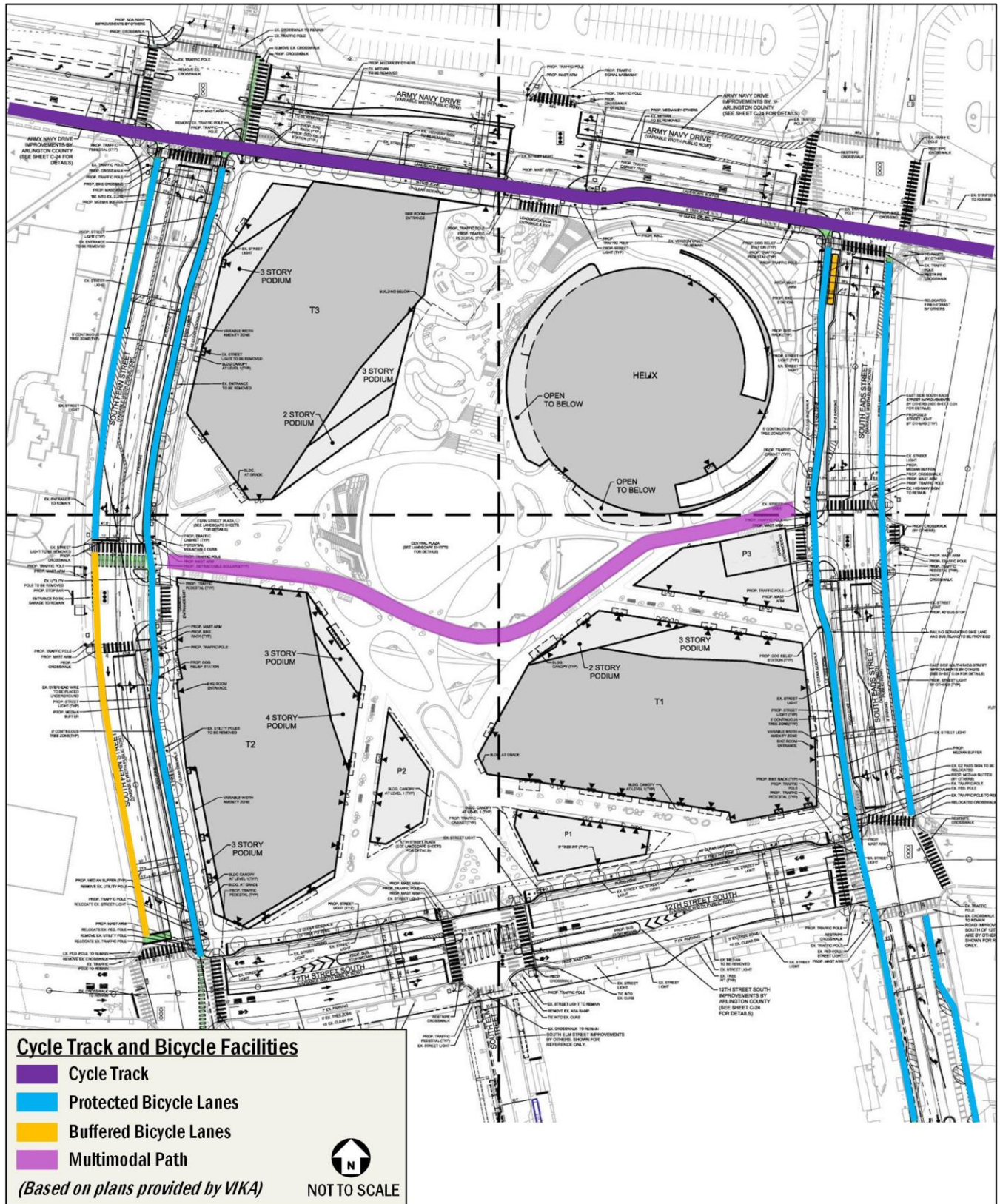


Figure 18: Cycle Track and Protected Bicycle Lanes

## Site Access and Circulation

### Pedestrian Access

As shown in Figure 19, pedestrian access to the office component for the four (4) buildings is primarily from the central plaza. Additional pedestrian access to the office component is along 12<sup>th</sup> Street S for the southeastern building (Tower 1), along S Fern Street for the southwestern building (Tower 2), along S Fern Street and Army Navy Drive for the northwestern building (Tower 3), and along S Eads Street for the northeastern (Helix) building. Pedestrian retail access will be primarily along 12<sup>th</sup> Street S, from the central plaza. There will also be stairs and a ramp (or other accessible accommodations) provided on the north side of the site to provide access from Army Navy Drive. A circulation plan showing expected pedestrian routes is shown in Figure 20.

### Bicycle Access

Bicycle access to the secure long-term bicycle parking on the ground floor of each building will be from S Eads Street for the southeastern building (Tower 1), from S Fern Street for the southwestern building (Tower 2), and from Army Navy Drive for the northwestern building (Tower 3). The northeastern building (Helix) will have access to the secure long-term bicycle parking provided in the southeastern building (Tower 1), the southwestern building (Tower 2), and the northwestern building (Tower 3). Short-term bicycle parking spaces will be placed within the site and along the perimeter of the site, along 12<sup>th</sup> Street S, Army Navy Drive, S Fern Street, and S Eads Street. Bicycle access to the site is primarily expected to occur via 12<sup>th</sup> Street S, and S Fern Street for retail use. There will also be a bike tunnel provided on the north side of the site to provide access from Army Navy Drive. A circulation plan showing expected bicycle routes is shown in Figure 20.

### Vehicular Access

By design there is limited direct vehicular access to each of the buildings of the proposed development. Access to the below-grade parking garage shared among the four (4) buildings will be provided via Army Navy Drive, S Fern Street, and S Eads Street.

There are a number of on-street parking and pick-up/drop-off spaces located along the frontage of each of the four buildings. There are on-street parking and pick-up/drop-off spaces on S Fern Street, 12<sup>th</sup> Street S, and S Eads Street which provide convenient and proximate access to each of the four buildings.

A circulation plan showing expected vehicular routes is shown in Figure 20. A proposed curbside management plan is shown on Figure 22.

### Loading Access

Loading access to the below-grade shared loading area will be provided via the Army Navy Drive access point, as shown on Figure 19. Trucks will be permitted to access the site by turning right from eastbound Army Navy Drive. All turns across the planned cycle track on the south side of Army Navy Drive will be protected movements (i.e., requiring a protected green arrow and "No Turn on Red"). Westbound left-turning access will be restricted. Vehicles will be permitted to make left- and right-turns when exiting the site. It is expected that most loading vehicles will exit toward I-395. While the loading dock and ramp have been designed to accommodate a WB-67, trucks of this size will be very infrequent. The arrival of a WB-67 would be scheduled and permitted during off-peak only.

A circulation plan showing expected loading routes is shown in Figure 20. AutoTURN exhibits showing the turning paths of trucks as they enter and exit the ramp to the internal, below-grade loading area are included in the Technical Appendix.

For security purposes, all delivery vehicles will be scheduled in advance and access the loading area uninterrupted. If a truck arrives unscheduled, it will be required to pull off into a separate screening area. The under-truck screening area will be located within the site, along the ramp to the loading area, to prevent trucks queuing on Army Navy Drive. A loading memorandum detailing loading access, screening procedures, and anticipated daily loading activity is included in the Technical Appendix.

### Loading

Per the Zoning Ordinance, the following outlines the loading facility requirements for land uses of the development:

- Office  
Buildings with over 6,000 square feet of office space are required to provide one (1) loading space.
- Retail  
Buildings with over 3,000 square feet of retail space are required to provide one (1) loading space, with one (1) additional space for more than 15,000 square feet, one (1) additional space for more than 50,000 square feet, and one additional space for each 100,000 square feet.

Per these requirements, the proposed development is required to provide three (3) loading spaces for office use and four (4)



loading spaces for retail use, for a total of seven (7) spaces required. The PenPlace development will provide seven (7) large loading berths and six (6) van parking stalls, for a total of 13 loading spaces, which exceeds County requirements. The number of on-site loading facilities will accommodate the practical needs of the site. Figure 8 shows the locations of the loading berths and service/delivery spaces.

## **Parking**

Based on the Arlington County Zoning Ordinance, the following outlines the vehicular parking requirements for the proposed development:

- Office  
One (1) space per 250 square feet of floor area on the first floor, one (1) space per 300 square feet of floor area located in the basement or on the 2<sup>nd</sup> through 5<sup>th</sup> floors, and one (1) space per 400 square feet of floor area located above the 5<sup>th</sup> floor.
- Retail  
One (1) space per 250 square feet of floor area on the first floor and one (1) space per 300 square feet of floor area located elsewhere in the building.

Per the Zoning Ordinance, the proposed development is required to provide 8,510 parking spaces. However, per the Reduced Parking Policy for Site Plan Office Buildings adopted in 2013, the County identified a baseline parking ratio for office buildings in Pentagon City of one (1) space per 975 square feet of floor area. A proposed development may choose to provide even less parking than this threshold via mitigations, such as:

1. By supporting Transportation Demand Management programs which encourage employees to commute in ways other than driving alone;
2. By contributing to transit operating costs; or
3. By contributing to transportation capital costs such as those related to transit, bicycle and pedestrian facilities either through direct compensation to the County or through infrastructure supplied by the developer.

The proposed development will provide 1,984 parking spaces in a below-grade parking garage shared among the four (4) buildings. The Applicant will meet County standards for providing less parking than stipulated in the County's adopted Reduced Parking Policy for Site Plan Office Buildings by providing one or more of the mitigation options listed above. This is consistent with a number of Arlington County policies and goals, the proposed development will limit on-site parking by providing a

total of 1,984 parking spaces. The amount on-site parking will meet the practical needs of the site while promoting the use of non-auto modes of travel to and from the proposed development.

A summary of the proposed parking supply by parking type is shown in Table 3.

## ***Bicycle and Pedestrian Facilities***

### **Bicycle Facilities**

The proposed PenPlace development will make significant bicycle related improvements over existing conditions in and around the site.

### **On-Street Bicycle Facilities**

Consistent with the Arlington County Master Transportation Plan, the proposed development will improve S Eads Street to include a 6-foot-wide southbound protected bicycle lane on the west side of S Eads Street from Army Navy Drive to 12<sup>th</sup> Street S. This facility will connect to the planned cycle track on Army Navy Drive and to the planned protected bicycle lanes south of 12<sup>th</sup> Street S. A northbound separated bicycle lane will be provided by others.

In addition, the proposed development will improve S Fern Street to include a northbound protected bike lane along the eastern side between Army Navy Drive and 12<sup>th</sup> Street S and a southbound protected bike lane along the western side between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway. Based on coordination with the County, staff has focused on creating high-quality bicycle facilities on other north-south corridors such as S Eads and S Joyce Streets, both a block away in either direction. Figure 18 shows the on-street bicycle facilities that are proposed to be provided as part of the PenPlace development.

### **Bicycle Parking**

Per the Standard Site Plan Conditions, the following outlines the bicycle parking requirements for land uses of the development:

- Office  
Provide one (1) long-term space for every 6,000 square feet of office space; and one (1) short-term space for every 20,000 square feet of office space.
- Retail  
Provide one (1) long-term space for every 25,000 square feet of retail space; and two (2) short-term spaces for every 10,000 square feet of the first 50,000 square feet of retail space and one (1) additional space for every 12,500 square feet of additional space.

### Long-Term Bicycle Parking

Per these requirements, the proposed development is required to provide:

- 157 long-term spaces for office use and two (2) long-term space for retail use in the southeastern building (Tower 1);
- 152 long-term spaces for office use and two (2) long-term space for retail use in the southwestern building (Tower 2);
- 155 long-term spaces for office use and one (1) long-term space for retail use in the northwestern building (Tower 3); and
- 35 long-term spaces for office use and no long-term spaces for retail use in the northeastern (Helix) building.

While 504 long-term bicycle parking spaces are required, the proposed development will provide 830 long-term bicycle parking spaces for office, and retail use, significantly exceeding zoning requirements. Secure long-term bicycle parking for the development will be located in the bicycle/locker room on the ground floor of the buildings on-site in the following locations:

- 274 spaces in the southeastern building (Tower 1);
- 244 spaces in the southwestern building (Tower 2); and
- 312 spaces in the northwestern building (Tower 3).

Secure long-term bicycle spaces for the northeastern building (Helix) will be provided in the other buildings. A bicycle repair station will be provided in each bicycle/locker room.

### Short-Term Bicycle Parking

Per these requirements, the proposed development is required to provide 150 short-term spaces for office, and 20 short-term spaces for retail use. Consistent with these requirements, the proposed development will provide 176 short-term parking spaces for office and retail use. Short-term bicycle parking spaces will be placed within the site and along the perimeter of the site, along 12<sup>th</sup> Street S, Army Navy Drive, S Fern Street and S Eads Street.

A summary of the proposed bicycle parking supply is shown in Table 4.

### Bicycle Showers and Lockers

Per the Standard Site Plan Conditions, the following outlines the bicycle shower and locker requirements for the office and retail uses of the development:

- **Showers**  
For office/retail buildings greater than 300,000 square feet, three (3) showers per gender, plus one (1) shower per gender for each additional 100,000 square feet or portion thereof above the first 300,000 square feet.
- **Lockers**  
For every required employee bicycle parking space, either:
  1. A minimum of one (1) clothes storage locker per gender shall be installed in gender-specific changing rooms; or
  2. A minimum of one (1) clothes locker shall be installed adjacent to, but outside of changing rooms.

Per these requirements, the proposed development is required to provide:

- 10 showers per gender and 158 lockers in the southeastern building (Tower 1)
- 10 showers per gender and 153 lockers in the southwestern building (Tower 2);
- 10 showers per gender and 156 lockers in the northwestern building (Tower 3); and
- Two (2) showers per gender and 36 lockers in the northeastern (Helix) building for office and retail use.

The proposed development will provide a total of:

- 31 showers and 298 lockers in the southeastern building (Tower 1);
- 31 showers and 306 lockers in the southwestern building (Tower 2); and
- 31 showers and 316 lockers in the northwestern building (Tower 3).

Shower and lockers for the northeastern building (Helix) will be provided in the other buildings' bicycle/locker rooms.

On-site bicycle facilities including the amount of long- and short-term bicycle parking, and the amount of bicycle storage and lockers exceeds County requirements and will encourage commuting by bicycles to and from the proposed development.

### Pedestrian Facilities

Pedestrian facilities directly surrounding the site will be significantly improved along S Eads Street, S Fern Street, Army Navy Drive, and 12<sup>th</sup> Street S to provide a more inviting pedestrian environment and comply with the improvements laid

out in the Arlington County Master Transportation Plan. The existing pedestrian facilities around the site provide a quality walking environment with issues in certain locations due to sidewalk width deficiencies or substandard materials such as asphalt. This project will reduce deficiencies by adding new sidewalks and streetscape features along the perimeter of the site.

New pedestrian facilities are expected to meet or exceed Arlington County requirements with an emphasis on pedestrian safety and comfort. This includes providing one (1) fewer curb cut along the perimeter of the site compared to existing conditions that reduce the number of pedestrian crossings, sidewalks that meet or exceed the width requirements, crosswalks at all necessary locations including a number of new signalized crossing points, and curb ramps with detectable warnings. The development will also include publicly available plazas throughout the site that will significantly improve pedestrian circulation and porosity compared to existing conditions.

In addition to improvements along the perimeter of the site, consistent with the Pentagon City PDSP plan, the proposed development will provide a north-south forest walk and an east-west multimodal path through the site that improves pedestrian connectivity and site porosity.

As part of the development, the installation of three (3) traffic signals at adjacent intersections will provide additional signalized pedestrian crossing points. Signals are proposed at the following intersections:

- Army Navy Drive and Parking Lot
- S Fern Street and Site Driveway
- S Eads Street and 11<sup>th</sup> Street S/Site Driveway

These signals will help accommodate the additional pedestrian demand that the development will generate as well as significantly improve the pedestrian connectivity near the site.

### ***Curbside Management***

A review of the existing curbside management was conducted and is shown on Figure 21. Currently, on-street parking is provided along Army Navy Drive (18 parking spaces), 12<sup>th</sup> Street S (20 parking spaces), S Fern Street (18 parking spaces), and S Eads Street (19 parking spaces), for a total of 75 on-street parking spaces along the site frontage.

The proposed development includes a number of improvements to curbside management along 12<sup>th</sup> Street S, Army Navy Drive, S Fern Street, and S Eads Street fronting the perimeter of the site to be coordinated with Arlington County. Figure 22 shows the proposed curbside management to include the following improvements:

- 12<sup>th</sup> Street S will be improved by adding two (2) median bus stops, serving the planned transitway extension to Pentagon City. No changes to on-street parking are proposed.
- Army Navy Drive will be improved by removing on-street parking to facilitate vehicular access to and from the site driveway on the southern side of Army Navy Drive and to accommodate the physically separated, two-way cycle track added along the south side of Army Navy Drive as part of the Army Navy Drive Complete Street project.
- S Fern Street will be improved by removing several on-street parking spaces to facilitate vehicular access to and from the site driveway on the eastern side of S Fern Street. 20 on-street parking spaces will be provided along the site frontage.
- S Eads Street will be improved by relocating and upgrading the existing southbound bus stop at the southwest corner of Army Navy Drive and S Eads Street to the far side of the S Eads Street and 11<sup>th</sup> Street S intersection, and by removing several on-street parking spaces to facilitate vehicular access to and from the site on the western side of S Eads Street. 11 on-street parking spaces will be provided along the site frontage.

Overall, a total of 51 on-street parking spaces are proposed for streets adjacent to the site, a decrease of 24 on-street parking spaces over existing conditions.

**Table 3: Vehicle Parking Summary**

| Building     | Land Use | Development Size    | Vehicle Parking Requirements |            | Vehicular Parking Spaces Provided |            |
|--------------|----------|---------------------|------------------------------|------------|-----------------------------------|------------|
|              |          |                     | Long Term                    | Short Term | Long Term                         | Short Term |
| Tower 1*     | Office   | 937,675 SF          | 2,544 spaces                 |            | -                                 |            |
|              | Retail   | 49,727 SF           | 116 spaces                   |            | -                                 |            |
| Tower 2      | Office   | 911,163 SF          | 2,476 spaces                 |            | -                                 |            |
|              | Retail   | 24,336 SF           | 97 spaces                    |            | -                                 |            |
| Tower 3      | Office   | 928,240 SF          | 2,522 spaces                 |            | -                                 |            |
|              | Daycare  | 14,527 SF           | 58 spaces                    |            | -                                 |            |
| Helix*       | Office   | 212,200 SF          | 653 spaces                   |            | -                                 |            |
|              | Retail   | 8,546 SF            | 34 spaces                    |            | -                                 |            |
| <b>Total</b> |          | <b>3,086,414 SF</b> | <b>8,510 spaces</b>          |            | <b>1,984 spaces</b>               |            |

\*This includes the square footage associated with the retail pavilions

\*\*This reflects the above-grade square footage for the Helix building

**Table 4: Bicycle Parking Summary**

| Building     | Land Use | Development Size    | Bicycle Parking Requirements |                   | Bicycle Parking Provided |                   |
|--------------|----------|---------------------|------------------------------|-------------------|--------------------------|-------------------|
|              |          |                     | Long Term                    | Short Term        | Long Term                | Short Term        |
| Tower 1*     | Office   | 937,675 SF          | 157 spaces                   | 47 spaces         | 274 spaces               | -                 |
|              | Retail   | 49,727 SF           | 2 spaces                     | 11 spaces         |                          |                   |
| Tower 2      | Office   | 911,163 SF          | 152 spaces                   | 46 spaces         | 244 spaces               | -                 |
|              | Retail   | 24,336 SF           | 2 spaces                     | 5 spaces          |                          |                   |
| Tower 3      | Office   | 928,240 SF          | 155 spaces                   | 46 spaces         | 312 spaces               | -                 |
|              | Daycare  | 14,527 SF           | 1 space                      | 3 spaces          |                          |                   |
| Helix***     | Office   | 212,200 SF          | 35 spaces                    | 11 spaces         | -                        | -                 |
|              | Retail   | 8,546 SF            | -                            | 1 space           |                          |                   |
| <b>Total</b> |          | <b>3,086,414 SF</b> | <b>504 spaces</b>            | <b>170 spaces</b> | <b>830 spaces*</b>       | <b>176 spaces</b> |

\*Long-term bicycle parking spaces for the Helix building will be provided in Tower 1, Tower 2, and Tower 3.

\*\*This includes the square footage associated with the retail pavilions

\*\*\*This reflects the above-grade square footage for the Helix building

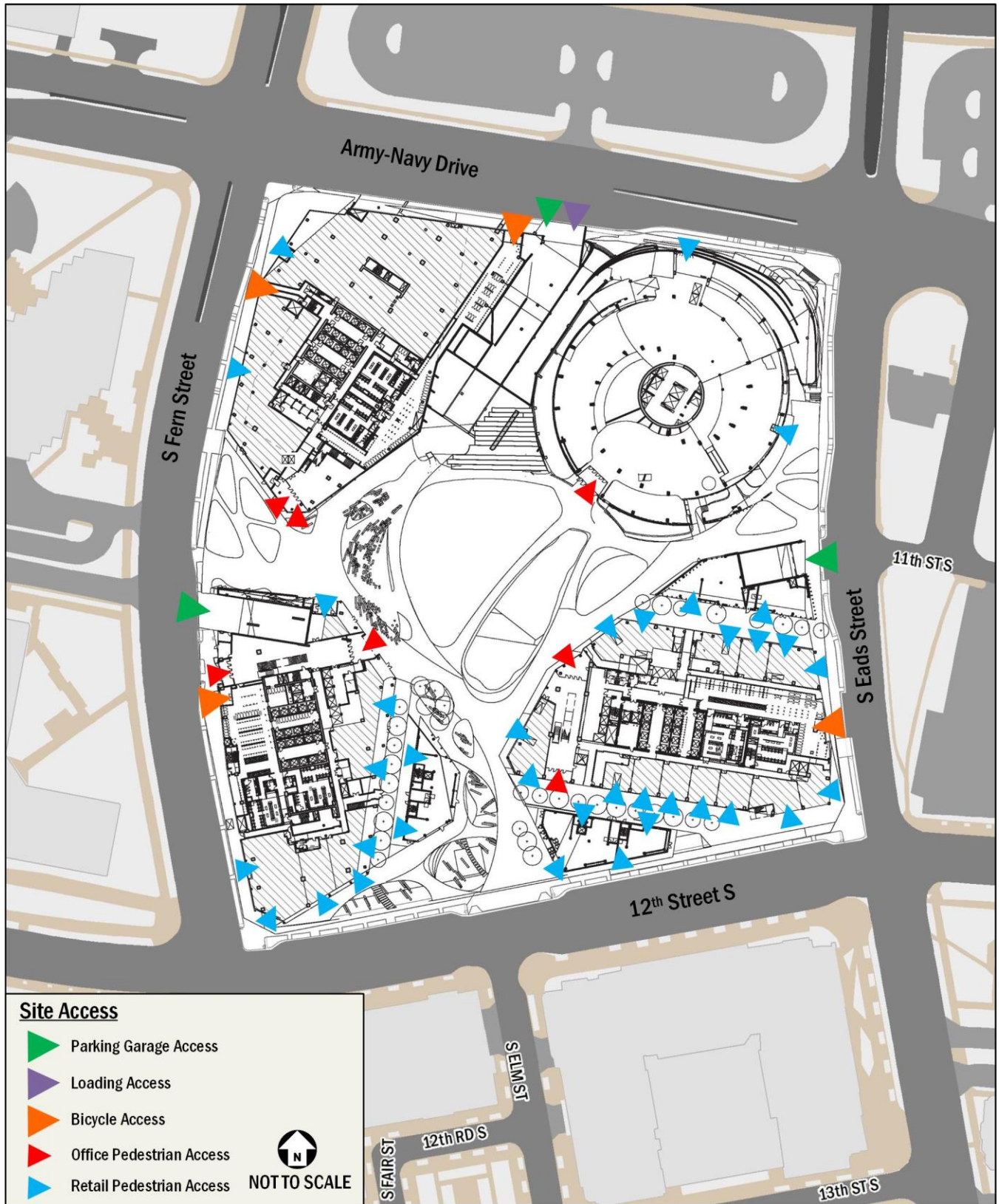


Figure 19: Site Access

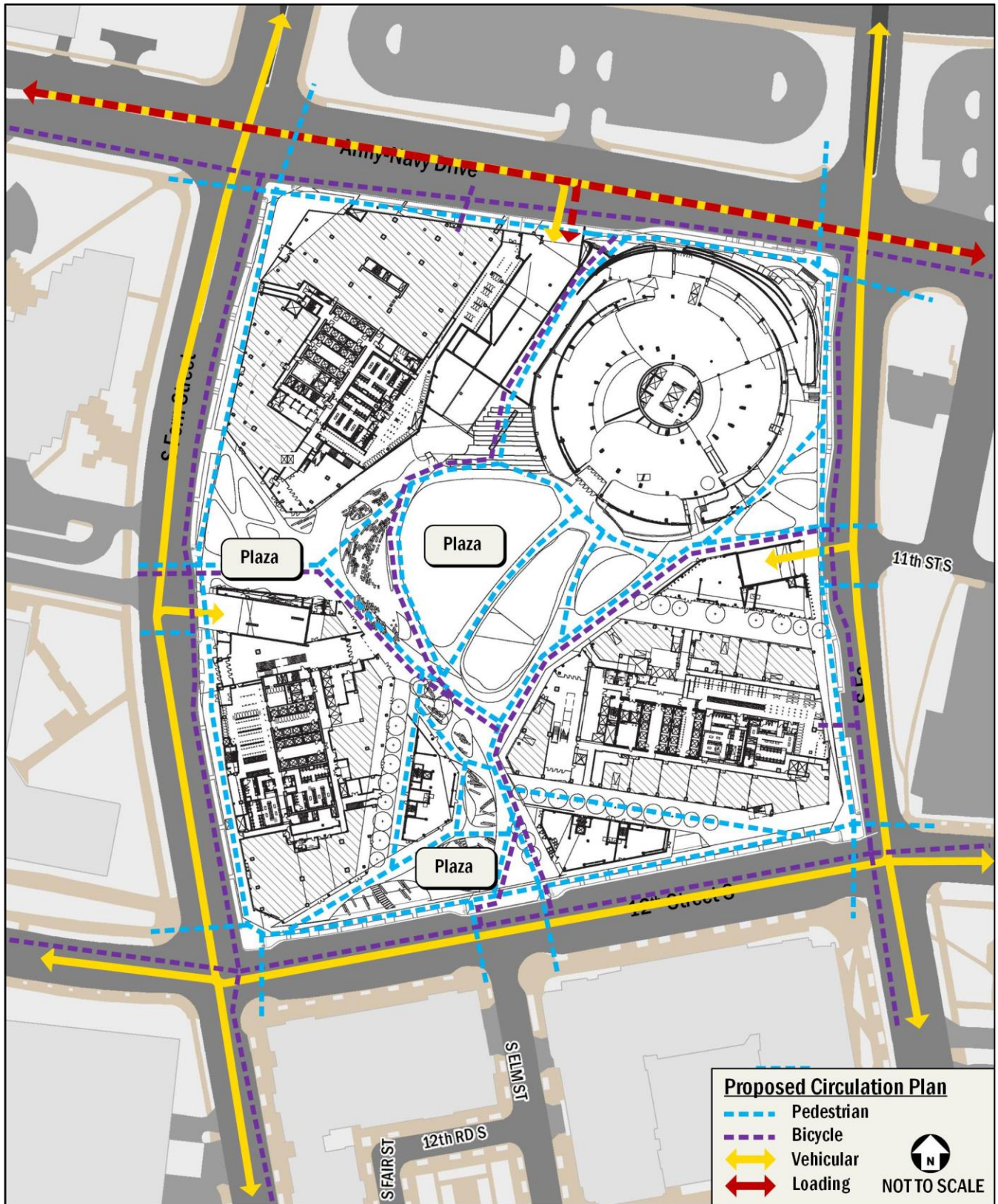


Figure 20: Circulation Plan

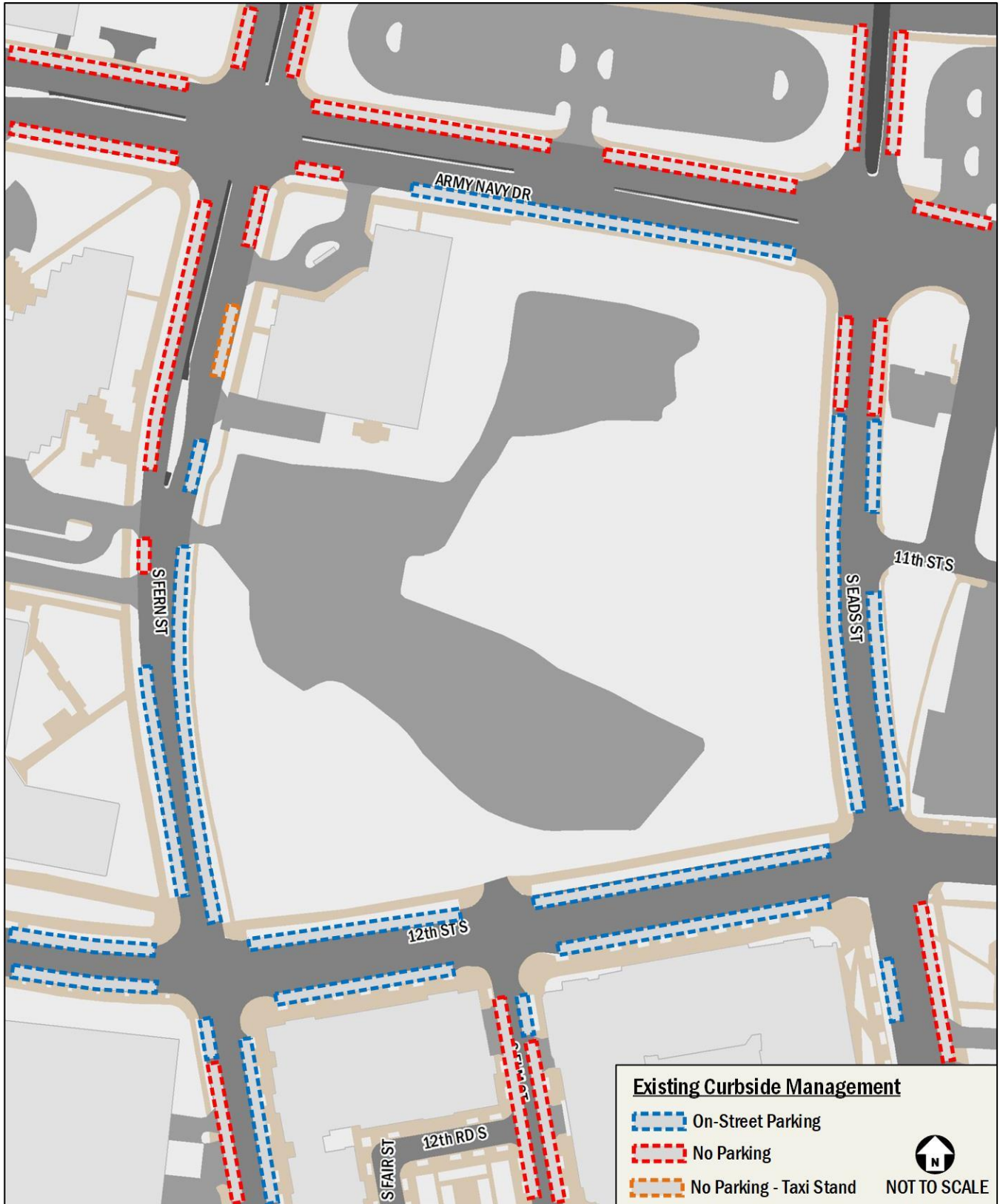


Figure 21: Existing Curbside Management

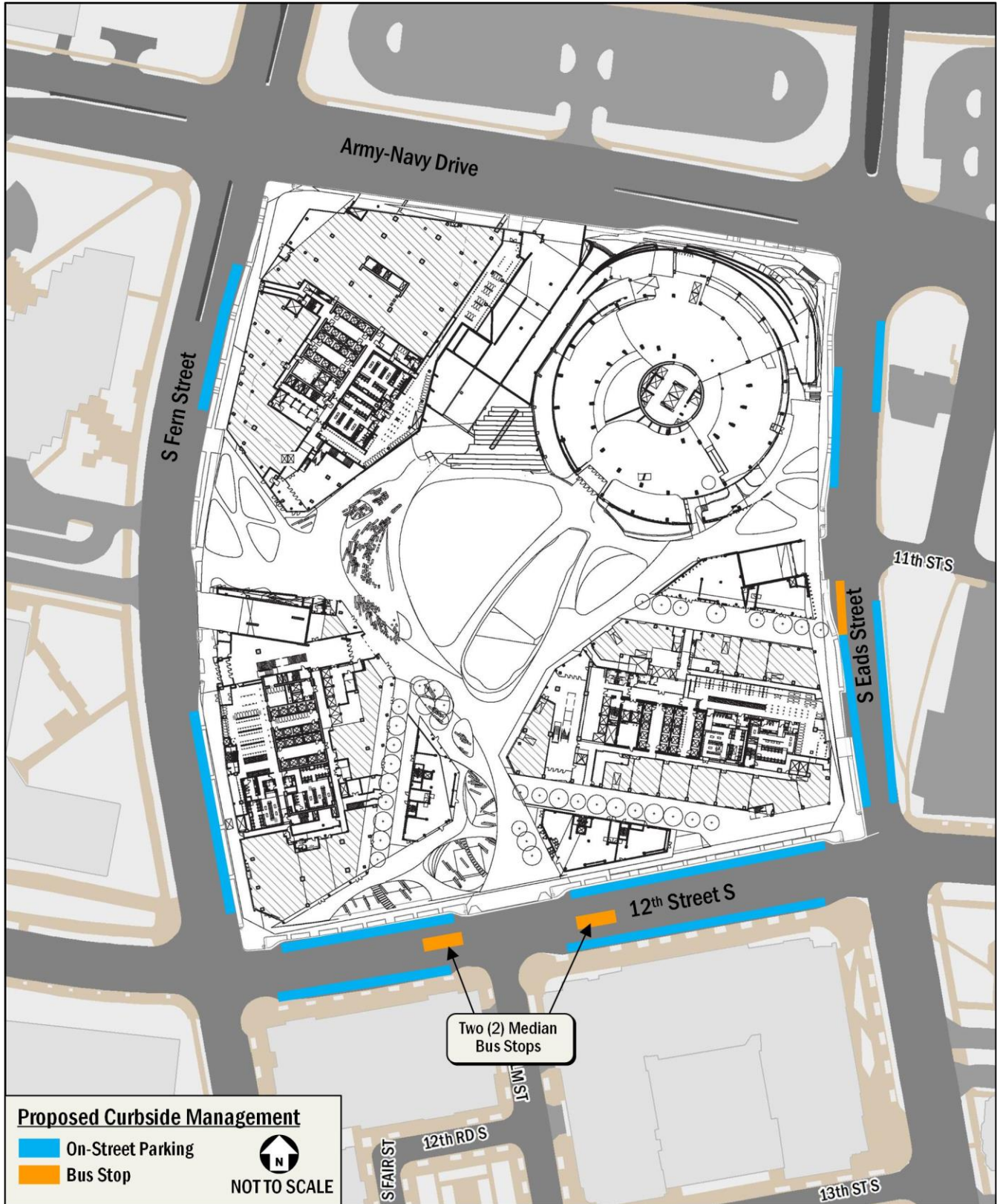


Figure 22: Proposed Curbside Management



## Transit

This chapter discusses the existing and planned transit facilities in the vicinity of the site, accessibility to transit, and evaluates the overall transit impacts of the project.

The following conclusions are reached within this chapter:

- The development has excellent access to transit.
- The development is located 0.2 miles from the Pentagon City Metro Station, 0.5 miles from the Pentagon Metro Station, and 0.6 miles from the Crystal City Metro Station.
- There are 16 bus stops within a quarter-mile of the site. These stops are directly served by WMATA (Metrobus), Metroway, Arlington Transit (ART), OmniRide, Fairfax Connector, and Loudoun County Commuter routes.

The site is well-served by numerous transit options under existing conditions. Combined, these transit services provide local, citywide, and regional transit connections and link the site with major cultural, residential, employment, and commercial destinations throughout the region. Figure 23 identifies the major transit routes, stations, and stops in the study area.

### **Metrorail Service**

The site is located approximately 0.2 miles, 0.5 miles, and 0.6 miles from the Pentagon City Metro Station, Pentagon Metro Station, and Crystal City Metro Station, respectively. The Pentagon City Metro Station is located southwest of the development site between 12<sup>th</sup> Street S and 15<sup>th</sup> Street S on S Hayes Street. It can be reached by walking west from the site on 12<sup>th</sup> Street S. The Pentagon Metro Station is located north of the development site inside the Pentagon Transit Center. It can be reached by walking north from the site on S Fern Street. The Crystal City Metro station is located southeast of the development site between 15<sup>th</sup> Street S and 18<sup>th</sup> Street S on S Bell Street. It can be reached by walking south from the site on S Eads Street and east on 18<sup>th</sup> Street S. There are sidewalks, curb ramps, and crosswalks along routes to all three (3) Metro stations. However, along the routes to Pentagon City and Crystal City Metro Stations, there is a temporary asphalt sidewalk along the east side of S Fern Street and the north side of 12<sup>th</sup> Street S, adjacent to the site, and sidewalks closed due to construction to the south of the site along 12<sup>th</sup> Street S and S Eads Street, reducing the quality of the walking environment.

The Pentagon City, Pentagon and Crystal City Metro stations serve the Blue and Yellow lines. The average daily ridership at

the Pentagon City, Pentagon, and Crystal City stations in 2019 was approximately 12,500, 15,000, and 11,700 boardings on weekdays, respectively, according to the WMATA Ridership Data Portal. The Blue Line travels north from Springfield, VA to Rosslyn then continues east to Largo, MD. Trains run approximately every 8 minutes during the morning and afternoon peak periods. They run about every 12 minutes during weekday non-peak periods, every 20 minutes on weekday evenings after 9:30pm, and every 12-20 minutes on weekends. The Yellow Line travels north from Huntington, VA to the Pentagon, east to the District core, and continues north to Greenbelt. Trains run approximately every 8 minutes during the morning and afternoon peak periods. They run about every 12 minutes during weekday non-peak periods, every 20 minutes during weekday evenings after 9:30pm, and every 12-20 minutes on weekends.

Figure 24 shows the average annual weekday passenger boardings for Metro stations in the 22202 Zip Code area from 1977, when the system opened, to 2015. Metrorail ridership in 22202 zip code is down 18% from its peak in 2010 and 2011. Ridership throughout the entire system is down five percent. According to the 22202 Transportation Study, three factors have contributed to the decline in ridership including high office vacancy rates in Crystal City from Base Realignment and Closure (BRAC), changes to Blue Line service (Rush Plus/Silver Line), and an overall decrease in rider satisfaction by Metrorail users. The decline in boardings at the stations near the site indicates there is available capacity at these stations. WMATA has initiated the Back2Good plan to improve safety, reduce delays, and build rider confidence in Metrorail. Since its implementation, Metrorail has reached its highest on-time performance in the last seven years. The proposed development will increase the amount of office space in Pentagon City/Crystal City which thereby increases the number of potential riders of Metrorail. The proposed development will implement Transportation Demand Management (TDM) measures that will incentivize the use of non-auto modes of travel, including Metrorail, and discourage the use of single-occupancy auto modes of travel.

At the Pentagon City Metro Station, which is a transfer point for regional and local transit buses and bus services, a second elevator is planned on the west side of S Hayes Street. Currently, there is a single elevator serving the station, which is located on the east side of S Hayes Street. The new elevator will

improve access for patrons and will provide redundancy when one elevator is out of service.

In order to accommodate the projected increase in demand at the Crystal City Metro Station as a result of redevelopment in Crystal City, a second entrance is planned for the station. The new entrance will provide improved access from Crystal Drive, the VRE station, and the nearby Metroway station. The project will also include improvements and upgrades to elevator and lobby facilities at the station. The second entrance is planned to open in 2025.

### **Bus Service**

A review of the existing Metrobus stops within a quarter-mile radius of the site, detailing individual bus stop amenities and conditions, is shown in Table 5. There are 16 bus stops within one quarter-mile of the site: four (4) on Army Navy Drive, four (4) on S Eads Street, five (5) on 15<sup>th</sup> Street S, and three (3) on S Hayes Street. These stops are served by 12 WMATA (Metrobus) routes, two (2) Arlington Transit (ART) routes, one (1) OmniRide route, one (1) Fairfax Connector route, and one (1) Loudoun County Commuter Bus route. Metroway bus service is available from the Crystal City and Pentagon City Metro stations.

The site is served by several bus lines and routes along multiple primary corridors. These bus lines connect the site to many areas of Virginia and the District, including several Metrorail stations serving all of the six (6) Metrorail lines. Table 6 shows a summary of the bus route information for the routes that serve the site, including service hours, headway, and distance to the nearest bus stop.

Table 7 presents the average weekday peak hour boarding and alighting information for the bus stops previously detailed. This information is based on WMATA ridership data provided by Arlington County for 2017. Existing peak hour boarding and alighting information for these bus stops is shown on Figure 25.

### **Crystal City Potomac Yard Metroway**

Metroway is an enhanced bus route that provides a connection between the Crystal City Metro, Pentagon City Metro, and Braddock Road Metro, traveling through Pentagon City, Crystal City, and Potomac Yard. Arlington's section of Metroway opened in April 2016 and includes an all-day dedicated transit lane through Potomac Yard, a peak period transit lane through Crystal City, and seven new transit stations. The Potomac Yard Line provides 4.5 miles of service between the Crystal City, Pentagon City, and Braddock Road Metro stations with faster,

more reliable bus service along the Route 1 corridor, with a ridership of approximately 2,400 passengers per day.

Metroway buses travel in dedicated bus-only lanes adjacent to the site along 12<sup>th</sup> Street S; however, there are also sections of the route in Crystal City and Potomac Yard where Metroway buses operate in mixed traffic, such as Army Navy Drive adjacent to the site. The nearest stop to the site is at the corner of 12<sup>th</sup> Street S and S Hayes Street adjacent to the Pentagon City Metro entrance at the end of the Metroway line. All buses from that stop proceed south to Crystal City and the Braddock Road Metro Station.

Figure 26 shows the 10-minute, 20-minute, and 30-minute transit travel shed to and from the proposed development. As shown in the transit travel shed, most of the District and Northern Virginia area is accessible via transit within 30 minutes from the proposed development. Several destinations in the District, Arlington, and Alexandria are accessible within a 20-minute transit trip from the proposed development, including Ronald Reagan Washington International Airport, Downtown DC, and Metro stations served by all metro lines in the area.

### **Planned Transit Facilities**

Improvements to transit facilities will be made as part of the Army Navy Drive Complete Street project, the 12<sup>th</sup> Street S Complete Street project, and the Pentagon City Transitway Extension project.

- As part of the Army Navy Drive Complete Street project, improvements will include a dedicated transit-only lane in each direction extending along Army Navy Drive between S Joyce Street and S Hayes Street.
- As part of the 12<sup>th</sup> Street S Complete Street project, improvements will include dedicated center-running transit-only lanes extending along 12<sup>th</sup> Street S from Army Navy Drive to S Hayes Street.

At the time of scoping, signal phasing was in development as part of a dedicated transitway study effort, led by Arlington County. Signal timings, phasing, and lane configurations along 12<sup>th</sup> Street S were consistent with those included in the base VISSIM model provided by Arlington County and the Interim Condition Plan for 12<sup>th</sup> Street S. Details on roadway reconfigurations and signal timing and phasing at signalized intersections are provided in the Traffic Operations section of this report.

- As part of the Crystal Drive segment of the Transitway Extension to Pentagon City project, improvements will

initially include curbside rush hour bus-only lanes from 15<sup>th</sup> Street S to 12<sup>th</sup> Street S and Long Bridge Drive and five (5) new transitway stations, with two (2) additional stations included in later phases.

Planned transit improvements are shown in Figure 27.

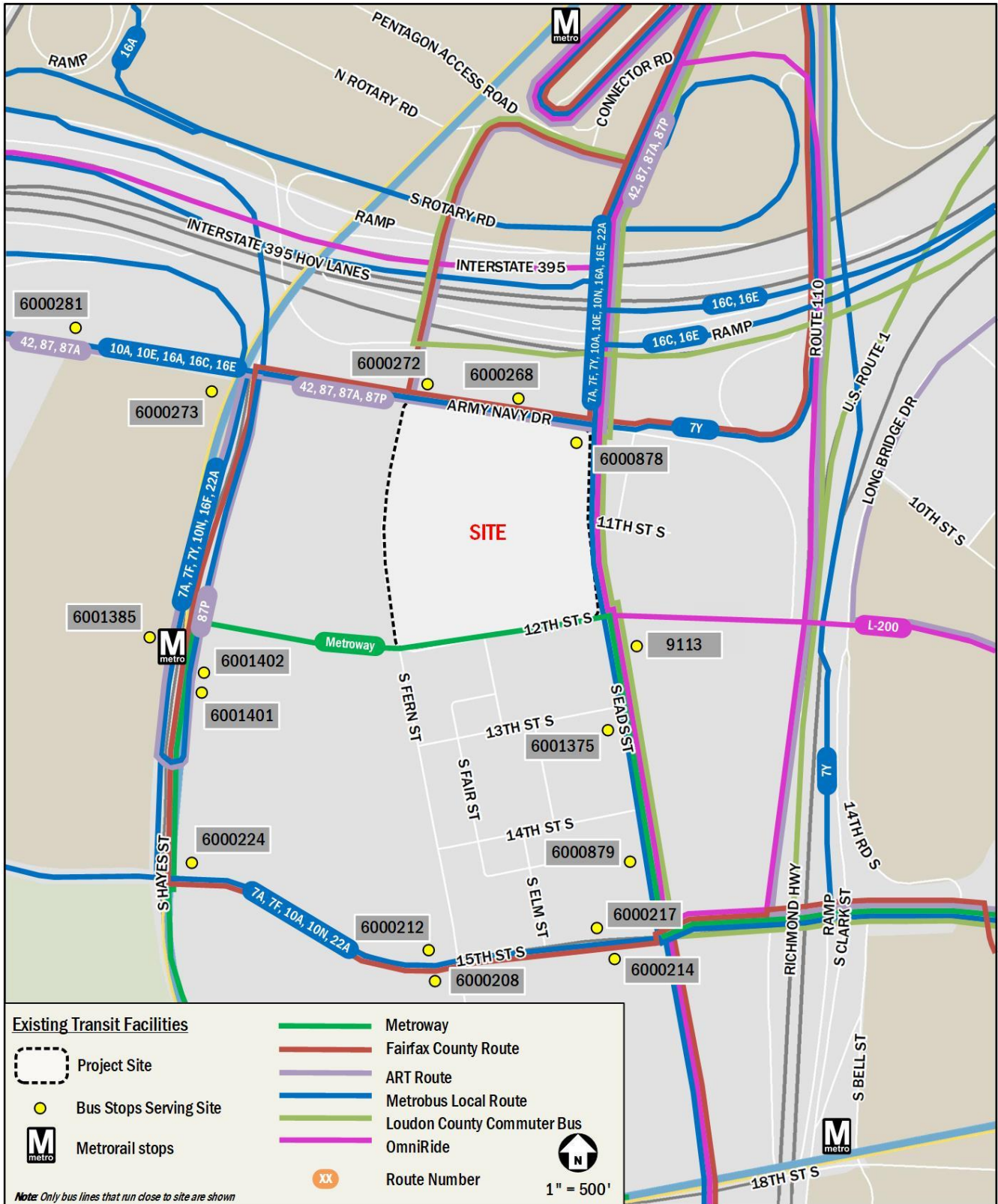


Figure 23: Existing Transit Facilities

### Annual Average Passenger Boardings Pentagon City and Crystal City Metrorail Stations (1977 – 2015)

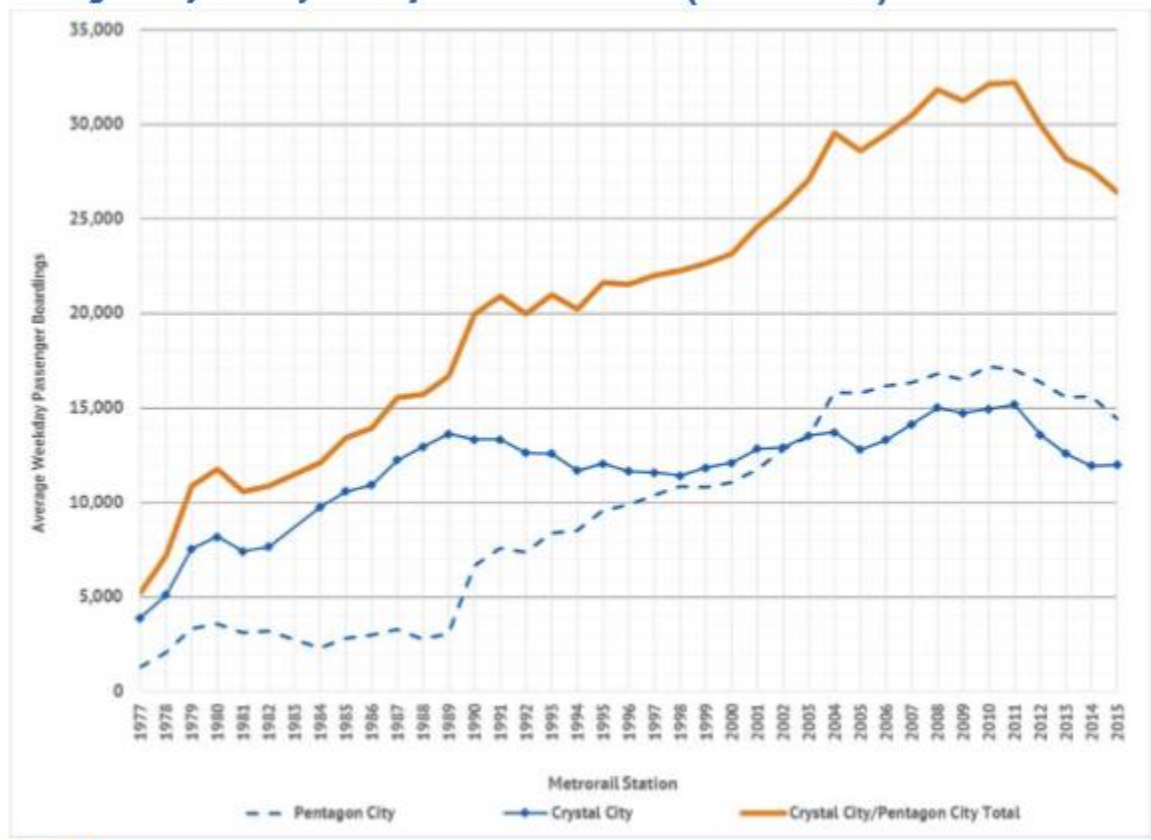


Figure 24: Annual Metro Ridership at Pentagon City and Crystal City Metro Stations (Source: 22202 Transportation Study)

**Table 5: Bus Stop Inventory**

| Location                          | Stop ID  | Buses Served                                   | Stop Condition   |
|-----------------------------------|----------|--|--|
| 15th Street & Fern Street (EB)    | 6000208  | 7A, 7F, 10A, 22A                               | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, information case, seating, shelter, trash receptacle |
| 15th Street & Fern Street (WB)    | 6000212  | 7A, 7F, 10A, 10N, 22A                          | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, information case, seating, no shelter                   |
| 15th Street & S Eads Street       | 6000214  | 10A  | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, no information case, no seating, no shelter          |
| 15th Street & S Eads Street       | 6000217  | 10A, 10N, 599                                  | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, no information case, no seating, no shelter          |
| 15th Street S & Hayes Street S    | 6000224  | 7A, 7F, 10A, 10N, 22A, Fairfax Connector       | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, no information case, no seating, no shelter             |
| Army Navy Drive & S Eads Street   | 6000268  | 10A, 10E, 16A, 16C, 16E, 42, 87, 87A, 87P, 599 | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, information case, no seating, no shelter             |
| Army Navy Drive & Fern Street     | 6000272  | 10A, 10E, 16A, 16C, 16E, 42, 87, 87A, 87P      | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, information case, no seating, no shelter             |
| Army Navy Drive & S Hayes Street  | 6000273  | 10A, 16E, 16G, 16H, 42, 87, 87A, 87P           | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, information case, no seating, no shelter                |
| Army Navy Drive & S Hayes Street  | 6000281  | 10A, 16A, 16C, 16E, 16G, 16H, 42, 87, 87A, 87P | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, information case, seating, shelter                      |
| S Eads Street & Army Navy Drive   | 6000878  | 7A, 7F, 7Y, 10N, 22A, Loudoun County Commuter  | Sign, ADA Clearance, acceptable sidewalk clearance, street lighting, no information case, no seating, no shelter             |
| S Eads Street & 15th Street S     | 6000879  | 7A, 7F, 7Y, 10N, 22A                           | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, information case, no seating, no shelter             |
| 13th Street & S Eads Street       | 6001375  | 7A, 7F, 7Y, 10N, 22A                           | Sign, ADA clearance, acceptable sidewalk clearance, no street lighting, no information case, no seating, no shelter          |
| S Hayes Street & 12th Street      | 6001385  | 7A, 7F, 22A                                    | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, no information case, seating, shelter                   |
| Pentagon City Station & Bus Bay B | 6001401  | 10N, 16E, 16G, 16H                             | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, no information case, no seating, no shelter             |
| Pentagon City Station & Bus Bay C | 6001402  | 7A, 7F, 22A, Metroway                          | Sign, ADA clearance, acceptable sidewalk clearance, street lighting, no information case, seating, shelter                   |
| 12th Street & S Eads Street       | Eads12NB | OmniRide (L-200)                               | Sign, no ADA clearance, acceptable sidewalk clearance, street lighting, no information case, no seating, no shelter          |

**Table 6: Bus Route Information**

| Route Number  | Route Name  | Service Hours  | Headway   | Walking Distance to Nearest Bus Stop |
|---------------|---|--|-----------|--------------------------------------|
| 10A 10E, 10N  | Alexandria-Pentagon Line                            | Weekdays: 5:00AM-2:55AM<br>Weekend: 5:30AM-2:55AM                    | 30-60 min | <0.1 miles, 1 minute                 |
| 7A, 7F, 7Y    | Lincolnia-North Fairlington Line                    | Weekdays: 5:09AM-12:18AM<br>Weekend: 7:00AM-2:00AM                   | 7-30 min  | 0.2 miles, 4 minutes                 |
| 16A, 16C, 16E | Columbia Pike Line                                  | Weekdays: 4:57AM-2:39AM<br>Weekend: 5:39AM-2:39AM                    | 5-25 min  | <0.1 miles, 1 minute                 |
| 16G, 16H      | Columbia Pike-Pentagon City Line                    | Weekdays: 5:24AM-11:00PM<br>Weekend: 6:25AM-10:55PM                  | 6-30 min  | 0.2 miles, 4 minutes                 |
| 22A           | Barcroft-South Fairlington Line                     | Weekdays: 9:39AM-3:09PM,<br>8:09PM-10:09PM<br>Weekend: 6:39AM-9:39PM | 30-60 min | 0.2 miles, 4 minutes                 |
| ART 42        | Ballston-Pentagon Line                              | Weekdays: 6:08AM-8:00PM<br>Weekend: 7:12AM-7:42PM                    | 15-30 min | <0.1 miles, 1 minute                 |
| ART 87        | Pentagon Metro - Army Navy Drive - Shirlington Line | Weekdays: 6:20AM-11:16PM<br>Weekend: 7:28AM-11:28PM                  | 20-33 min | <0.1 miles, 1 minute                 |
| LC Commuter   | Telos-Arlington/Washington DC Line                  | Weekdays: 6:35AM-8:35AM,<br>3:10PM-5:23PM                            | 5-70 min  | 0.2 miles, 4 minutes                 |
| 599           | Pentagon-Crystal City Express Line                  | Weekdays: 6:14AM-8:44AM,<br>3:32PM-6:02PM                            | 20-35 min | 0.2 miles, 4 minutes                 |
| L-200         | Lake Ridge-Pentagon & Crystal City                  | Weekdays: 6:21AM-7:55AM,<br>12:24PM-6:49PM                           | 10-30 min | 0.2 miles, 4 minutes                 |
| Metroway      | Potomac Yard Line                                   | Weekdays: 5:30AM-12:00AM<br>Weekend: 6:30AM-12:00AM                  | 6-30 min  | 0.3 miles, 5 minutes                 |

**Table 7: Bus Stop Boarding and Alighting Weekday Information – Peak Hours**

| Stop                             | Stop ID | Routes Served           | AM Peak Period |            | PM Peak Period |            | Daily Boardings | Daily Alightings |
|----------------------------------|---------|-------------------------|----------------|------------|----------------|------------|-----------------|------------------|
|                                  |         |                         | Boardings      | Alightings | Boardings      | Alightings |                 |                  |
| 15th Street & Fern Street (EB)   | 6000208 | 7A                      | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 7F                      | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 10A                     | 3.5            | 1.1        | 8.6            | 1.8        | 26.4            | 5.9              |
|                                  |         | 22A                     | 0              | 0          | 0              | 0          | 1.4             | 7.3              |
| 15th Street & Fern Street (EB)   | 6000212 | 7A                      | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 7F                      | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 10A                     | 1.1            | 4.5        | 3.1            | 5.3        | 7.3             | 17.3             |
|                                  |         | 10N                     | 0              | 0          | 0              | 0          | 0.3             | 0                |
|                                  |         | 22A                     | 0              | 0          | 0.4            | 0          | 2.7             | 0.4              |
| 15th Street & S Eads Street (EB) | 6000214 | 10A                     | 1.4            | 0.7        | 13.3           | 0.6        | 21.5            | 3.2              |
| 15th Street & S Eads Street      | 6000217 | 10A                     | 0.1            | 6.6        | 1.7            | 2          | 2.3             | 17.6             |
|                                  |         | 10N                     | 0              | 0          | 0              | 0          | 0               | 0                |
| 15th Street S & Hayes Street S   | 6000224 | 7A                      | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 7F                      | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 10A                     | 0              | 5.1        | 0.3            | 8.7        | 0.8             | 28.8             |
|                                  |         | 10N                     | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 22A                     | 0              | 0          | 0.2            | 0          | 1.8             | 0.1              |
|                                  |         | 599                     | NA             | NA         | NA             | NA         | NA              | NA               |
| Army Navy Drive & S Eads Street  | 6000268 | 10A                     | 2.3            | 0.3        | 4.4            | 0.8        | 7.2             | 1.1              |
|                                  |         | 10E                     | 0              | 0          | 5.6            | 0.5        | 5.6             | 0.5              |
|                                  |         | 16A                     | 5.2            | 1.1        | 15.4           | 0.7        | 21.3            | 2                |
|                                  |         | 16C                     | 15.2           | 10         | 37.1           | 17.5       | 53.2            | 27.6             |
|                                  |         | 16E                     | 0              | 0          | 0              | 0          | 0.3             | 0.2              |
|                                  | 42202   | 42                      | 0              | 0          | 0              | 0          | 4               | 2                |
|                                  |         | 87                      | 0              | 0          | 0              | 0          | 3               | 1                |
|                                  |         | 87A                     | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 87P                     | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | 599                     | NA             | NA         | NA             | NA         | NA              | NA               |
| Army Navy Drive & Fern Street    | 6000272 | 10A                     | 1              | 0.7        | 1.6            | 0.3        | 2.8             | 1                |
|                                  |         | 10E                     | 0              | 0          | 1              | 0          | 1               | 0                |
|                                  |         | 16A                     | 1              | 1.1        | 2.7            | 0.1        | 4.7             | 1.3              |
|                                  |         | 16C                     | 0.8            | 1.2        | 8              | 4.1        | 10.5            | 5.7              |
|                                  |         | 16E                     | 0              | 0          | 0              | 0          | 0.9             | 0.4              |
|                                  | 42203   | 42                      | 0              | 0          | 0              | 0          | 3               | 2                |
|                                  |         | 87                      | 0              | 0          | 0              | 0          | 2               | 1                |
|                                  |         | 87A                     | 0              | 0          | 0              | 0          | 1               | 0                |
|                                  |         | 87P                     | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  |         | Loudoun County Commuter | NA             | NA         | NA             | NA         | NA              | NA               |
| Army Navy Drive & S Hayes Street | 600273  | 10A                     | 0              | 0.4        | 0.1            | 1.8        | 1.4             | 7.8              |
|                                  |         | 10E                     | 0.4            | 12.3       | 0              | 0          | 0.4             | 14               |
|                                  |         | 16E                     | 0              | 0          | 0              | 0          | 0.1             | 0.7              |
|                                  |         | 16G                     | 0.5            | 6.2        | 0.3            | 12.9       | 1.8             | 42.3             |
|                                  |         | 16H                     | 0              | 0          | 0              | 0          | 0               | 0                |
|                                  | 42205   | 42                      | NA             | NA         | NA             | NA         | NA              | NA               |
|                                  |         | 87                      | NA             | NA         | NA             | NA         | NA              | NA               |
|                                  |         | 6000281                 | 10A            | 1.9        | 0.4            | 10.2       | 2.1             | 21.1             |



| Stop                              | Stop ID                 | Routes Served | AM Peak Period |            | PM Peak Period |            | Daily Boardings | Daily Alightings |
|-----------------------------------|-------------------------|---------------|----------------|------------|----------------|------------|-----------------|------------------|
|                                   |                         |               | Boardings      | Alightings | Boardings      | Alightings |                 |                  |
| Army Navy Drive & S Hayes Street  | 42204                   | 10E           | 0              | 0          | 13.4           | 0.7        | 13.4            | 0.7              |
|                                   |                         | 16A           | 1.4            | 0.5        | 14.5           | 2.3        | 42.9            | 5.9              |
|                                   |                         | 16C           | 3.4            | 1.8        | 42.2           | 17.8       | 74.2            | 23.7             |
|                                   |                         | 16E           | 0              | 0          | 0              | 0          | 25.7            | 0.8              |
|                                   |                         | 16G           | 3.3            | 0.1        | 40.1           | 1.1        | 99.9            | 4.7              |
|                                   |                         | 16H           | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   | 42                      | NA            | NA             | NA         | NA             | NA         | NA              |                  |
|                                   | 87                      | NA            | NA             | NA         | NA             | NA         | NA              |                  |
| S Eads Street & Army Navy Drive   | 6000878                 | 7A            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7F            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7Y            | 24.4           | 33.3       | 0              | 0          | 25              | 35.1             |
|                                   |                         | 10N           | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 22A           | 0              | 0          | 0.3            | 0          | 0.7             | 0.1              |
|                                   | Loudoun County Commuter | NA            | NA             | NA         | NA             | NA         | NA              |                  |
| S Eads Street & 15th Street       | 6000879                 | 7A            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7F            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7Y            | 15.5           | 13.7       | 0              | 0          | 16.7            | 15.5             |
|                                   |                         | 10N           | 0              | 0          | 0              | 0          | 0               | 1                |
|                                   |                         | 22A           | 0              | 0          | 0              | 0          | 1.2             | 0.3              |
| S Eads Street & 13th Street       | 6001375                 | 7A            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7F            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7Y            | 35.6           | 28.2       | 0              | 0          | 37.9            | 29.5             |
|                                   |                         | 10N           | 0              | 0          | 0              | 0          | 0.2             | 0                |
|                                   |                         | 22A           | 0              | 0          | 0              | 0          | 0.3             | 0.1              |
| S Hayes Street & 12th Street      | 6001385                 | 7A            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7F            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 22A           | 0              | 0          | 0              | 0          | 1               | 21               |
| Pentagon City Station & Bus Bay B | 6001401                 | 10N           | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 16E           | 0              | 0          | 0              | 0          | 49.4            | 7.1              |
|                                   |                         | 16G           | 29.7           | 207.9      | 278.3          | 78.6       | 526.9           | 524.3            |
|                                   |                         | 16H           | 0              | 0          | 0              | 0          | 0               | 0                |
| Pentagon City Station & Bus Bay C | 6001402                 | 7A            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 7F            | 0              | 0          | 0              | 0          | 0               | 0                |
|                                   |                         | 22A           | 0              | 0          | 1.7            | 0.1        | 22              | 1.7              |
|                                   |                         | Metroway      | 75.9           | 41.3       | 81.7           | 100.4      | 284.2           | 282.4            |

WMATA Ridership Data provided by Arlington County

NA: Ridership data unavailable

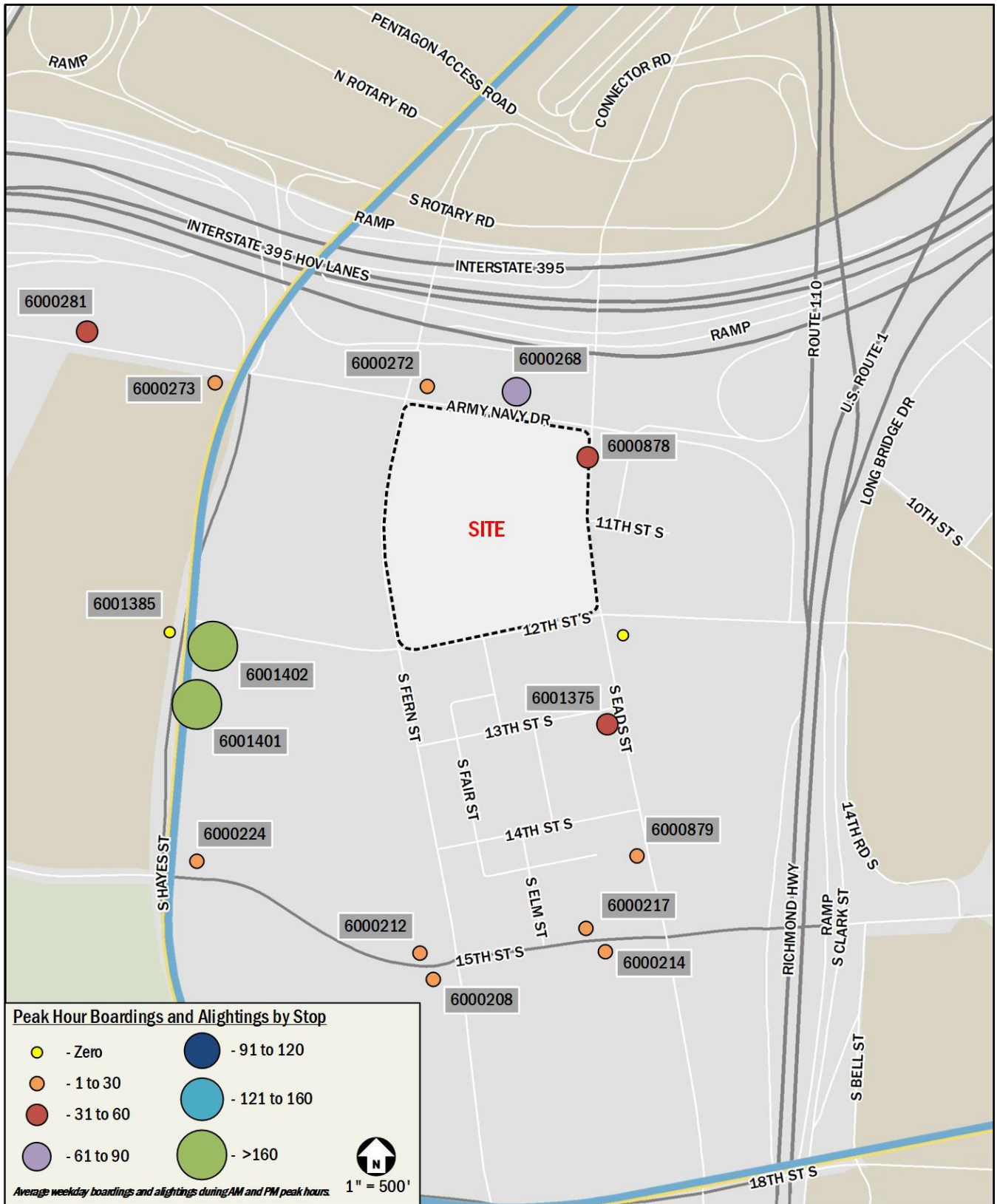


Figure 25: Peak Hour Boardings and Alightings by Stop

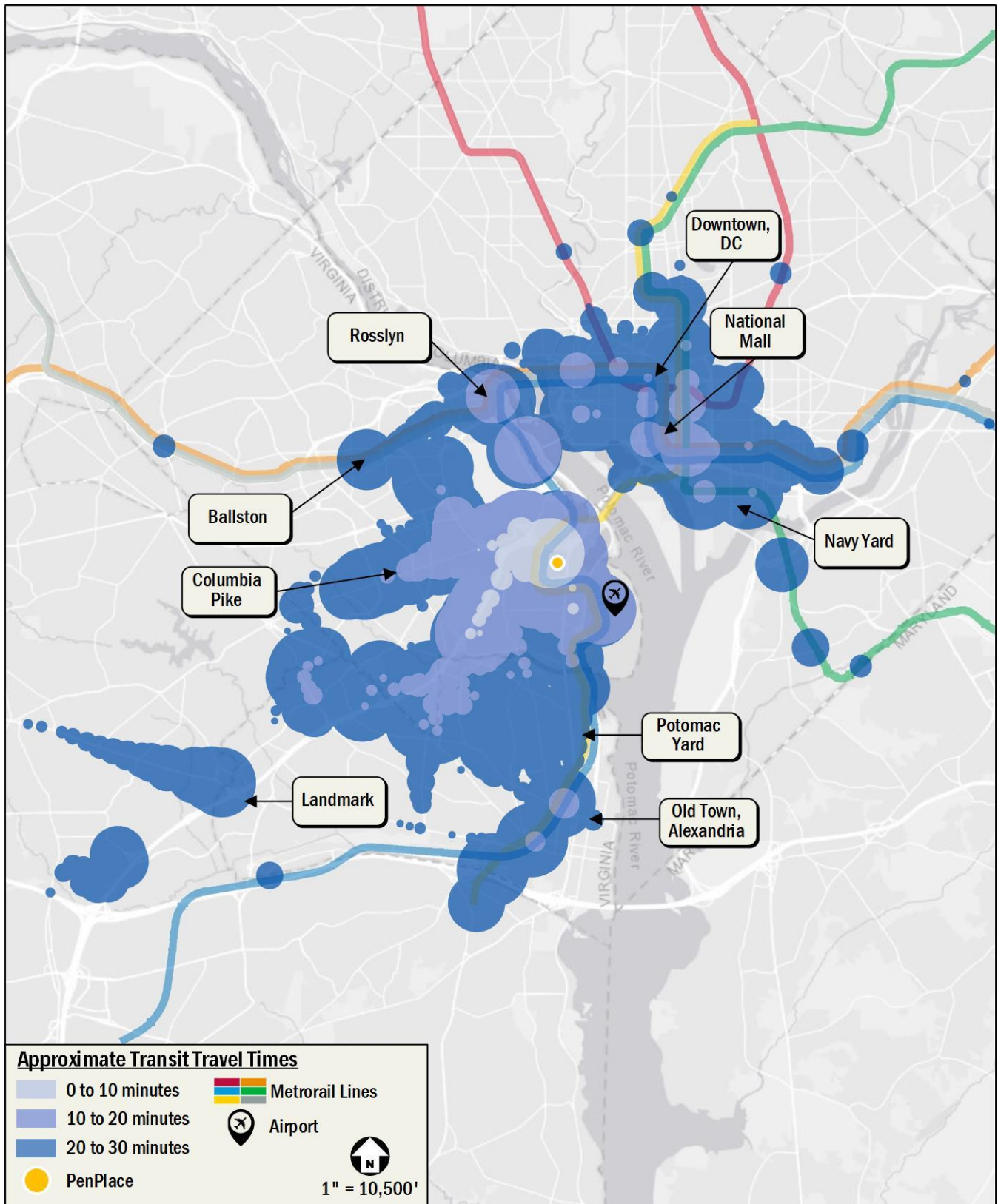


Figure 26: Approximate Transit Travel Times

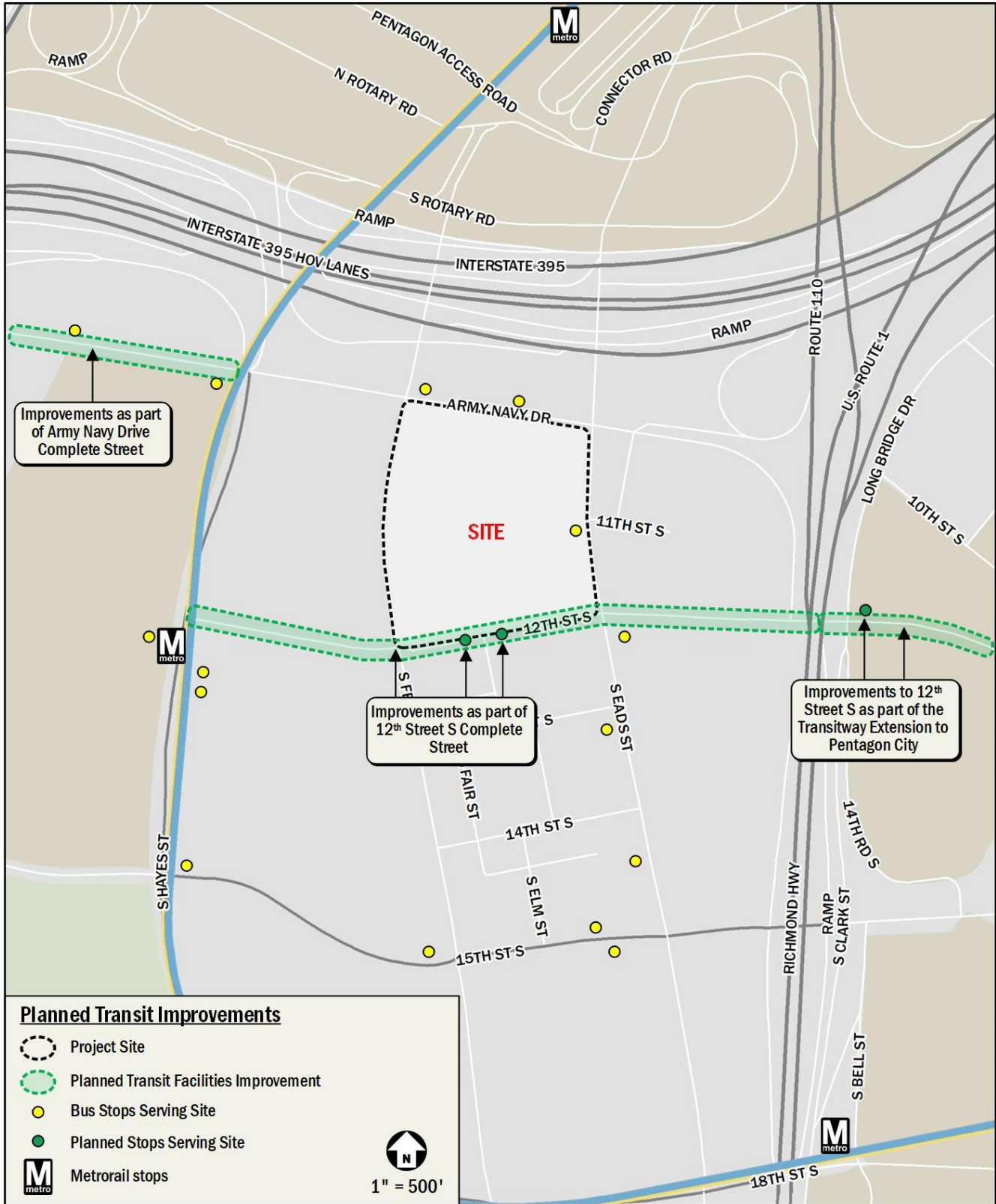


Figure 27: Planned Transit Improvements

## Bicycle Facilities

This chapter summarizes existing and future bicycle access and reviews the quality of cycling routes to and from the site.

The following conclusions are reached within this chapter:

- The site has access to several on- and off-street bicycle facilities, including bicycle lanes on S Eads Street, S Hayes Street, 15<sup>th</sup> Street S, 18<sup>th</sup> Street S, and Crystal Drive which connect to the Mt. Vernon Trail to the east and Four Mile Run Trail to the south.
- Future planned projects in the vicinity of the site include bicycle lanes along Army Navy Drive, S Eads Street, and 12<sup>th</sup> Street as part of the Army Navy Drive, S Eads Street, and 12<sup>th</sup> Street South Complete Street projects. These will further improve bicycle access and connectivity by upgrading bicycle facilities along these routes.
- Consistent with the Arlington County Master Transportation Plan, the proposed development will provide southbound protected bicycle lanes on S Eads Street from Army Navy Drive to 12<sup>th</sup> Street S and northbound protected bicycle lanes on S Fern Street from Army Navy Drive to 12<sup>th</sup> Street S.
- As part of the proposed development, short-term bicycle parking spaces will be provided along the perimeter of the site. Long-term bicycle parking spaces, showers, and lockers will be provided for use of the employees of the site.

### Existing Bicycle Facilities

The site has access to several existing on- and off-street bicycle facilities, including bicycle lanes on S Hayes Street, S Eads Street, 15<sup>th</sup> Street S, and Crystal Drive. Figure 28 shows the existing facilities within the study area. There are also protected and buffered bicycle lanes along a portion of S Eads Street south of the site, between 12<sup>th</sup> Street S and 23<sup>rd</sup> Street S. Protected bicycle lanes provide physical separation such as an on-street parking lane between bicycles and motor vehicles (also known as a cycle track) and buffered bicycle lanes have the same function as standard bicycle lanes with a marked buffer on one side of the lane. These bicycle facilities connect to a network of bicycle facilities that provide connections to the Mt. Vernon Trail to the east and Four Mile Run Trail to the south.

Arlington County publishes an annual Bicycle Comfort Level Map highlighting the most comfortable bicycle routes throughout Arlington County. The map uses a rating system of “perception of comfort” to show which routes are most comfortable. Routes are rated as ‘Easy’, ‘Medium’, ‘Challenging’, ‘Expert Level’, or

‘Prohibited’. The most recent publication of the map (2020) shows the majority of bicycle routes in the vicinity of the site rated as ‘Medium’ and ‘Challenging’. S Eads Street is rated ‘Medium’, and Army Navy Drive is rated ‘Challenging’ adjacent to the site.

No bicycle parking is provided along the perimeter of the site under existing conditions. Short-term bicycle racks are available at the Pentagon City, Pentagon, and Crystal City Metro Stations as well as at the Metroway stop in the vicinity of the site.

Figure 29 shows the 10-minute, 20-minute, and 30-minute bicycle travel shed for the proposed development. Within a 10-minute bicycle ride, the proposed development has access to several destinations including the Mount Vernon and Four Mile Run trails, public transportation stops, Metro stations served by the Blue and Yellow lines, the Crystal City VRE Station, retail zones, residential neighborhoods, and community amenities. Within a 20-minute bicycle ride, the proposed development has access to destinations in the District, Arlington, and Alexandria such as Custis Trail, Arlington Memorial Bridge, Lincoln Memorial, residential neighborhoods, and retail zones. Within a 30-minute bicycle ride, the proposed development is accessible to most of Arlington and Alexandria, and several destinations in the District including Downtown, and the Southwest Waterfront.

### Capital Bikeshare

In addition to personal bicycles, the Capital Bikeshare program provides additional cycling options for residents and patrons of the proposed development. The Bikeshare program has placed over 550 Bikeshare stations across Washington, DC, Arlington County, VA, City of Alexandria, VA, Montgomery County, MD, Fairfax County, VA, Prince George’s County MD, and most recently the City of Falls Church, VA, with over 4,500 bicycles provided. There are three (3) existing Capital Bikeshare stations that house a total of 50 bicycles within a quarter-mile of the site, located along S Eads Street, S Fern Street, and S Hayes Street. There are six (6) additional stations located within one half-mile of the site.

### E-Scooters and Dockless E-Bicycles

Four (4) electric-assist scooter (e-scooter) and electric-assist bicycle (e-bicycle) companies provide Shared Mobility Device (SMD) service in Arlington County: Bird, Helbiz, Lime and Spin. These SMDs are provided by private companies that give

registered users access to a variety of e-scooter and e-bicycle options. These devices are used through each company-specific mobile phone application. Many SMDs do not have designated stations where pick-up/drop-off activities occur like with Capital Bikeshare; instead, many SMDs are parked in public space, most commonly in the “furniture zone” (the portion of sidewalk between where people walk and the curb, often where other street signs, street furniture, trees, parking meters, etc. are found). At this time, SMD pilot/demonstration programs are underway in Arlington County, the District, Fairfax County, the City of Alexandria, and Montgomery County.

### **Planned Bicycle Facilities**

Existing bicycle facilities have been recommended by the Arlington County Master Transportation Plan and Crystal City Sector Plan to be upgraded in the future, as shown on Figure 13, including adding bicycle lanes along Army Navy Drive between S Joyce Street and 12<sup>th</sup> Street S, adding bicycle lanes along S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, adding bicycle lanes along S Fern Street between the Pentagon Transit Center and 18<sup>th</sup> Street S, and adding off-street bicycle facilities along S Clark Street/S Bell Street between 12<sup>th</sup> Street S and 18<sup>th</sup> Street S.

The recently adopted Bicycle Element of the Arlington County Master Transportation Plan identifies 15<sup>th</sup> Street S as a Primary Bicycling Corridor. The plan makes the following recommendations:

- Reconstruct Army Navy Drive to include bi-directional, protected bicycle lanes from S Joyce Street to 12<sup>th</sup> Street S.
- Construct an off-street cycle track connecting the planned Army Navy Drive protected bicycle lane at 12<sup>th</sup> Street S to 18<sup>th</sup> Street S and the Crystal City Metrorail station
- Reconstruct 18<sup>th</sup> Street S between Richmond Highway (Rt. 1) and Crystal Drive to include an enhanced on-street bicycle facility and improve the connection with the Crystal City Connector Trail. Also identified in the Crystal City Sector Plan.
- Upgrade the existing bicycle lanes on S Joyce Street and 15<sup>th</sup> Street S between Army Navy Drive and S Hayes Street to include more separation from motor vehicle traffic.
- Develop an enhanced bicycle facility on S. Fern Street between the Pentagon reservation and 18<sup>th</sup> Street South. The proposed development will provide a northbound protected bike lane along the eastern side between Army Navy Drive and 12<sup>th</sup> Street S and a southbound protected

bike lane along the western side between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway.

In December 2020, County staff developed recommendations for a bicycle network that provides new north-south bicycle facilities along with improvements to east-west streets in Crystal City. Following public input in 2021, the updated Recommended Crystal City Bike Network includes:

- Southbound protected bicycle lane on Crystal Drive between 18<sup>th</sup> Street S and 23<sup>rd</sup> Street S.
- Northbound, contraflow protected bicycle lane on S Clark/Bell Street between 26<sup>th</sup> Street S and 20<sup>th</sup> Street S.
- Protected or buffered/partially buffered eastbound and westbound bicycle lanes on 15<sup>th</sup> Street S, 18<sup>th</sup> Street S and 23<sup>rd</sup> Street S.
- Westbound buffered bicycle lane connecting Crystal Drive and the contraflow bicycle lane on S Clark/Bell Street.

Several bicycle infrastructure improvements are planned in the study area as parts of other planned projects:

- As part of the Army Navy Drive Complete Street project, separated two-way bicycle lanes will be installed along the south side of Army Navy Drive between S Joyce Street and 12<sup>th</sup> Street S.
- As part of the S Eads Street Complete Street project, buffered bicycle lanes will also be installed on the east side of S Eads Street from Army Navy Drive to 12<sup>th</sup> Street S.
- As part of the S Eads Street Protected Bicycle Lanes Extension and Metropolitan Park 6, 7, 8 project, protected bicycle lanes will be installed along both sides of S Eads Street from 12<sup>th</sup> Street S to 15<sup>th</sup> Street S and the S Eads Street and 15<sup>th</sup> Street S intersection will be reconfigured as a protected intersection.
- As part of the 12<sup>th</sup> Street S Complete Street project, shared lanes are planned from S Hayes Street to Clark Street/Long Bridge Drive, connecting to the existing bicycle lanes on Crystal Drive east of the site.
- As part of the 12<sup>th</sup> Street S/S Clark-Bell Street Realignment project, an off-street trail will be installed along the west side of S Clark Street.
- As part of the Metropolitan Park 6, 7, 8 project, separated bicycle lanes will be installed along the west side of S Eads Street from 12<sup>th</sup> Street S to 15<sup>th</sup> Street S, protected bicycle lanes will be provided along both sides of 15<sup>th</sup> Street S between S Elm Street and Route 1, and a protected intersection will be provided at S Eads Street and 15<sup>th</sup> Street

S, improving sightlines and providing more separation between bicycles and vehicles.

## PenPlace Related Improvements

The proposed PenPlace development will make significant bicycle related improvements over existing conditions in and around the site.

### On-Street Bicycle Facilities

Consistent with the Arlington County Master Transportation Plan, the proposed development will improve S Eads Street to include a 6-foot-wide southbound protected bicycle lane on the west side of S Eads Street from Army Navy Drive to 12<sup>th</sup> Street S. This facility will connect to the planned cycle track on Army Navy Drive and to the planned protected bicycle lanes south of 12<sup>th</sup> Street S. A northbound protected bicycle lane will be provided by others.

In addition, the proposed development will improve S Fern Street to include a northbound protected bike lane along the eastern side between Army Navy Drive and 12<sup>th</sup> Street S and a southbound protected bike lane along the western side between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway. Based on coordination with the County, staff has focused on creating high-quality bicycle facilities on other north-south corridors such as S Eads and S Joyce Streets, both a block away in either direction. Figure 18 shows the on-street bicycle facilities that are proposed to be provided as part of the PenPlace development.

### Bicycle Parking

The proposed development will include both short- and long-term bicycle parking spaces. The proposed development will provide 176 short-term parking spaces for office and retail use, meeting zoning requirements. The proposed development will provide 830 long-term bicycle parking spaces for office, and retail use, significantly exceeding zoning requirements. Secure long-term bicycle parking for the development will be located on the ground floor of each building on-site, with 274 spaces in the southeastern building (Tower 1), 244 spaces in the southwestern building (Tower 2), and 312 spaces in the northwestern building (Tower 3). Secure long-term bicycle spaces for the northeastern building (Helix) will be provided in the southeastern building (Tower 1), the southwestern building (Tower 2), and the northwestern building (Tower 3). Short-term bicycle parking spaces will be placed within the site and along the perimeter of the site, along Army Navy Drive, 12<sup>th</sup> Street S, S Fern Street, and S Eads Street.

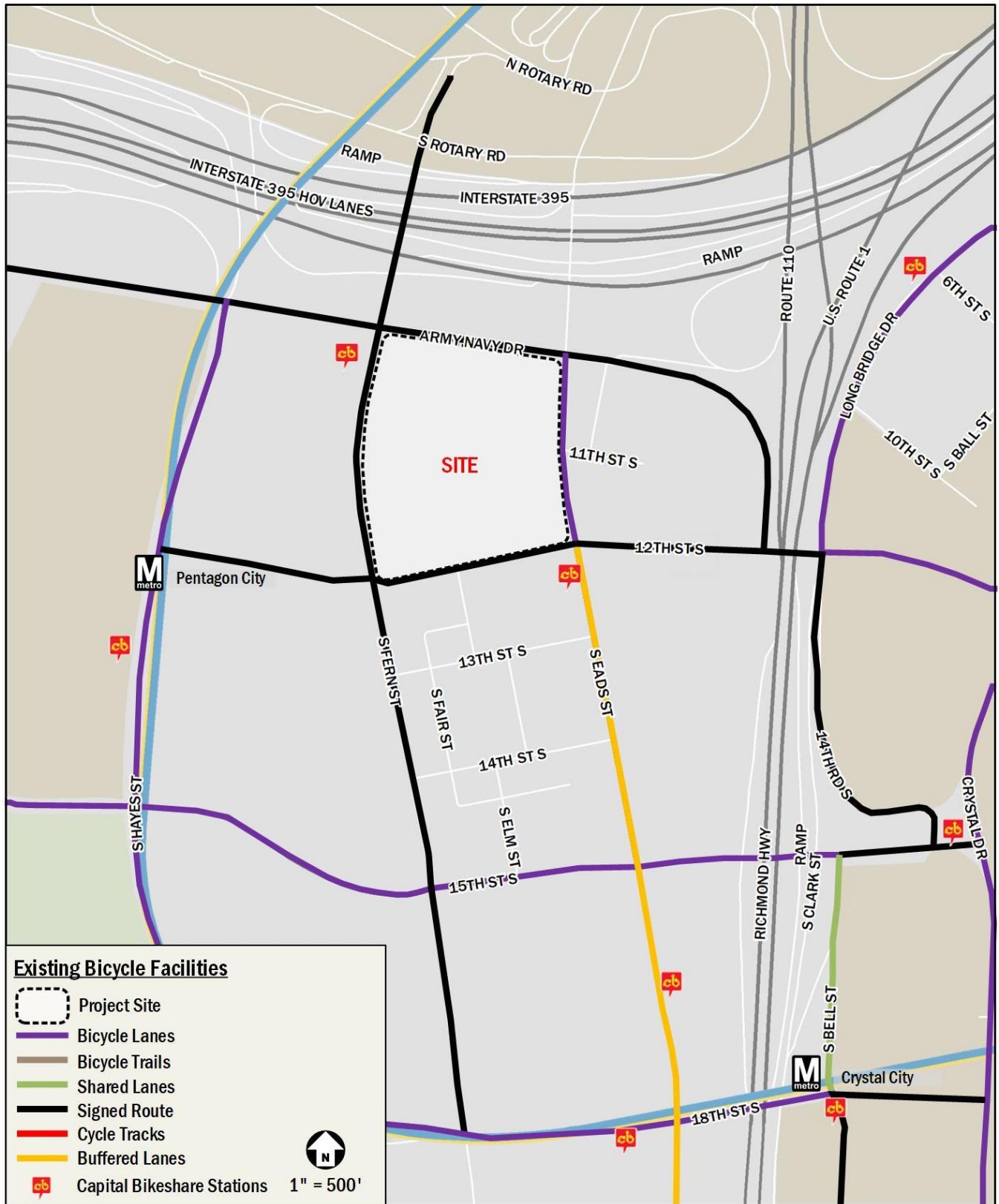


Figure 28: Existing Bicycle Facilities



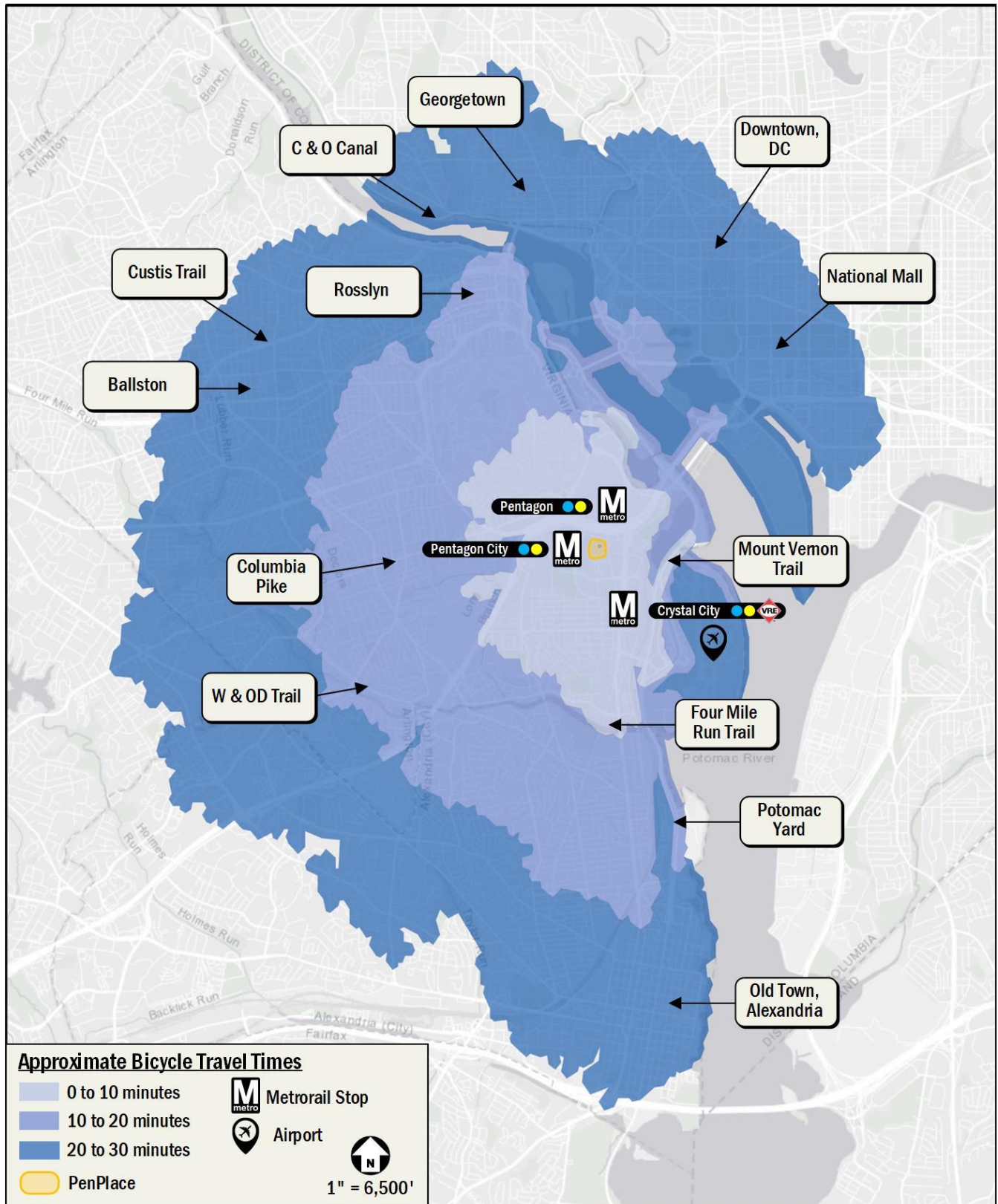


Figure 29: Approximate Bicycle Travel Times

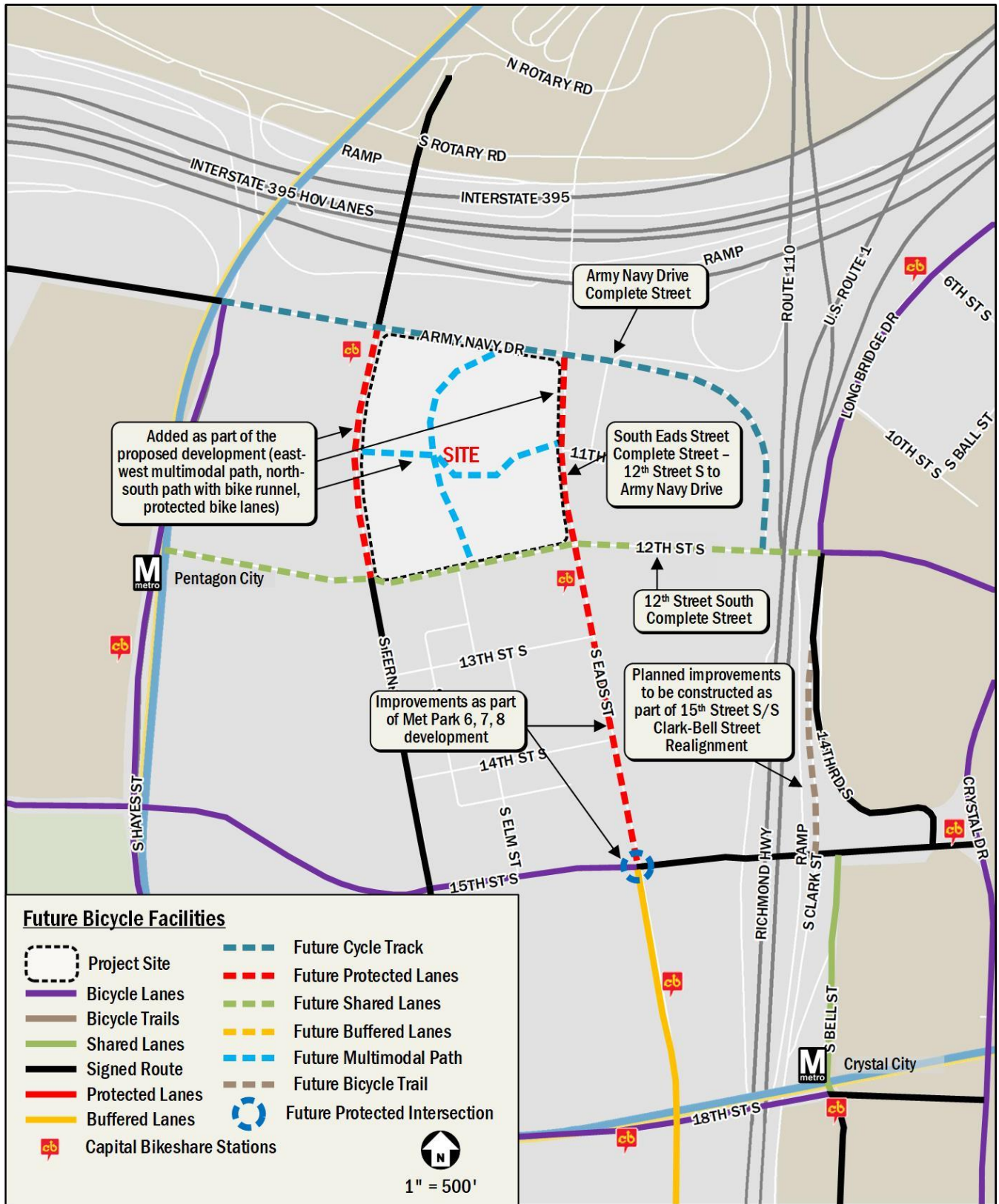


Figure 30: Future Bicycle Facilities

## Pedestrian Facilities

This chapter summarizes the existing and future pedestrian access to the site and reviews walking routes to and from the site.

The following conclusions are reached within this chapter:

- The existing pedestrian infrastructure surrounding the site provides a quality walking environment. There are sidewalks along the majority of primary routes to pedestrian destinations with a number of gaps in the system.
- Planned and proposed improvements to the pedestrian infrastructure surrounding the site will improve pedestrian comfort and connectivity.
- The proposed development will provide a more inviting pedestrian environment by adding new sidewalks and streetscape features along the perimeter of the site that meet or exceed Arlington County requirements. The project will include publicly available plazas throughout the site to improve pedestrian circulation.

### **Pedestrian Study Area**

Pedestrian facilities within a quarter-mile of the site were evaluated as well as routes to nearby transit facilities, including routes to Pentagon City Metro Station to the west, Pentagon Metro Station to the north, and Crystal City Metro Station to the south. The site is accessible to transit options such as the bus stop adjacent to the site on S Eads Street and the Metroway at the Pentagon City Metro Station 0.2 miles west from the site. In general, existing pedestrian facilities surrounding the site provide comfortable walking routes to and from nearby transit options. However, there are some areas of concern within the study area that negatively impact the quality and attractiveness of the walking environment. This includes physical barriers that limit pedestrian connectivity.

Figure 32 shows expected pedestrian pathways, walking time and distances, and barriers or areas of concern. Route 1 bifurcates through Crystal City from north to south. Although Route 1 is not a full pedestrian barrier, it presents challenges for pedestrians by limiting east-west connection points to approximately every 1000 feet. The study area is also bordered by I-395 further to the west and to the north, as well as the Pentagon which limits pedestrian connectivity to areas to the west and north of Pentagon City.

Figure 33 shows the 10-minute, 20-minute, and 30-minute walk travel shed for the proposed development. Within a 10-minute

walk, the proposed development has access to several destinations including public transportation stops, Metro stations served by the Blue and Yellow lines, Long Bridge Park, the Pentagon Transit Center, the Crystal City VRE Station, the Mount Vernon Trail, retail zones, nearby residential neighborhoods, and community amenities. Within a 20-minute walk, the proposed development has access to destinations such as residential neighborhoods to the south and west, retail zones in Crystal City, and Arlington National Cemetery. Within a 30-minute walk, the proposed development has access to destinations including Ronald Reagan Washington International Airport, Four Mile Run Trail, and residential neighborhoods to the south and west.

### **Existing Pedestrian Facilities**

A review of pedestrian facilities surrounding the proposed development shows that many facilities provide a quality walking environment. Figure 28 shows a detailed inventory of the existing pedestrian infrastructure surrounding the site. Sidewalks, crosswalks, and curb ramps are evaluated based on the guidelines set forth by the Arlington County, and ADA standards. Sidewalk and buffer widths and recommendations are shown in Table 8. It should be noted that the sidewalk widths shown in Figure 34 reflect the total sidewalk widths based on observations in the field taken from curb to building, with pinch points and locations with a clear width of less than four (4) feet noted.

ADA standards require that curb ramps be provided wherever an accessible route crosses a curb and must have a detectable warning. Additionally, curb ramps shared between two crosswalks is not desired. As shown in Figure 34, under existing conditions the majority of curb ramps meet ADA standards.

Within the study area, the majority of roadways have existing sidewalks on both sides, with some deficiencies. Of note, portions of the sidewalk along the east side of S Eads Street, the east side of S Fern Street adjacent to the site, and the north side of 12<sup>th</sup> Street S adjacent to the site that have a temporary asphalt sidewalk. In addition, there are sidewalks closed due to construction to the south of the site along 13<sup>th</sup> Street S, S Eads Street, S Elm Street, and 15<sup>th</sup> Street S, which reduce the quality of the walking environment toward the Pentagon City and Crystal City Metro Stations. Despite some deficiencies, all primary

**Table 8: Sidewalk Recommendations per Arlington County Master Transportation Plan**

| Street Name               | Section  | Minimum Sidewalk Width | Minimum Sidewalk Width Met | Sidewalk Width* | Minimum Buffer Width | Minimum Buffer Width Met | Buffer Width* |
|---------------------------|--|------------------------|----------------------------|-----------------|----------------------|--------------------------|---------------|
| Army Navy Drive           | S Hayes Street to S Fern Street                        | 6-12 ft                | N                          | 5 ft            | 6 feet               | Y                        | 6 ft          |
| Army Navy Drive           | S Fern Street to S Eads Street                         | 6-12 ft                | N                          | < 5 ft          | 6 feet               | Y                        | 6 ft          |
| Army Navy Drive           | S Eads Street to 12 <sup>th</sup> Street S             | 6-12 ft                | N                          | < 5 ft          | 6 feet               | N                        | None          |
| S Hayes Street            | Army Navy Drive to 12 <sup>th</sup> Street S           | 6-12 ft                | Y                          | 12+ ft          | 6 feet               | Y                        | 6 ft          |
| S Hayes Street            | 12 <sup>th</sup> Street S to 15 <sup>th</sup> Street S | 6-12 ft                | Y                          | 12+ ft          | 6 feet               | Y                        | 6 ft          |
| 12 <sup>th</sup> Street S | S Hayes Street to S Fern Street                        | 10-12 ft               | N                          | 7 ft            | 6 feet               | Y                        | 6 ft          |
| 12 <sup>th</sup> Street S | S Fern Street to S Eads Street                         | 10-12 ft               | Y                          | 10 ft           | 6 feet               | Y                        | 6 ft          |
| 12 <sup>th</sup> Street S | S Eads Street to Crystal Drive                         | 6-12 ft                | Y                          | 8 ft            | 6 feet               | N                        | None          |
| S Fern Street             | Army Navy Drive to 12 <sup>th</sup> Street S           | 6-12 ft                | N                          | < 5 ft          | 6 feet               | Y                        | 7 ft          |
| S Fern Street             | 12 <sup>th</sup> Street S to 15 <sup>th</sup> Street S | 6-12 ft                | Y                          | 6 ft            | 6 feet               | N                        | 4 ft          |
| S Eads Street             | Army Navy Drive to 12 <sup>th</sup> Street S           | 6-12 ft                | N                          | < 5 ft          | 6 feet               | N                        | None          |
| S Eads Street             | 12 <sup>th</sup> Street S to 15 <sup>th</sup> Street S | 6-12 ft                | Y                          | 8 ft            | 6 feet               | Y                        | 7 ft          |
| S Elm Street              | 12 <sup>th</sup> Street S to 13 <sup>th</sup> Street S | 6-8 ft                 | Y                          | 10 ft           | 4-6 feet             | Y                        | 6 ft          |
| S Elm Street              | 14 <sup>th</sup> Street S to 15 <sup>th</sup> Street S | 6-8 ft                 | Y                          | None            | 4-6 feet             | N                        | None          |
| 13 <sup>th</sup> Street S | S Fern Street to S Eads Street                         | 6-8 ft                 | Y                          | 10 ft           | 4-6 feet             | Y                        | 5 ft          |
| 14 <sup>th</sup> Street S | S Fern Street to S Elm Street                          | 6-8 ft                 | Y                          | 9 ft            | 4-6 feet             | Y                        | 6 ft          |
| 15 <sup>th</sup> Street S | S Hayes Street to S Fern Street                        | 6-12 ft                | Y                          | 6 ft            | 6 feet               | Y                        | 6 ft          |
| 15 <sup>th</sup> Street S | S Fern Street to S Eads Street                         | 6-12 ft                | Y                          | 9 ft            | 6 feet               | N                        | 4 ft          |
| 15 <sup>th</sup> Street S | S Eads Street to Crystal Drive                         | 10-16 ft               | Y                          | 12+ ft          | 6 feet               | Y                        | None          |
| 12 <sup>th</sup> Road S   | S Elm Street to S Fair Street                          | 6-8 ft                 | Y                          | 10 ft           | 4-6 feet             | Y                        | 6 ft          |
| S Fair Street             | 12 <sup>th</sup> Road S to 14 <sup>th</sup> Road S     | 6-8 ft                 | Y                          | 6 ft            | 4-6 feet             | Y                        | 6 ft          |
| 14 <sup>th</sup> Road S   | S Fair Street to S Elm Street                          | 6-8 ft                 | Y                          | 9 ft            | 4-6 feet             | Y                        | 6 ft          |

\* Widths based most narrow measurement along either side of roadway section

pedestrian destinations are accessible via routes with sidewalks, most of which meet Arlington County and ADA standards.

Overall, the site is situated within an urban transportation network, with quality pedestrian access. Figure 31 shows the existing pedestrian peak hour volumes at study area intersections. The most heavily-used crosswalk in the study area is across S Fern Street on the north side of 12<sup>th</sup> Street S, most likely a result of the proximity to the Pentagon City Metro Station on the southwest corner of S Hayes Street and 12<sup>th</sup> Street S.

**Planned Pedestrian Facilities**

As a result of the development, pedestrian facilities around the perimeter of the site will be improved to meet Arlington County and ADA standards. This includes the improvement of sidewalks along the site frontage along S Eads Street, S Fern Street, Army Navy Drive, and 12<sup>th</sup> Street S so that they meet or exceed width requirements and provide a more inviting pedestrian

environment. The development will also include publicly available plazas that will improve pedestrian circulation. Additional improvements will be made as part of the Army Navy Drive Complete Street project, the S Eads Street Complete Street project, and the 12<sup>th</sup> Street S Complete Street project.

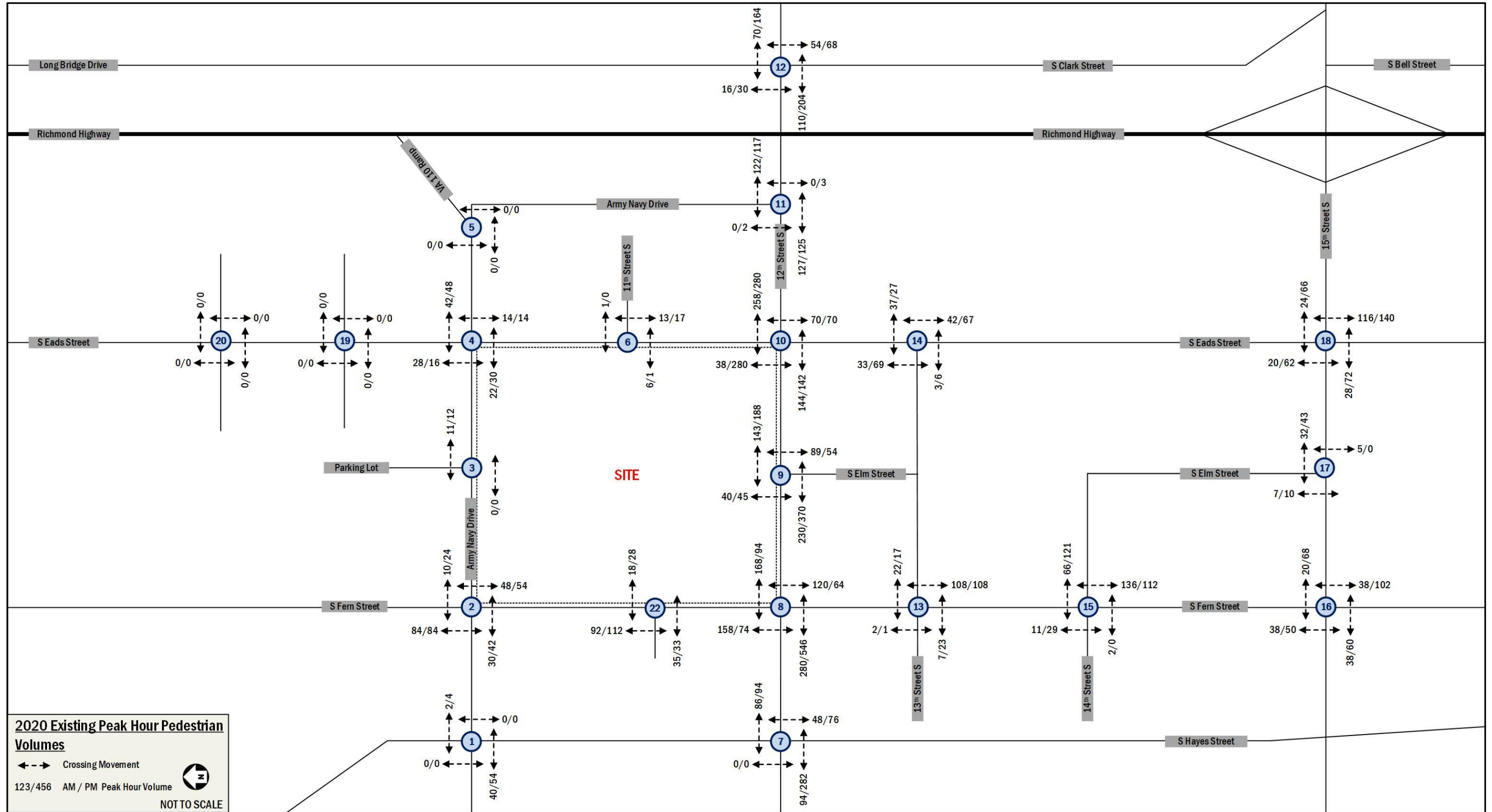
The proposed development will reduce deficiencies by providing improved sidewalk and streetscape features throughout the site. In addition to improvements along the perimeter of the site, consistent with the Pentagon City PDSP plan, the proposed development will provide a north-south forest walk and an east-west multimodal path through the site that improves pedestrian connectivity and site porosity.

As part of the development, signals are proposed at the following intersections:

- Army Navy Drive and Parking Lot
- S Fern Street and Site Driveway

- S Eads Street and 11th Street S/Site Driveway

The installation of signals at these intersections will provide additional signalized pedestrian crossing points which will help accommodate the additional pedestrian demand that the development will generate as well as significantly improve the pedestrian facilities near the site. Figure 35 shows the site-generated peak hour pedestrian volumes and Figure 36 shows the future peak hour pedestrian volumes at study area intersections. Planned and proposed pedestrian improvements are shown in Figure 37.



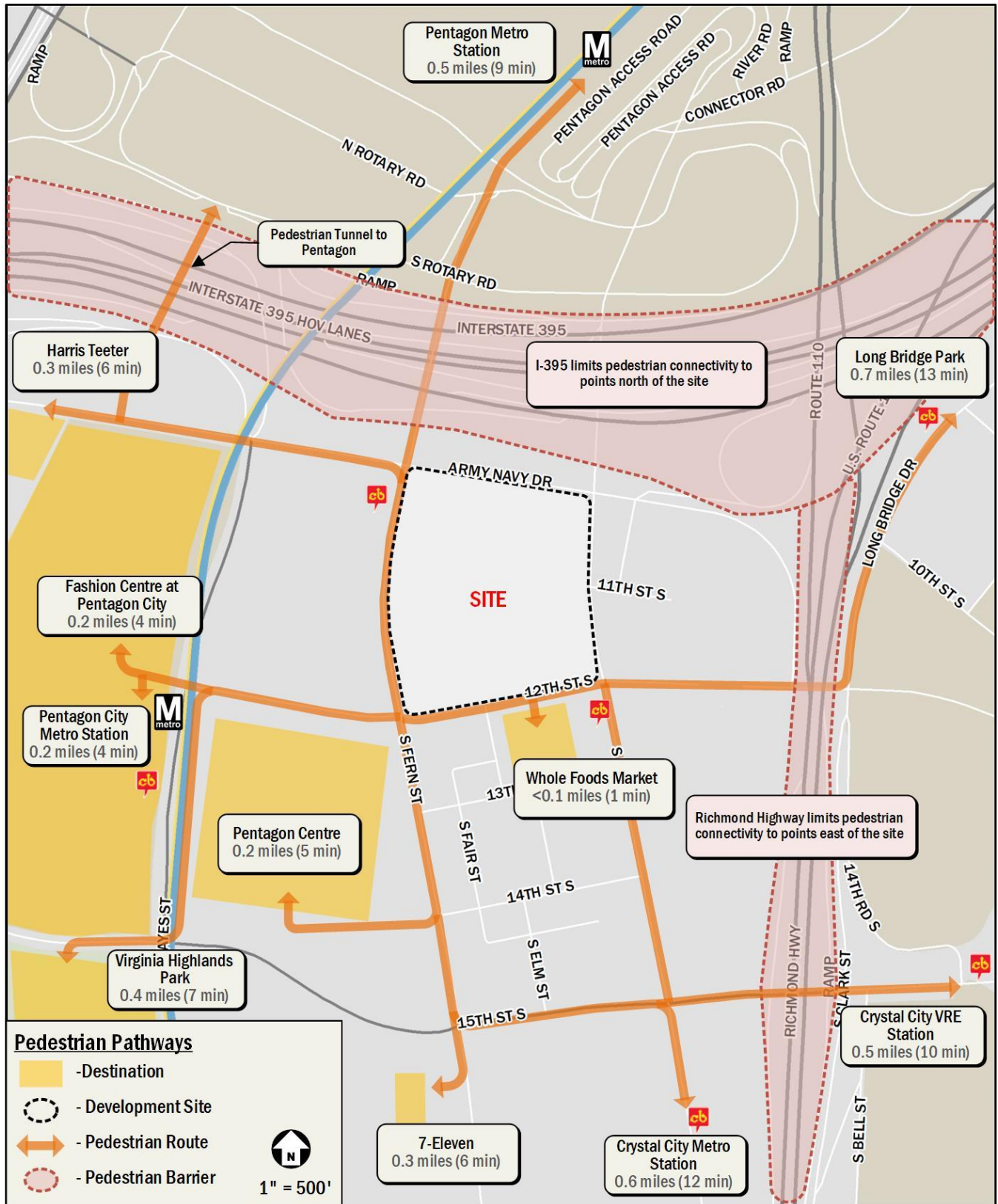


Figure 32: Pedestrian Pathways

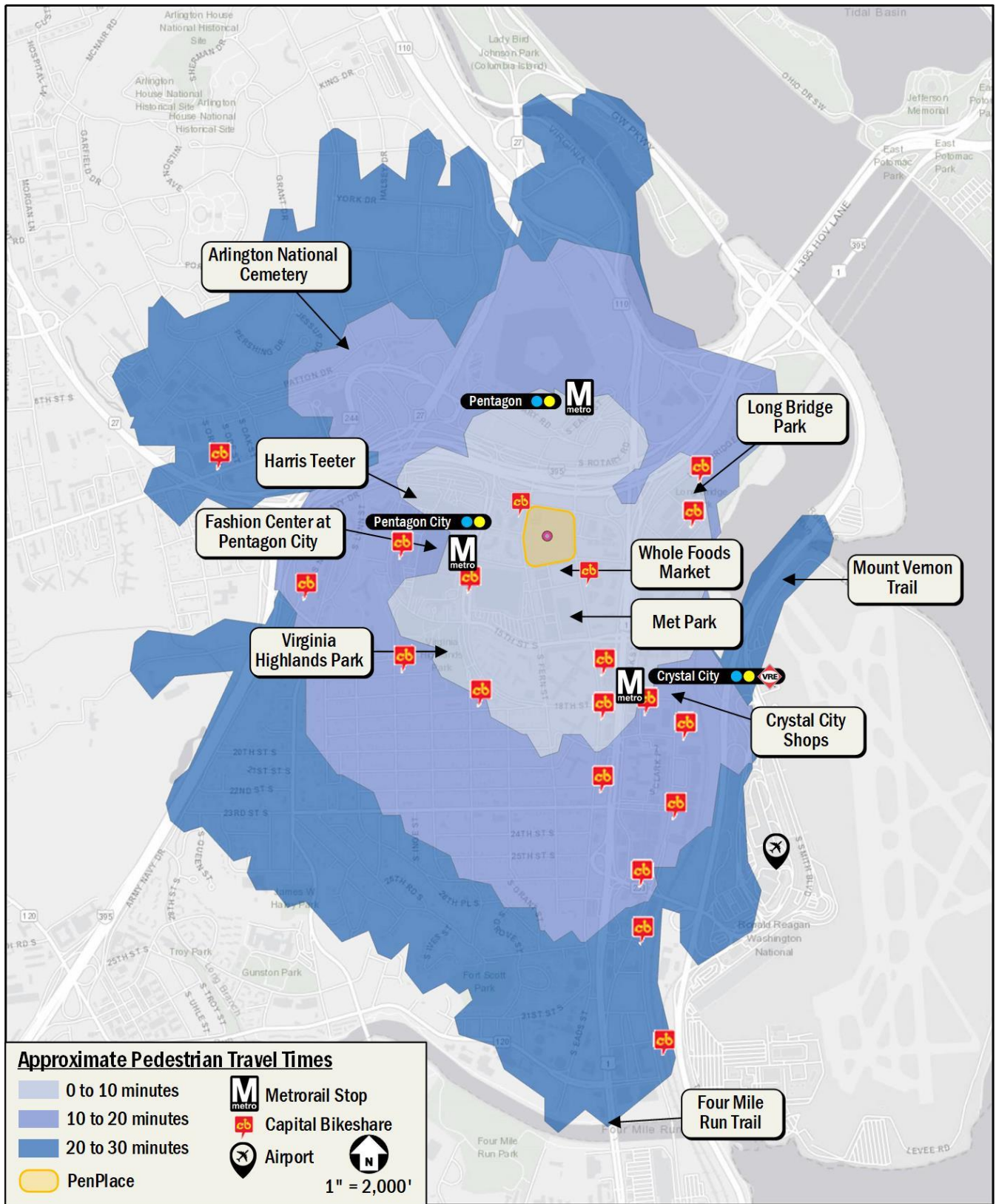


Figure 33: Approximate Pedestrian Travel Times



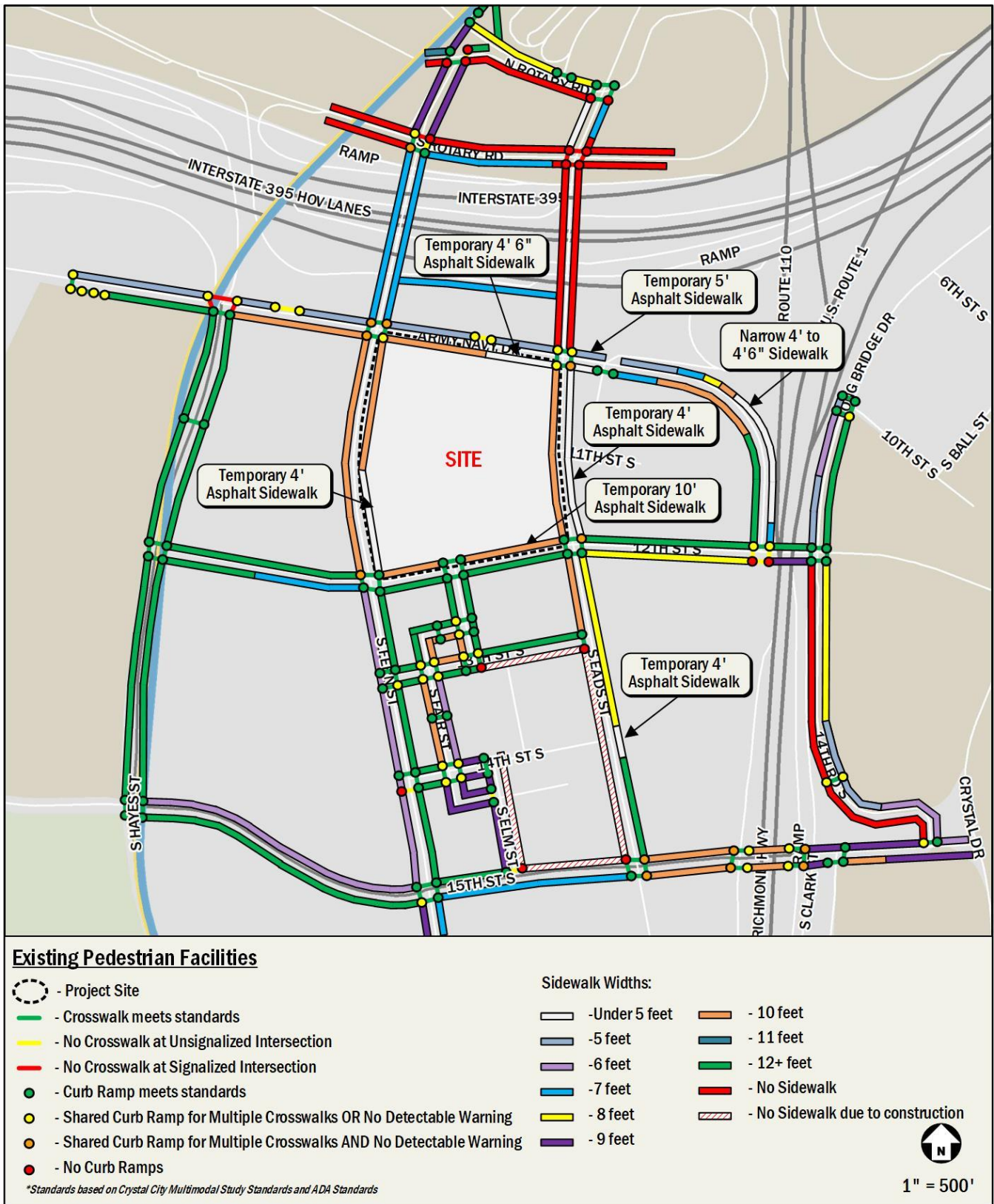


Figure 34: Existing Pedestrian Facilities

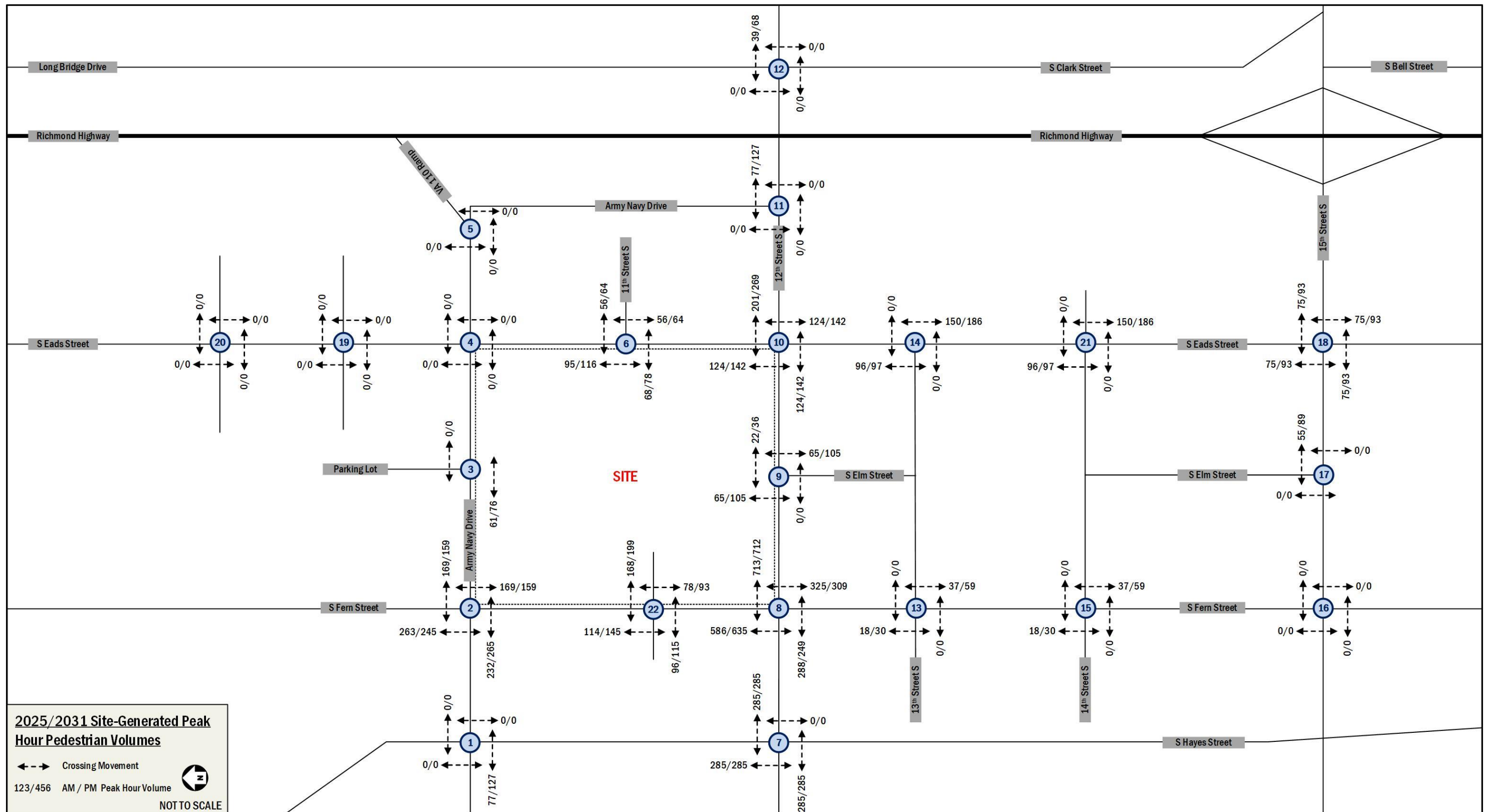


Figure 35: 2025/2031 Site-Generated Peak Hour Peak Hour Pedestrian Volumes

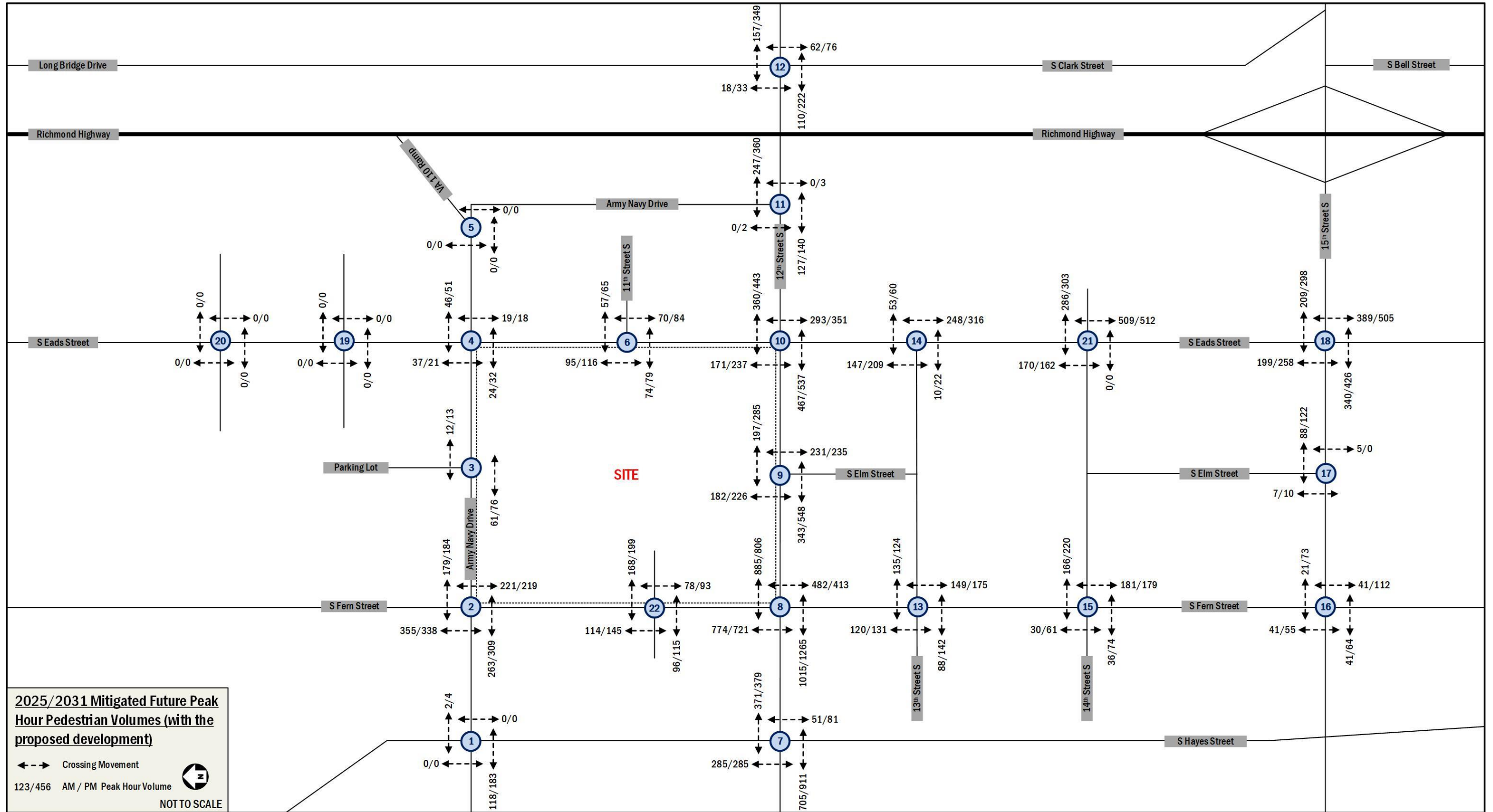


Figure 36: 2025/2031 Mitigated Future Peak Hour Pedestrian Volumes

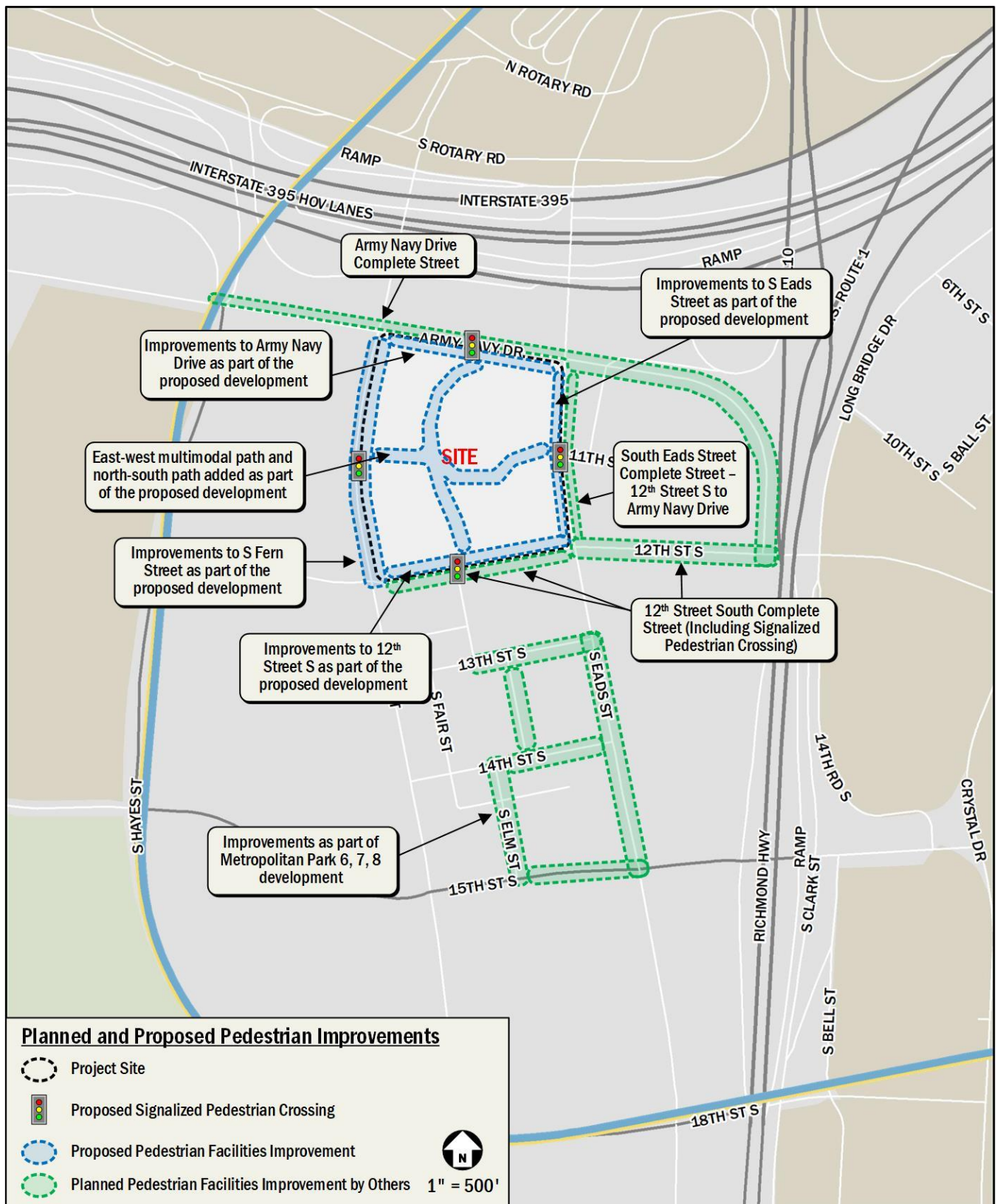


Figure 37: Planned and Proposed Pedestrian Improvements

## Travel Demand Assumptions

This chapter outlines the transportation demand of the proposed PenPlace development. It reviews the expected mode splits, multimodal trip generation, and the trip distribution and routing assumptions, which forms the basis for the chapters that follow.

### Mode Split Methodology

Mode split (also called mode share) is the percentage of travelers using a particular type (or mode) of transportation when traveling. The main source of mode split information for this report was based on Census data using Transportation Analysis Districts (TADs) and data contained in the State of the Commute 2016, the Crystal City Multimodal Transportation Study, the WMATA Ridership Survey, and the Arlington County Mode Share Assumptions for Pentagon City.

### Office Mode Splits

Office mode splits were primarily based on Census data at the TAD level for commuters with destinations in the TAD. Figure 45 shows the TAD used in the analysis in relation to the proposed development and Figure 46 shows the origins of driving commuters with destinations in the project TAD. Table 9 summarizes the data that was used to establish the office mode split assumptions for this report. Given the low parking ratio proposed for the site compared to other sites in the area, and planned improvements to transit, bicycle, and pedestrian access in the vicinity of the site, a reduced office auto mode split was assumed for the proposed development.

**Table 9: Summary of Office Mode Split Data**

| Information Source  | Mode            |         |           |                |                     |
|---|-----------------|---------|-----------|----------------|---------------------|
|   | SOV             | Carpool | Transit   | Bicycle / Walk | Telecommute / Other |
| State of the Commute 2016 (of District employees)         | 38%             | 6%      | 45%       | 6%             | 5%                  |
| Crystal City Multimodal Transportation Study (Table 3.7)  | 39% AM / 50% PM |         | 27%       | 28%            | ---                 |
| Crystal City Multimodal Transportation Study (Figure 3.4) | ---             | ---     | 46% - 50% | ---            | ---                 |
| WMATA Ridership Survey (Suburban Inside the Beltway)      | 66%             | ---     | 30%       | 6%             | ---                 |

|   |     |     |    |     |
|---|-----|-----|----|-----|
| WMATA Ridership Survey (Suburban outside the Beltway)     | 89% | 11% | 0% | --- |
| Arlington County Mode Share Assumptions for Pentagon City | 30% | 61% | 9% | --- |

### Amenity Space Mode Splits

The amenity space component of the proposed development includes support space for the site, including the Helix building. This space will primarily be used off-peak and by office users already on-site. The Helix building will be opened to the public several weekends per month for public tours but will be closed to the public on a typical weekday. As such, amenity mode splits were primarily based on the anticipated usage on the site, as agreed upon with Arlington County staff during the scoping phase of the project.

### Daycare Mode Splits

The daycare component of the proposed development is primarily intended to serve the office users of the site. Daycare mode splits were primarily based on the anticipated usage on the site, as agreed upon with Arlington County staff during the scoping phase of the project.

### Neighborhood Retail Mode Splits

Neighborhood retail mode splits were primarily based on information contained in WMATA's 2005 *Development-Related Ridership Survey*. Table 10 summarizes the data that was used to establish the neighborhood retail mode split assumptions for this report.

**Table 10: Summary of Neighborhood Retail Mode Split Data**

| Information Source                           | Mode |         |         |              |                   |
|--|------|---------|---------|--------------|-------------------|
|  | SOV  | Carpool | Transit | Bicycle/Walk | Telecommute/Other |
| WMATA Ridership Survey (Crystal City Shops)  | 27%  | ---     | 37%     | 36%          | ---               |
| WMATA Ridership Survey (Crystal Plaza Shops) | 24%  | ---     | 41%     | 35%          | ---               |

### Community Space Mode Splits

Based on preliminary discussions, the community space component of the proposed development may consist of some classrooms, meetings rooms, and/or instructional space. As a

conservative measure, the same mode splits as those assigned to the daycare use were applied to the community space component, as agreed upon with Arlington County staff during the scoping phase of the project.

The site has multiple bus stops surrounding it and three (3) Metro stations near the site. It is expected that a significant portion of trips will be by Metrorail, bus, bicycle, or on foot during the morning and afternoon peak hours, rather than by personal vehicle. Based on this, the auto mode splits for the development were determined to be 30% for the office component, 30% for the amenity space component, 50% for the daycare component, 5% for the neighborhood retail component, and 50% for community space component. The proposed mode splits were vetted and approved by Arlington County and VDOT during the scoping process. Table 11 shows the mode split assumptions for the proposed development.

**Table 11: Summary of Mode Split Assumptions by Land Use**

| Land Use            | Mode |         |         |      |
|---------------------|------|---------|---------|------|
|                     | Auto | Transit | Bicycle | Walk |
| Office              | 30%  | 54%     | 6%      | 10%  |
| Amenity             | 30%  | 54%     | 6%      | 10%  |
| Daycare             | 50%  | 20%     | 5%      | 25%  |
| Neighborhood Retail | 5%   | 15%     | 5%      | 75%  |
| Community           | 50%  | 20%     | 5%      | 25%  |

**Trip Generation Methodology**

Weekday peak hour trip generation is calculated based on the methodology outlined in the Institute of Transportation Engineers’ (ITE) Trip Generation, 10<sup>th</sup> Edition.

Office trip generation is based on the development program of 2.8 million square feet. Office trip generation was calculated based on ITE Land Use 710 (General Office Building), using the setting/location of Center City Core, splitting trips into different modes using assumptions outlined in the mode split section of this report.

Amenity trip generation is based on the development program of 388,300 square feet. The amenity use will include support space for the site, including the Helix building, and is anticipated to generate minimal additional trips during the morning and afternoon peak hours. The amenity space will primarily be used off-peak and by off users already on-site. The Helix building will be opened to the public several days per month for public tours

but will be closed to the public on a typical weekday. Amenity office trip generation was based on ITE Land Use 580 (Museum) to be conservative, using the setting/location of General Urban/Suburban, splitting trips into different modes using assumptions outlined in the mode split section of this report.

Daycare trip generation is based on the development program of 14,500 square feet. Daycare trip generation was calculated based on ITE Land Use 565 (Day Care Center), using the setting/location of General Urban/Suburban (limited data is available for person trips), splitting trips into different modes using assumptions outlined in the mode split section of this report.

Neighborhood retail trip generation is based on the development program of 82,600 square feet of neighborhood-serving ground floor retail. Retail trip generation was calculated based on ITE’s baseline vehicular trips for Land Use 820 (Shopping Center), using the setting/location of General Urban/Suburban (limited data is available for person trips), splitting trips into different modes using assumptions outlined in the mode split section of this report.

Community space trip generation is based on the development program of 27,000 square feet. Community space trip generation was calculated based on ITE Land Use 495 (Recreational Community Center), using the setting/location of General Urban/Suburban, splitting trips into different modes using assumptions outlined in the mode split section of this report.

A summary of the multi-modal trip generation for the overall development for the 2025 and 2031 horizon years is shown in Table 12 for the weekday morning and weekday afternoon peak hours. Detailed trip generation calculations are included in the Technical Appendix.

**Table 12: Multi-Modal Trip Generation (2025 and 2031 Horizon Years)**

| Mode         | Land Use         | ITE Code | Mode Split | Development Size | AM Peak Hour       |                   |                    | PM Peak Hour      |                    |                    |
|--------------|------------------|----------|------------|------------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|
|              |                  |          |            |                  | In                 | Out               | Total              | In                | Out                | Total              |
| Auto         | Office           | 710      | 30%        | 2,777,079 SF     | 635 veh/hr         | 94 veh/hr         | 729 veh/hr         | 108 veh/hr        | 565 veh/hr         | 673 veh/hr         |
|              | Helix            | 580      | 30%        | 388,272 SF       | 28 veh/hr          | 5 veh/hr          | 33 veh/hr          | 3 veh/hr          | 18 veh/hr          | 21 veh/hr          |
|              | Daycare          | 565      | 50%        | 14,527 SF        | 43 veh/hr          | 37 veh/hr         | 80 veh/hr          | 38 veh/hr         | 43 veh/hr          | 81 veh/hr          |
|              | Retail           | 820      | 5%         | 82,608 SF        | 2 veh/hr           | 2 veh/hr          | 4 veh/hr           | 8 veh/hr          | 8 veh/hr           | 16 veh/hr          |
|              | Community Center | 495      | 50%        | 27,000 SF        | 16 veh/hr          | 8 veh/hr          | 24 veh/hr          | 15 veh/hr         | 16 veh/hr          | 31 veh/hr          |
| <b>Total</b> |                  |          |            |                  | <b>724 veh/hr</b>  | <b>146 veh/hr</b> | <b>870 veh/hr</b>  | <b>172 veh/hr</b> | <b>650 veh/hr</b>  | <b>822 veh/hr</b>  |
| Transit      | Office           | 710      | 54%        | 2,777,079 SF     | 1347 ppl/hr        | 202 ppl/hr        | 1549 ppl/hr        | 228 ppl/hr        | 1201 ppl/hr        | 1429 ppl/hr        |
|              | Helix            | 580      | 54%        | 388,272 SF       | 85 ppl/hr          | 13 ppl/hr         | 98 ppl/hr          | 10 ppl/hr         | 53 ppl/hr          | 63 ppl/hr          |
|              | Daycare          | 565      | 20%        | 14,527 SF        | 31 ppl/hr          | 27 ppl/hr         | 58 ppl/hr          | 28 ppl/hr         | 31 ppl/hr          | 59 ppl/hr          |
|              | Retail           | 820      | 15%        | 82,608 SF        | 13 ppl/hr          | 8 ppl/hr          | 21 ppl/hr          | 41 ppl/hr         | 45 ppl/hr          | 86 ppl/hr          |
|              | Community Center | 495      | 20%        | 27,000 SF        | 13 ppl/hr          | 7 ppl/hr          | 20 ppl/hr          | 12 ppl/hr         | 14 ppl/hr          | 26 ppl/hr          |
| <b>Total</b> |                  |          |            |                  | <b>1489 ppl/hr</b> | <b>257 ppl/hr</b> | <b>1746 ppl/hr</b> | <b>319 ppl/hr</b> | <b>1344 ppl/hr</b> | <b>1663 ppl/hr</b> |
| Bike         | Office           | 710      | 6%         | 2,777,079 SF     | 150 ppl/hr         | 22 ppl/hr         | 172 ppl/hr         | 25 ppl/hr         | 134 ppl/hr         | 159 ppl/hr         |
|              | Helix            | 580      | 6%         | 388,272 SF       | 9 ppl/hr           | 2 ppl/hr          | 11 ppl/hr          | 1 ppl/hr          | 6 ppl/hr           | 7 ppl/hr           |
|              | Daycare          | 565      | 5%         | 14,527 SF        | 8 ppl/hr           | 7 ppl/hr          | 15 ppl/hr          | 7 ppl/hr          | 8 ppl/hr           | 15 ppl/hr          |
|              | Retail           | 820      | 5%         | 82,608 SF        | 4 ppl/hr           | 3 ppl/hr          | 7 ppl/hr           | 14 ppl/hr         | 15 ppl/hr          | 29 ppl/hr          |
|              | Community Center | 495      | 5%         | 27,000 SF        | 3 ppl/hr           | 2 ppl/hr          | 5 ppl/hr           | 3 ppl/hr          | 4 ppl/hr           | 7 ppl/hr           |
| <b>Total</b> |                  |          |            |                  | <b>174 ppl/hr</b>  | <b>36 ppl/hr</b>  | <b>210 ppl/hr</b>  | <b>50 ppl/hr</b>  | <b>167 ppl/hr</b>  | <b>217 ppl/hr</b>  |
| Walk         | Office           | 710      | 10%        | 2,777,079 SF     | 250 ppl/hr         | 37 ppl/hr         | 287 ppl/hr         | 42 ppl/hr         | 223 ppl/hr         | 265 ppl/hr         |
|              | Helix            | 580      | 10%        | 388,272 SF       | 16 ppl/hr          | 2 ppl/hr          | 18 ppl/hr          | 2 ppl/hr          | 10 ppl/hr          | 12 ppl/hr          |
|              | Daycare          | 565      | 25%        | 14,527 SF        | 39 ppl/hr          | 34 ppl/hr         | 73 ppl/hr          | 35 ppl/hr         | 39 ppl/hr          | 74 ppl/hr          |
|              | Retail           | 820      | 75%        | 82,608 SF        | 65 ppl/hr          | 42 ppl/hr         | 107 ppl/hr         | 206 ppl/hr        | 224 ppl/hr         | 430 ppl/hr         |
|              | Community Center | 495      | 25%        | 27,000 SF        | 17 ppl/hr          | 8 ppl/hr          | 25 ppl/hr          | 15 ppl/hr         | 18 ppl/hr          | 33 ppl/hr          |
| <b>Total</b> |                  |          |            |                  | <b>387 ppl/hr</b>  | <b>123 ppl/hr</b> | <b>510 ppl/hr</b>  | <b>300 ppl/hr</b> | <b>514 ppl/hr</b>  | <b>814 ppl/hr</b>  |

## ***Distribution and Assignment Methodology***

Trip distribution for the proposed PenPlace development was based on:

- Census Transportation Planning Products (CTPP) Transportation Analysis Districts (TAD) flow data;
- The Crystal City Multimodal Transportation Study;
- Existing traffic volumes and travel patterns in the study area; and
- StreetLight InSight® origin and destination data.

The main source of distribution and trip assignment information for this report was based on StreetLight. StreetLight metrics that are derived from a combination of two types of locational data: navigation-GPS data and Location-Based Services (LBS) data, including historical data, with a sample size of approximately 23% of the adult population. This data is then transformed into contextualized, aggregated, and normalized travel patterns that can be used to create origin and destination analyses. Please note that the Origin-Destination (OD) analysis is based on existing travel data patterns to/from the Pentagon City area. Due to the relatively limited number of office buildings in Pentagon City, proximate office buildings in Crystal City were also used in the OD analysis, as shown in Figure 38.

### **Existing Local and Regional Distribution**

Using StreetLight LBS data (December 2017 to November 2018), the general home location of commuters to Pentagon City and the general work locations of residents in Pentagon City were mapped. The results of the Home and Work Analysis are shown in Figure 39 and Figure 40. As can be seen, the results of the Home and Work Analysis show that the majority of trips to the Pentagon City area originate along the I-395 corridor to the southeast of Pentagon City, and that the majority of work locations for residents that live in the Pentagon City area are either in Washington, DC or the Crystal City area. The proposed development is primarily office space, so the home location of commuters that work in the Pentagon City area was deemed more relevant in determining existing travel patterns for future office employees.

The results of the Home and Work Analysis were then used to define the roadways used for trips to and from Pentagon City. Using StreetLight LBS data for an average weekday (Tuesday – Thursday), during the morning (7:00AM-9:00AM) and afternoon (4:00PM-6:00PM) peak hours, from January 2018 to November

2018, specific paths and distributions were identified for trips going to/from the Pentagon City area. Figure 41 shows the inbound distribution results for the morning and afternoon peak hours, and Figure 42 shows the outbound distribution results for the morning and afternoon peak hours.

### **Existing Trip Assignment**

Trip assignment for proposed development was primarily determined using StreetLight InSight data. Trip assignments were based on applying middle filters between the same origin and destination pairs that were used to determine the local and regional distribution of trips, as explained above. By using middle filters, it was possible to establish the approximate number of vehicles that entered or exited the study area, what route they took, how much time each route took, and where they exited the study area or ended their trip.

### **Adjustments to Trip Distribution and Assignments**

Trip distributions and assignments for the proposed development were adjusted for the following reasons:

1. Due to the location of I-395 and Route 1 on- and off-ramps, the distribution results based on StreetLight data needed to be adjusted to account for the location of the proposed development in relation to the location of the existing office buildings that the OD analysis is based on.
2. Due to the proximity of the Pentagon Transit Center, trip distribution and assignments were adjusted to account for data skew that is most likely a result of many devices being captured going to and from the Pentagon Transit Center on S Eads Street, north of I-395.
3. Improvements to the Boundary Channel Interchange will increase the number of vehicles that choose to travel to/from the proposed development via Long Bridge Drive.
4. Based on the I-395 Express Lanes Extension IMR, the extension of the express/HOT lanes to S Eads Street will increase the number of vehicles that use the HOV-only lanes. Reversible lanes will also alter existing travel patterns in the area.

Based on the methodology outlined above, Figure 43 shows the inbound distribution results for the morning and afternoon peak hours, and Figure 44 shows the outbound distribution results for the morning and afternoon peak hours.



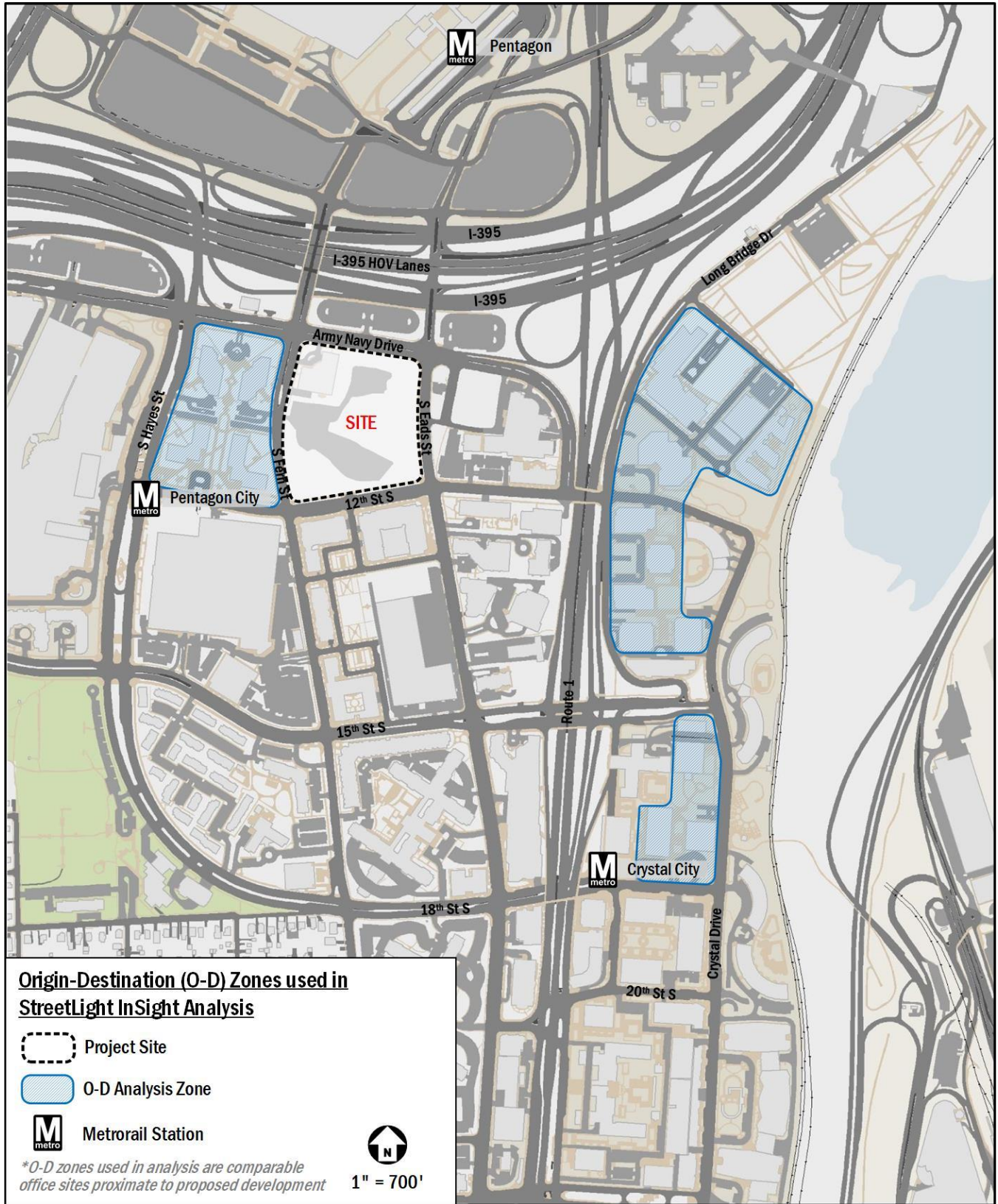


Figure 38: Origin-Destination Zones Used in StreetLight InSight Analysis

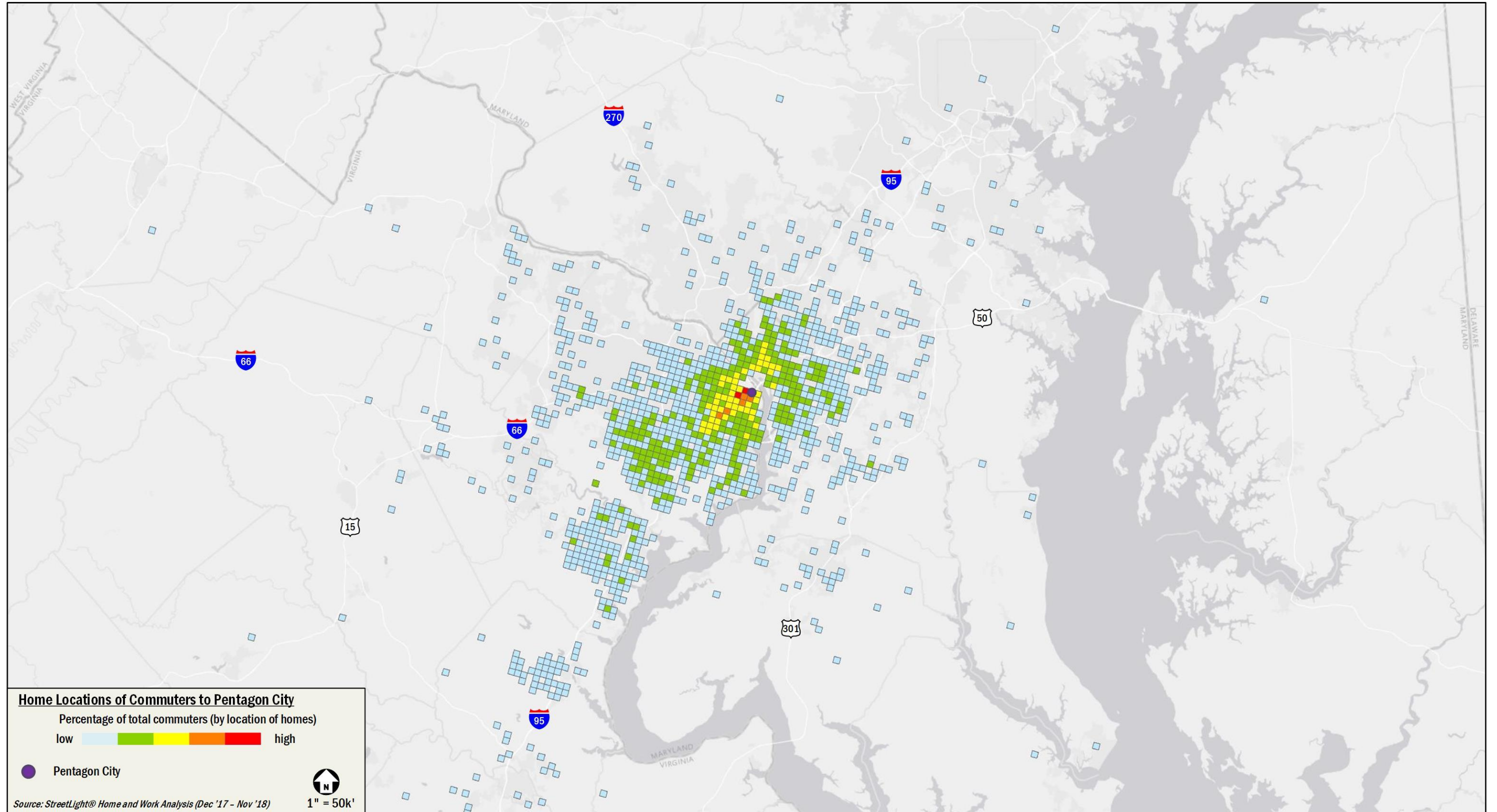


Figure 39: Home Locations of Commuters to Pentagon City

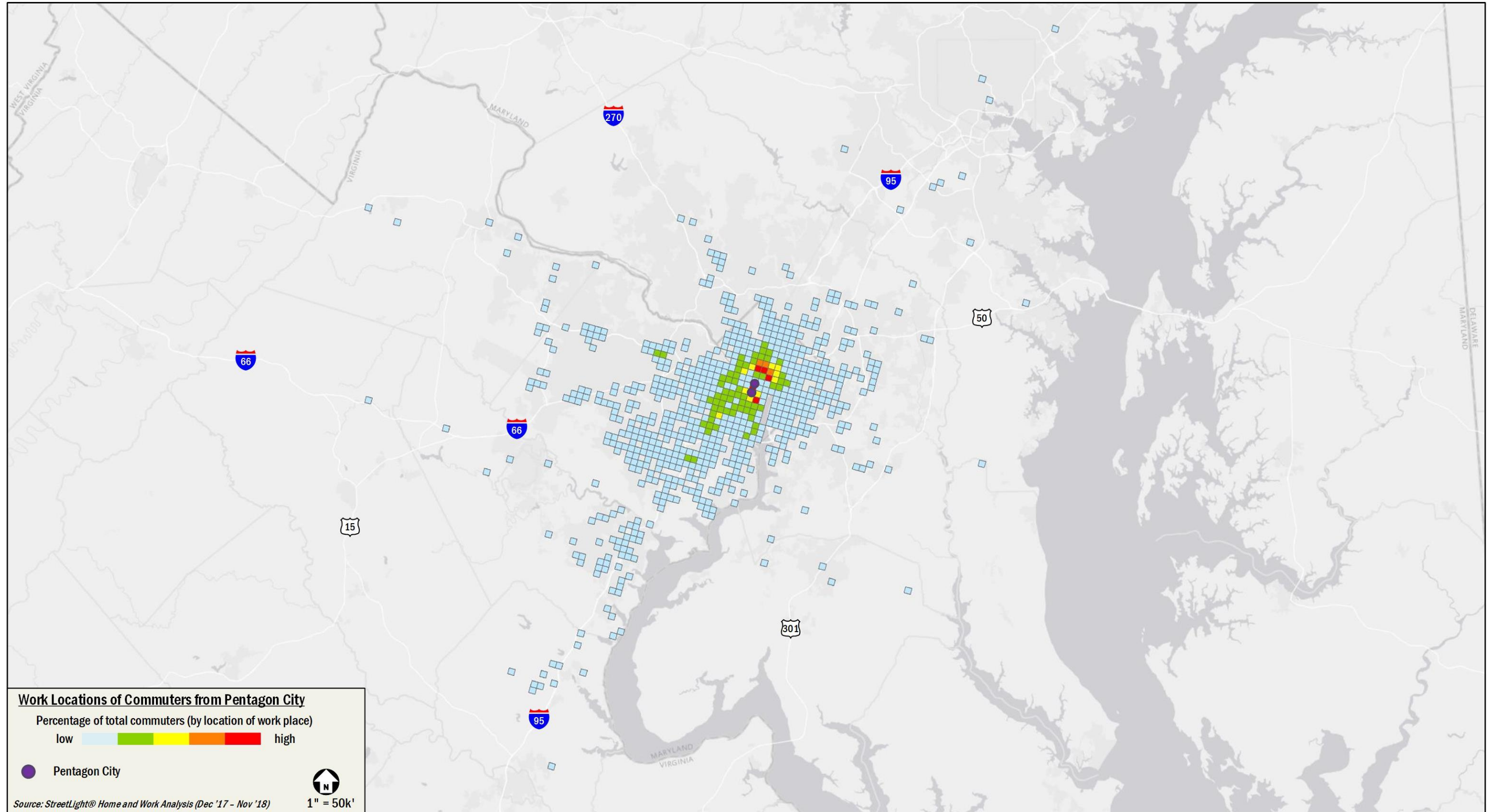


Figure 40: Work Locations of Commuters from Pentagon City

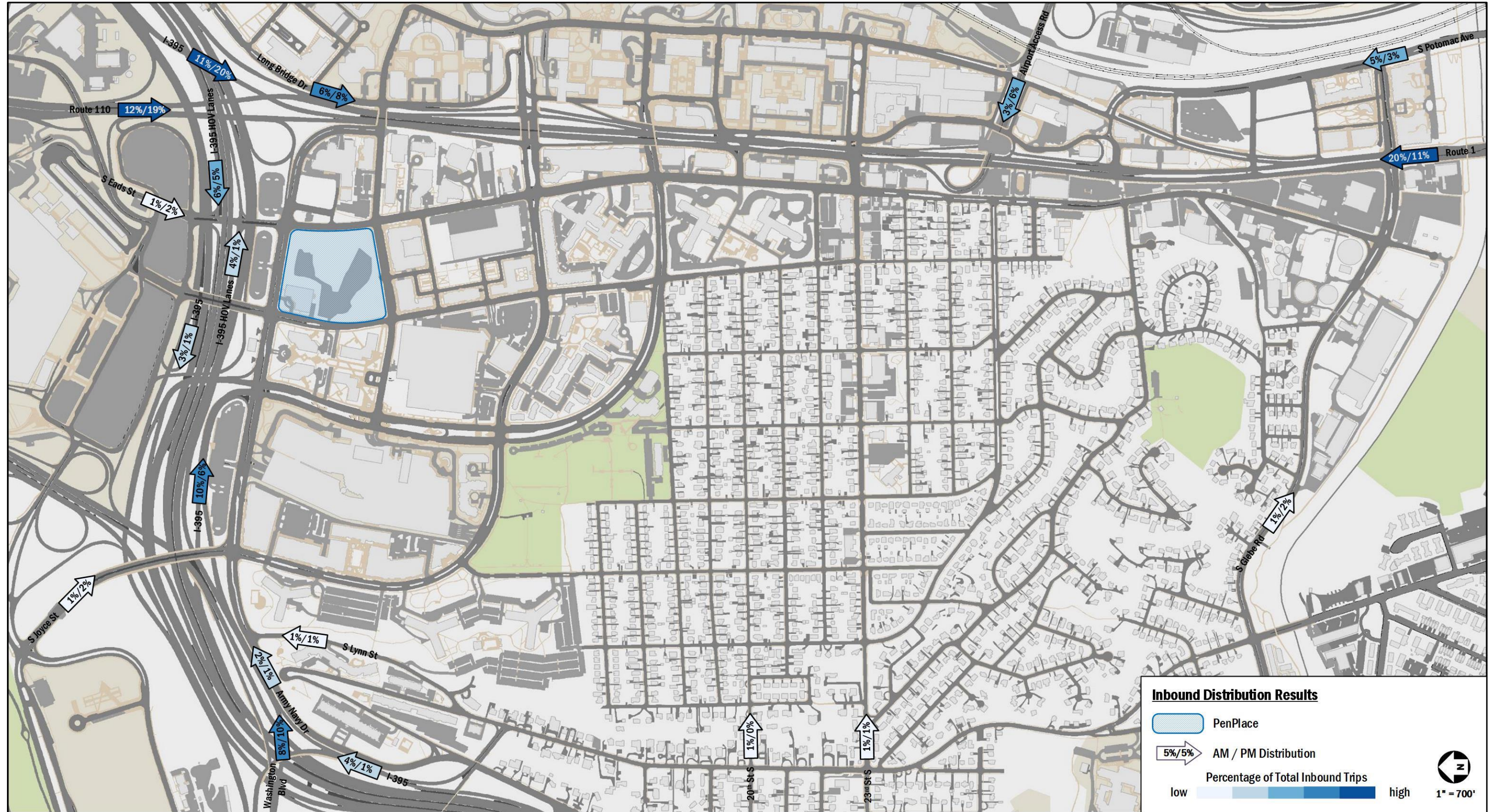


Figure 41: Inbound Distribution StreetLight InSight Results

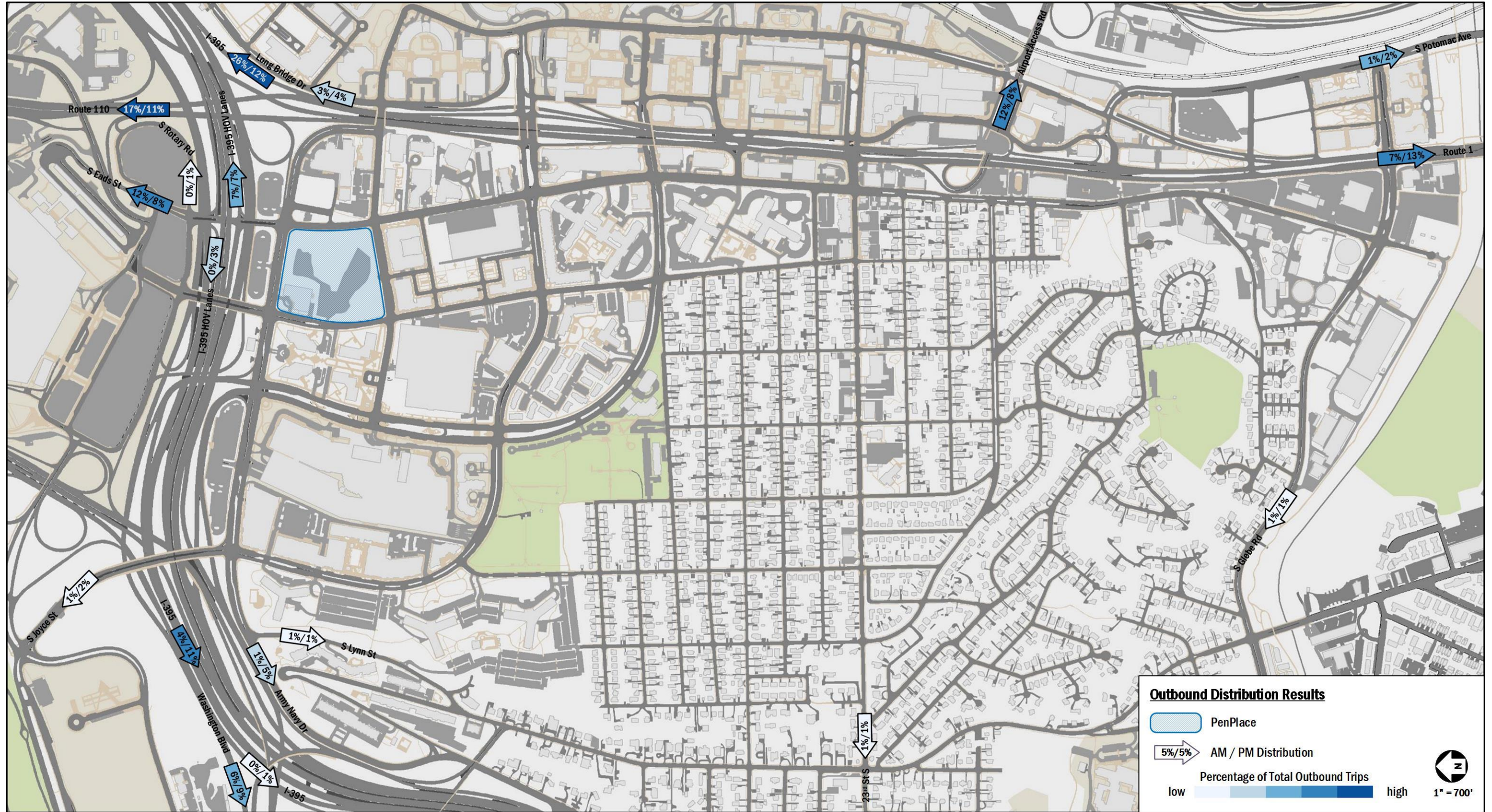


Figure 42: Outbound Distribution Streetlight InSight Results

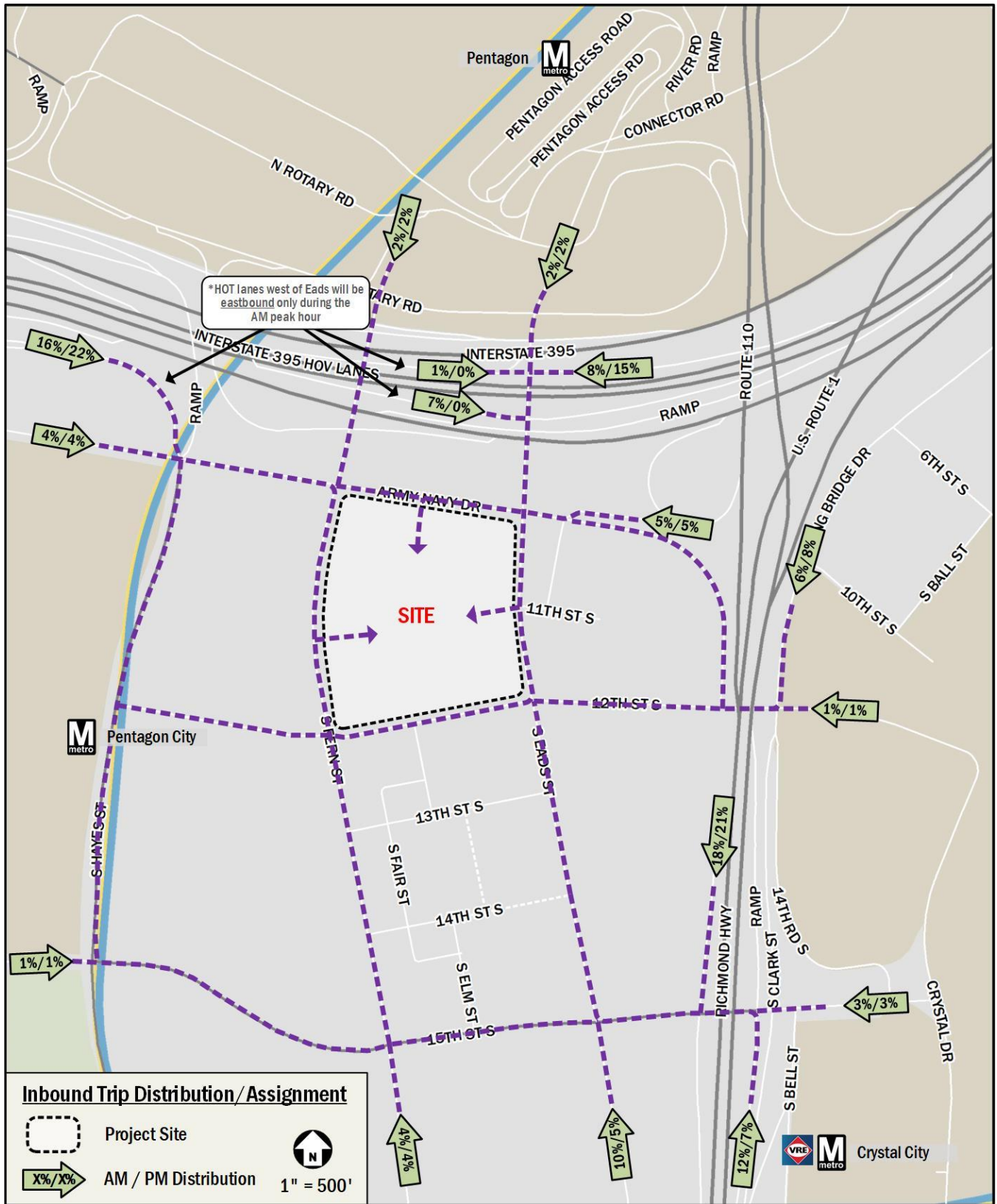


Figure 43: Inbound Trip Distribution

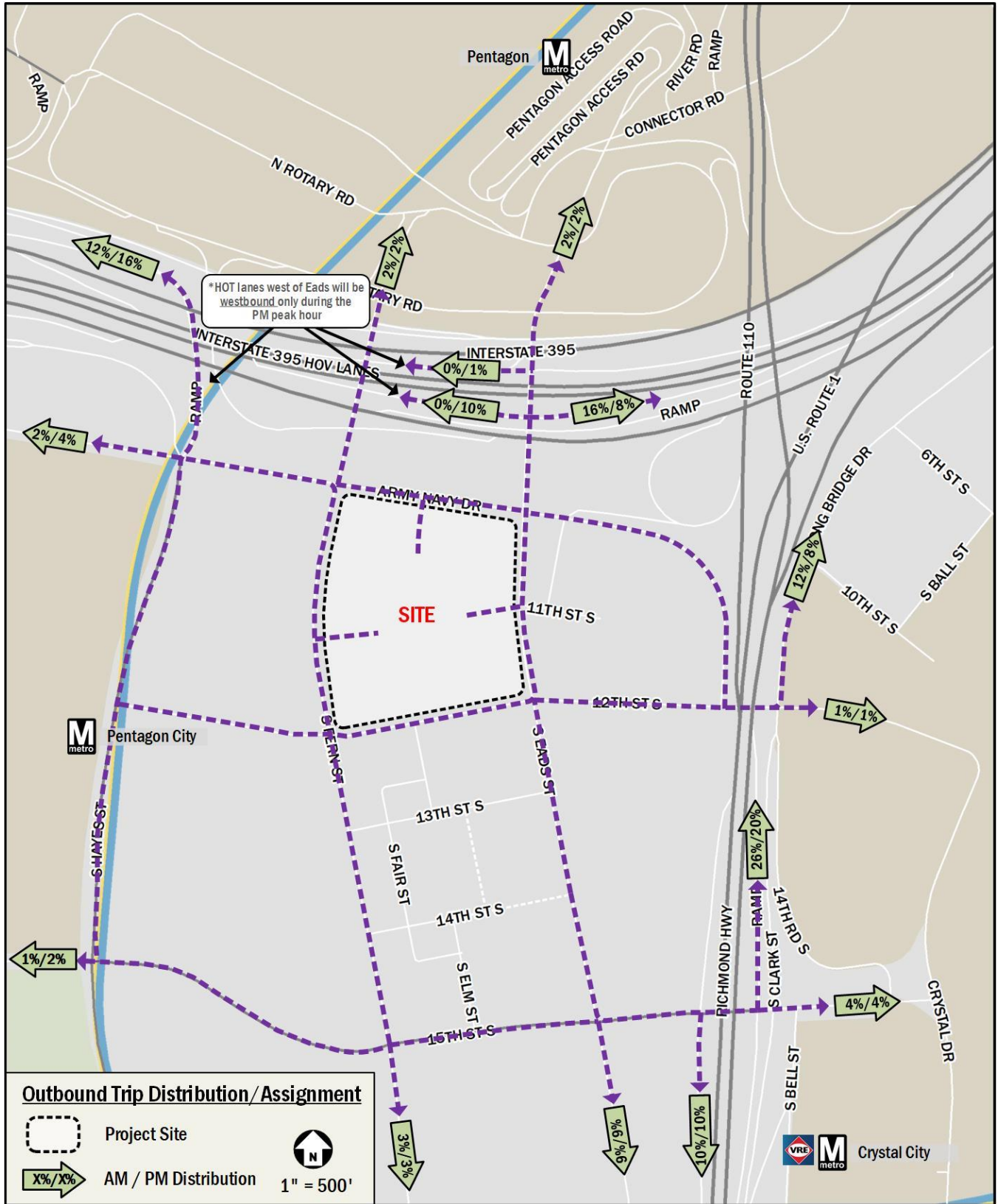


Figure 44: Outbound Trip Distribution

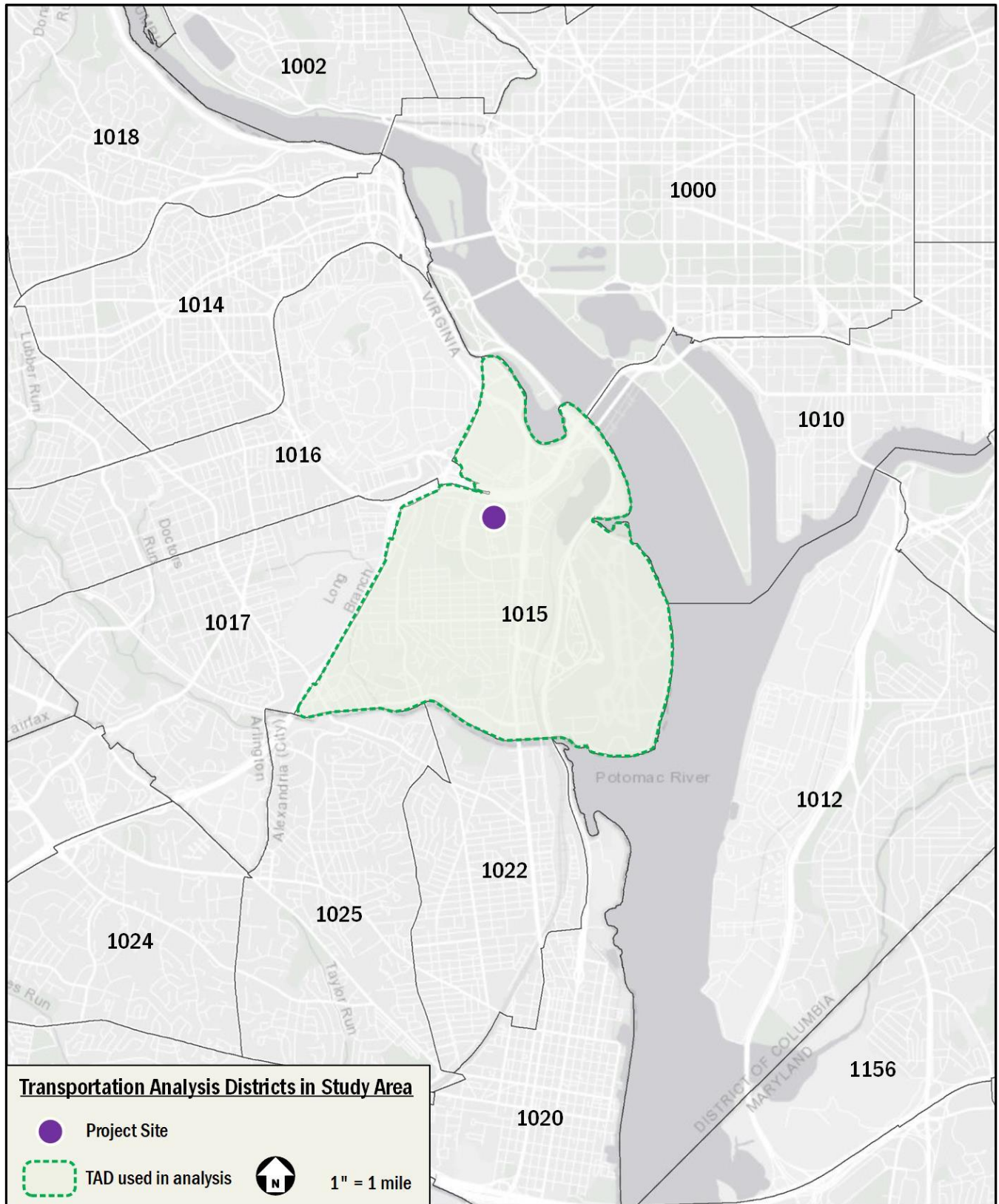


Figure 45: Transportation Analysis District (TAD) in Study Area



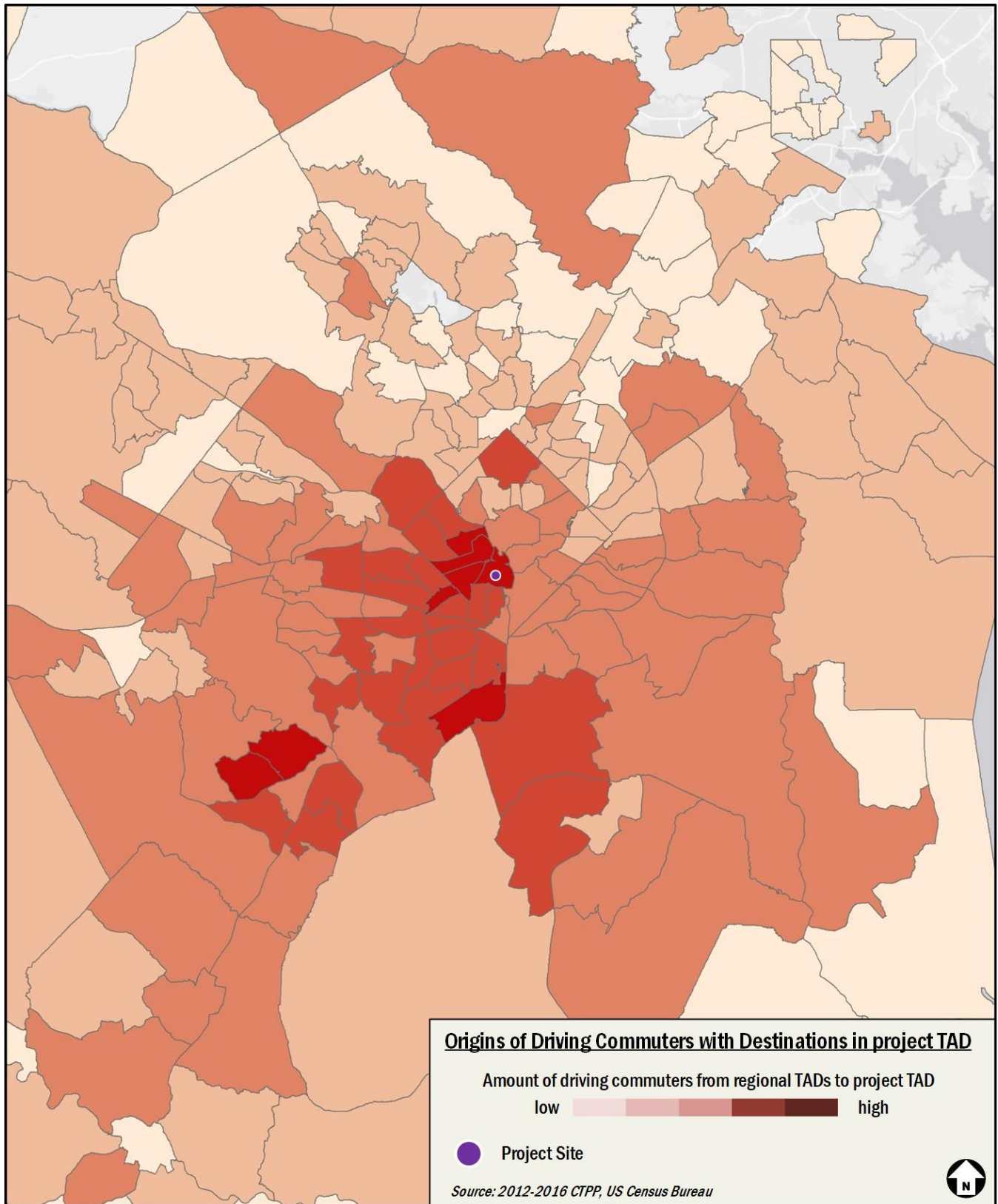


Figure 46: Origins of Driving Commuters with Destinations in project TAD

## Traffic Operations

This chapter provides a summary of an analysis of the existing and future roadway capacity in the study area for the 2025 and 2031 horizon years with and without the PenPlace development. Included is a VISSIM analysis of potential vehicular impacts of the proposed development and a discussion of potential improvements.

Compared to typical macroscopic analysis tools, such as Synchro, VISSIM is a microsimulation modelling tool that measures the performance of individual vehicles as they travel through the network while accounting for the influence of other vehicles, transit, pedestrians, and cyclists. Given the multimodal nature of Pentagon City and planned improvements, particularly streets directly adjacent to the site where a cycle track, protected bicycle lanes, and dedicated transit lanes will be in place, VISSIM was determined to be the appropriate analysis tool for this development as agreed upon during the scoping process.

The purpose of the capacity analysis is to:

- Determine the existing capacity of the study area roadways;
- Determine the overall impact of the proposed development on the study area roadways; and
- Discuss potential improvements and mitigation measures to accommodate the additional vehicular trips.

The capacity analysis focuses on the morning and afternoon commuter peak hours, as determined by the existing traffic volumes in the study area.

The following conclusions are reached with this chapter:

- The recommended mitigations will create additional capacity at critical locations to allow more vehicles to be processed through the analyzed network. In 2025, with the recommended mitigations, the total number of vehicles processed increases by +6.85% in the morning peak period and +6.76% in the afternoon peak period. In 2031, with the recommended mitigations, the total number of vehicles processed increases by +4.96% in the morning peak period and +3.51% in the afternoon peak period.
- The GEH statistic is a formula used in traffic modeling to compare two sets of traffic volumes and indicate whether the model processes enough vehicles in the network to be considered valid. Under the 2025 Mitigated Future scenario, all movements operate at acceptable GEH values (GEH value < 5). Under the 2031 Mitigated Future scenario, most movements operate at acceptable GEH values (GEH value

< 5); however, the three (3) intersections along 15<sup>th</sup> Street S, at S Eads Street, S Elm Street, and S Fern Street, have one or more movements that operate above the acceptable GEH value (GEH > 5) in the afternoon peak hour. This is primarily due to vehicles being metered by the new at-grade Richmond Highway and 15<sup>th</sup> Street S intersection which experiences congestion.

- Travel times for vehicles were modeled along Army Navy Drive and for transit vehicles along 12th Street S. The mitigation measures identified decreased travel times during some study periods or locations and travel times increased in others. Simulation results indicated that increase in travel time between 2025/2031 Background and 2025/2031 Mitigated Future scenarios remains below 60 seconds for both peak hours.
- The bicycle and pedestrian delay results under the 2025 Mitigated Future scenario, with added site traffic and recommended mitigation measures, are comparable to that under the 2025 Background scenario.
- In completing the VISSIM analysis, several overall trends regarding existing and expected future travel patterns in the study area during the morning and afternoon peak hours were identified. Most vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. Army Navy Drive and S Eads Street are heavily traveled corridors, and it is likely that drivers will alter their patterns and mode choices as future conditions change. However, this report does recommend that a number of intersections within the study area be improved with either signal timing adjustments, modifications to signal phasing, restriping, or new traffic signals.
- Potential mitigation measures were explored at study intersections and included the following recommendations for both 2025 and 2031 Mitigated Future Conditions (detailed in Table 1 and Figure 1):
  - Adjustments to signal timings at nine (9) intersections
  - Modifications to signal phasing and adjustments to signal timings at seven (7) intersections
  - Signal modifications at seven (7) intersections
  - Re-striping at eight (8) intersections
  - Relocating one (1) existing bus stop along S Eads Street
  - Adding new signals at three (3) intersections, including Army Navy Drive/Parking Lot/Site Driveway, S Eads

- Street/11th Street S/Site Driveway, and S Fern Street/Site Driveway
- Providing a protected southbound bike lane along S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, a northbound protected bike lane along S Fern Street between Army Navy Drive and 12<sup>th</sup> Street S, and a southbound bike lane along S Fern Street between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway
- With the recommended mitigations in place, the VISSIM analysis shows that traffic operations with the proposed development are consistent with the 2025 and 2031 Background scenario at many intersections. Nevertheless, as can be expected of urban infill there are still certain locations that are projected to experience delay and queuing issues where traffic is concentrated, especially along Army Navy Drive and S Eads Street which funnel traffic to/from I-395.

### **Study Area, Scope, & Methodology**

This section outlines the assumptions used to develop the existing and future roadway capacity analysis, including volumes, roadway geometries, and traffic operations. The scope of the analysis contained within this report was extensively discussed with and approved by Arlington County and VDOT staff. The general methodology follows national, Arlington County, and VDOT guidelines on the preparation of transportation impact evaluations of site development.

### **Capacity Analysis Scenarios**

The vehicular capacity analyses are performed to determine if the proposed development will lead to adverse impacts on traffic operations. This will be accomplished by comparing future scenarios: (1) without the proposed development (referred to as the Background conditions) and (2) with the development approved and constructed (including any mitigation measures, referred to as the Future conditions).

Specifically, this chapter examined the following analysis scenario:

1. 2020 Existing Conditions
2. 2025 Future Conditions without the development (2025 Background)

3. 2025 Mitigated Future Conditions with the development (2025 Mitigated Future)
4. 2031 Future Conditions without the development (2031 Background)
5. 2031 Mitigated Future Conditions with the development (2031 Mitigated Future)

### **Study Area**

The study area of the analysis is a set of intersections where detailed capacity analyses are performed for the scenarios listed above. The set of intersections included are those intersections most likely to have potential impacts or require changes to traffic operations to accommodate the proposed development.

Based on the projected future trip generation and the location of the site access points, as agreed to in this report's scoping agreement, the following intersections were chosen for analysis:

1. Army Navy Drive and S Hayes Street/I-395 Ramp
2. Army Navy Drive and S Fern Street
3. Army Navy Drive and Parking Lot
4. Army Navy Drive and S Eads Street
5. Army Navy Drive and VA 110 Off-Ramp
6. 11<sup>th</sup> Street S and S Eads Street
7. 12<sup>th</sup> Street S and S Hayes Street
8. 12<sup>th</sup> Street S and S Fern Street
9. 12<sup>th</sup> Street S and S Elm Street
10. 12<sup>th</sup> Street S and S Eads Street
11. 12<sup>th</sup> Street S and Army Navy Drive
12. 12<sup>th</sup> Street S and Long Bridge Drive/S Clark Street
13. 13<sup>th</sup> Street S and S Fern Street
14. 13<sup>th</sup> Street S and S Eads Street
15. 14<sup>th</sup> Street S and S Fern Street
16. 15<sup>th</sup> Street S and S Fern Street
17. 15<sup>th</sup> Street and S Elm Street
18. 15<sup>th</sup> Street S and S Eads Street
19. S Eads Street and I-395 HOT Lanes (South Node)
20. S Eads Street and I-395 HOT Lanes (North Node)
21. 14<sup>th</sup> Street S and S Eads Street (Planned)
22. S Fern Street and Site Driveway (Planned)

Figure 9 shows the vehicular study area intersections. Roadway characteristics, including classification, number of lanes, speed limit, the presence of on-street parking, and average daily traffic volumes (ADT) are outlined in Table 13.

**Table 13: Existing Roadway Network**

| Roadway                   | Classification*  | Lanes | Speed  | On-Street Parking | ADT**  |
|---------------------------|--|-------|--------|-------------------|--------|
| S Hayes Street            | Minor Arterial (VDOT)<br>Arterial Type B (Arlington)   | 6     | 30 mph | Yes               | 11,000 |
| S Eads Street             | Major Collector (VDOT)<br>Arterial Type B (Arlington)  | 2-3   | 30 mph | Yes               | 7,300  |
| S Fern Street             | Major Collector (VDOT)<br>Arterial Type B (Arlington)  | 2-4   | 25 mph | Yes               | 5,800  |
| 12 <sup>th</sup> Street S | Major Collector (VDOT)<br>East of Eads – Arterial Type B (Arlington)<br>West of Eads – Non-Arterial; Urban Center      | 2     | 25 mph | Yes               | 6,100  |
| 15 <sup>th</sup> Street S | Minor Arterial (VDOT)<br>West of Fern, East of Eads – Arterial Type A<br>East of Hayes, West of Eads – Arterial Type B | 2-3   | 30 mph | Yes               | 12,000 |
| Army Navy Drive           | Major Collector (VDOT)<br>Arterial Type B (Arlington)  | 4-5   | 35 mph | Yes               | 7,800  |

\*From VDOT and Arlington GIS

\*\* VDOT ADT Data from 2019

## Traffic Volume Assumptions

The following section reviews the traffic volume assumptions and methodologies used in the roadway capacity analyses.

### Existing Traffic Volumes

The existing traffic volumes are comprised of turning movement count data, provided by Arlington County, which was collected in 2019 and early 2020. Existing volumes were balanced where appropriate. The existing turning movement counts, without volume balancing, are included in the Technical Appendix.

The existing peak hour traffic volumes for intersections within the vehicular study area are shown in Figure 47.

### 2025 Traffic Volumes

#### 2025 Background Traffic Volumes (without the proposed development)

Traffic projections for the 2025 Background Conditions consist of the existing volumes with the addition of growth along local roadways in the study area in 2025. This local growth is accounted for by traffic generated by developments expected to be completed prior to the 2025 horizon year (known as background developments).

#### Background Developments (2025)

Following industry methodologies, a background development must meet the following criteria to be incorporated into the analysis:

- Be located in the study area, defined as having an origin or destination point within the cluster of study area intersections;
- Have entitlements; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, 10 developments were included in the 2025 Background Conditions scenario. These developments are:

1. Crystal Drive Central District Retail
2. 1770 Crystal Drive Office
3. Century Center
4. 1900 S Eads (Crystal House)
5. The Altaire (400 Army Navy Drive)
6. 241 18th Street S Office
7. 1800 S Bell Street
8. Verizon Site
9. Metropolitan Park 6, 7, and 8

#### 10. 1900 Crystal Drive

As part of the scoping process with Arlington County staff, Pentagon Centre (Phase I) was also identified as a background development for the 2025 Background Conditions scenario. However, at the direction of staff, no further development of the Pentagon Centre project should be accounted for in 2025 than what is already included in existing conditions.

The location of the background developments included in the 2025 Background Conditions scenario in relation to the proposed PenPlace development is shown on Figure 48. Transportation studies were available for the majority of the background developments included in the 2025 Background Condition. Details on each of the background developments included in the 2025 Background Conditions are presented below:

1. **Crystal Drive Central District Retail:** Located in the Crystal City area and bounded by 15th Street S to north, 18th Street S to the south, S Bell Street to the west, and Crystal Drive to the east, the approved Crystal Drive Central District Retail development will improve upon the existing site with the addition of approximately 5,200 square feet of office space, 10,300 square feet of retail, 17,500 square feet of grocery, and a movie theatre with approximately 940 seats. The retail portion will be spread throughout the block, including a new two-story building at the corner of 18th Street and Crystal Drive, and an expansion to 1550 Crystal Drive to accommodate the proposed grocery. The expected build out year is 2020. The development is expected to generate 56 net weekday AM peak hour vehicle trips and 322 net weekday PM peak hour vehicle trips based on the Traffic Impact Study prepared by Gorove Slade Associates dated October 13, 2017.
2. **1770 Crystal Drive Office:** Located in the Crystal City area on the northwest corner of the intersection of 18th Street S and Crystal Drive, the existing 272,000 square foot office building was vacant when turning movement counts were collected. As such, vehicular trips were added to the network to account for the 1770 Crystal Drive Office site being vacant when turning movement counts were collected. To determine the number of trips generated by the vacant office space, ITE's Trip Generation, 10<sup>th</sup> Edition was used, with mode splits based on nearby developments that have recently been studied. During the AM peak hour 86 vehicle trips were added to the network and during the weekday PM peak hour 86 vehicle trips were added to the network.

3. **Century Center:** Located in the Crystal City area at the southwest corner of the intersection of Crystal Drive and 23<sup>rd</sup> Street S, the approved Century Center development will maintain the existing parking garage and retail on site and redevelop the existing office space with a new residential tower containing approximately 300 dwelling units. The expected build out year was initially projected to occur in 2019; however, construction has not yet begun. The Century Center development is expected to generate 53 weekday AM peak hour vehicle trips and 64 weekday PM peak hour vehicle trips based on the Traffic Impact Study prepared by Gorove Slade Associates dated January 10, 2017.
4. **1900 S Eads (Crystal House):** Located in the Pentagon City area and bounded by 18<sup>th</sup> Street S to the north, S Eads Street to the east, 22<sup>nd</sup> Street S to the south, and S Fern Street to the west, the approved Crystal House development will raze a portion of an existing parking lot and redeveloped it with 798 residential dwelling units. The expected build-out year is 2026; however it was included as a background development in the 2025 Background Conditions as a conservative measure. The Crystal House development is expected to generate 130 weekday AM peak hour vehicle trips and 153 weekday PM peak hour vehicle trips based on the Traffic Impact Analysis prepared by Wells & Associates dated October 19, 2018.
5. **The Altaire (400 Army Navy Drive):** Located in the Pentagon City area at the southeast corner of the Army Navy Drive and S Eads Street intersection, the approved Altaire development replaced a 235,000 square foot office building with a residential building containing approximately 452 dwelling units. Construction of the project was completed in October of 2018; however, at the time turning movement counts were collected, the Altaire was approximately 70% occupied. As such, additional vehicular trips were added to the network compensate for the Altaire being only 70% occupied. During the AM peak hour 27 vehicle trips were added to the network and during the weekday PM peak hour 32 vehicle trips were added to the network based on the Traffic Impact Study prepared by Gorove Slade Associates dated June 11, 2013.
6. **241 18<sup>th</sup> Street S Office:** Located in the Crystal City area near the northwest corner of the intersection of 18<sup>th</sup> Street S and Crystal Drive, the existing 330,700 square foot office building was 62% vacant when turning movement counts were collected. As such, vehicular trips were added to the network to account for the 241 18<sup>th</sup> Street S site being 62% vacant when turning movement counts were collected. To determine the number of trips generated by the vacant office space, ITE's Trip Generation, 10<sup>th</sup> Edition was used, with mode splits based on nearby developments that have recently been studied. During the AM peak hour 48 vehicle trips were added to the network and during the weekday PM peak hour 53 vehicle trips were added to the network.
7. **1800 S Bell Street:** Located in the Crystal City area on the southwest corner of the intersection of S Bell Street and 18<sup>th</sup> Street S, the existing 221,000 square feet office building was only 20% occupied when turning movement counts were collected. As such, vehicular trips were added to the network to account for the 1800 S Bell Street building being mostly vacant. To determine the number of trips generated by the vacant office space, ITE's Trip Generation, 10<sup>th</sup> Edition was used, with mode splits based on nearby developments that have recently been studied. During the AM peak hour 61 vehicle trips were added to the network and during the weekday PM peak hour 64 vehicle trips were added to the network.
8. **Verizon Site:** Located in the Crystal City area and bounded by S Eads Street to the west, 11<sup>th</sup> Street S to the north, existing office and residential buildings to the east, and 12<sup>th</sup> Street S to the south, the approved Verizon Site development will raze the existing telecommunications facility and redevelop to include one mixed-use building with approximately 306 dwelling units and 10,908 square feet of neighborhood-serving ground floor retail. The expected build out year is 2022. The development is expected to generate 42 net weekday AM peak hour vehicle trips and 40 net weekday PM peak hour vehicle trips based on the Traffic Impact Study prepared by Gorove Slade Associates dated July 19, 2019.
9. **Metropolitan Park 6, 7, 8:** Located in the Pentagon City area and bounded by 13<sup>th</sup> Street S to north, 15<sup>th</sup> Street S to the south, S Elm Street to the west, and S Eads Street to the east, the approved Metropolitan Park 6, 7, 8 development will raze the existing warehouse space and redevelop to include two buildings with approximately 2.1 million square feet of office space and 55,000 square feet of neighborhood-serving ground floor retail. The expected build out year is 2021. The development is expected to generate 558 net weekday AM peak hour vehicle trips and 524 net weekday PM peak hour vehicle trips based on the Traffic Impact Study prepared by Gorove Slade Associates dated October 22, 2019.
10. **1900 Crystal Drive:** Located in the Crystal City area and bounded by 18<sup>th</sup> Street S to north, 20<sup>th</sup> Street S to the south, S Bell Street to the west, and Crystal Drive to the

east, the approved 1900 Crystal Drive development will raze the existing vacant office building and redevelop to include two residential buildings with approximately 790 residential units and 40,598 square feet of neighborhood-serving ground floor retail. The expected build out year is 2023. The development is expected to generate 109 net weekday AM peak hour vehicle trips and 137 net weekday PM peak hour vehicle trips based on the Traffic Impact Study prepared by Gorove Slade Associates dated March 15, 2019.

The total traffic generated by the background developments in 2025 is shown in Table 14. Trips generated by the approved background developments in 2025 are included in the Technical

Appendix. The traffic volumes generated by background developments along the network were added to the existing traffic volumes in order to establish the 2025 Background traffic volumes. Trip distribution assumptions for the background developments were based on the distributions included in their respective studies or based on those determined for the proposed PenPlace development and altered where necessary based on anticipated travel patterns. The peak hour traffic volumes generated by background developments is provided in Figure 49. The traffic volumes for the 2025 Background conditions are shown on Figure 50.

**Table 14: Traffic Generated by 2025 Background Developments**

| Development   | Trip Generation |            |              |              |            |              |
|---|-----------------|------------|--------------|--------------|------------|--------------|
|   | AM Peak Hour    |            |              | PM Peak Hour |            |              |
|   | In              | Out        | Total        | In           | Out        | Total        |
| <u>Crystal Drive Central District Retail <sup>(1)</sup></u>                         |                 |            |              |              |            |              |
| Total New Vehicle-Trips   | 36              | 20         | 56           | 118          | 204        | 322          |
| <u>1770 Crystal Drive Office/241 S 18<sup>th</sup> Street Office <sup>(2)</sup></u> |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 117             | 17         | 134          | 22           | 117        | 139          |
| <u>Century Center <sup>(3)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle-Trips   | 10              | 43         | 53           | 42           | 22         | 64           |
| <u>1900 S Eads (Crystal House) <sup>(4)</sup></u>                                   |                 |            |              |              |            |              |
| Total New Vehicle-Trips   | 37              | 93         | 130          | 92           | 61         | 153          |
| <u>The Altaire (400 Army Navy Drive) <sup>(5)</sup></u>                             |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 5               | 22         | 27           | 21           | 11         | 32           |
| <u>1800 S Bell Street <sup>(6)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 53              | 8          | 61           | 10           | 54         | 64           |
| <u>Verizon Site <sup>(7)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 12              | 30         | 42           | 23           | 17         | 40           |
| <u>Metropolitan Park 6, 7, 8 <sup>(8)</sup></u>                                     |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 485             | 73         | 558          | 87           | 437        | 524          |
| <u>1900 Crystal Drive <sup>(9)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 31              | 78         | 109          | 75           | 62         | 137          |
| <b>Total Background Trips</b>   | <b>786</b>      | <b>384</b> | <b>1,170</b> | <b>490</b>   | <b>985</b> | <b>1,475</b> |

(1): Extracted from Central District Retail Phase I & 1770 Crystal Drive Residential TIS (10.13.2017) prepared by Gorove Slade Associates.

(2): 241 18<sup>th</sup> Street is 77% occupied and 1770 is currently empty and both will be 100% occupied by 2023. Trip Generation was performed to determine the number of trips that will be generated when the offices are fully occupied.

(3): Extracted from Century Center TIS (01.10.2017) prepared by Gorove Slade Associates.

(4): Extracted from Crystal House III TIA (05.24.2017) prepared by Wells + Associates.

(5): Extracted from 400 Army Navy Drive TIS (06.11.2013) prepared by Gorove Slade Associates. Building assumed 25% occupied at the time of data collection.

(6): The office building is currently 42% occupied and will be 100% occupied by 2023. Trip Generation was performed to determine the number of trips that will be generated when the offices are fully occupied.

(7): Extracted from Verizon Site MMTA (07.19.2019) prepared by Gorove Slade Associates.

(8): Extracted from Metropolitan Park 6, 7, 8 MMTA (10.22.2019) prepared by Gorove Slade Associates.

(9): Extracted from 1900 Crystal Drive MMTA (03.15.2019) prepared by Gorove Slade Associates.

### 2025 Mitigated Future Traffic Volumes (with the proposed development)

The 2025 Mitigated Future Conditions traffic volumes consist of the 2025 Background volumes with the addition of the traffic volumes generated by the proposed development (site-generated trips), shown in Table 12. Thus, the 2025 Mitigated Future Conditions traffic volumes include traffic generated by: the existing volumes, background developments, and the proposed development.

During the afternoon peak hour, approximately 85% of existing northbound left-turn trips at the Army Navy Drive and S Eads Street intersection were re-routed to reflect more natural travel patterns in the future, given increased demands for capacity along S Eads Street as a result of planned developments, and to increase the accuracy of the VISSIM model. Based on a review of the transportation analysis prepared for the Pentagon City Plan, re-routes were also considered at this location. No additional re-routes were assumed during the morning peak hour. These trips were re-routed to turn left at intersections further south on S Eads Street (i.e., 15<sup>th</sup> Street S and 18<sup>th</sup> Street S) toward S Hayes Street where there is available capacity. The number of trips shifted to utilize 12<sup>th</sup> Street S was minimized since the transitway will be running east-west along that corridor in the future. While not included as reported study intersections, the impacts of this shift in volumes along 18<sup>th</sup> Street and at the intersection of 15<sup>th</sup> Street S and S Hayes Street are captured in the VISSIM model. Of note, the westbound right-turn at the 15<sup>th</sup> Street S and S Hayes Street intersection increases by approximately 35% and the northbound thru at the 15<sup>th</sup> Street S and S Hayes Street intersection increases by approximately 21%. A diagram of the re-routed peak hour volumes is included in the Technical Appendix.

Trip distribution and assignments for site-generated traffic was primarily determined using StreetLight InSight® data and observations, as detailed in the Travel Demand Assumptions chapter of this report. The origin of outbound and destination of inbound vehicular trips were the access points to the below-grade parking garage on Army Navy Drive, S Eads Street, and S Fern Street. A summary of trip distribution assumptions is shown on Figure 43 for the inbound distribution assumptions and on Figure 44 for the outbound distribution assumptions. Trip distribution and assignment assumptions were vetted and approved by Arlington County and VDOT.

Based on the trip distribution and assignment assumptions, site-generated trips were distributed through the study area intersections. The site-generated traffic volumes for the 2025 horizon year are shown on Figure 51. The 2025 Mitigated Future Conditions traffic volumes, which are comprised of existing volumes, background developments, and the proposed development are shown on Figure 52.

## 2031 Traffic Volumes

### Route 1 Multimodal Improvements Study

The methodology for establishing the 2031 traffic volumes used in the capacity analysis are similar to those used for the 2025 horizon year; however, the recommendations of the Route 1 Multimodal Improvements Study would alter existing and future traffic patterns. The study proposes to bring Route 1 down to grade at the existing grade-separated intersections of 15<sup>th</sup> Street S and 18<sup>th</sup> Street S to create an urban boulevard through Pentagon City and Crystal City.

The Richmond Highway and 15<sup>th</sup> Street S intersection is not included as a study intersection, as agreed upon during the scoping process; however, it is expected that site-generated trips will utilize this intersection to access Richmond Highway.

Assumptions for re-routing volumes were generally consistent with that assumed in the Route 1 Multimodal Improvements Study (Phase 1), published by VDOT in October 2021. As such, a portion of left- and right-turning volumes at 15<sup>th</sup> Street S and 20<sup>th</sup> Street S were re-routed to use the new at-grade 18<sup>th</sup> Street S intersection and S Eads Street, with the exception of left-turns at 18<sup>th</sup> Street S where no left-turns are permitted as part of the recommended at-grade concept identified by VDOT. To be conservative and consistent with the assumptions from the Route 1 Multimodal Improvements Study, vehicular traffic forecasts for background developments and site trips remain consistent with that assumed in 2025 scenarios.

Diagrams showing how existing trips were re-routed at intersections most likely to be affected by the recommendations of the Route 1 Multimodal Improvements Study project are included in the Technical Appendix.

Converting Richmond Highway to an at-grade urban boulevard will balance the needs of multimodal connectivity and vehicular capacity. Richmond Highway is a heavily trafficked corridor under existing conditions. Based on the findings of Phase 1 of the Route 1 Multimodal Improvements Study, increased congestion is expected with the project. Phase 2 of the Route 1



Multimodal Improvements Study is anticipated to include the development of a comprehensive TDM strategy. This TDM strategy will aim to reduce future traffic volumes below existing levels, mitigate future congestion, and discuss potential traffic diversion.

### **2031 Background Traffic Volumes (without the proposed development)**

Traffic projections for the 2031 Background Conditions consist of the existing volumes with the addition of growth along local roadways in the study area in 2031. This local growth is accounted for by traffic generated by developments expected to be completed prior to the 2031 horizon year (known as background developments).

#### Background Developments (2031)

Following industry methodologies, a background development must meet the following criteria to be incorporated into the analysis:

- Be located in the study area, defined as having an origin or destination point within the cluster of study area intersections;
- Have entitlements; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, 10 developments were included in the 2031 Background Conditions scenario. These developments are:

1. Crystal Drive Central District Retail
2. 1770 Crystal Drive Office
3. Century Center
4. 1900 S Eads (Crystal House)
5. The Altaire (400 Army Navy Drive)
6. 241 18<sup>th</sup> Street S Office
7. 1800 S Bell Street
8. Verizon Site
9. Metropolitan Park 6, 7, and 8
10. 1900 Crystal Drive

The location of the background developments included in the 2031 Background Conditions scenario in relation to the proposed PenPlace development is shown on Figure 48. All of the background developments included in the 2031 Background Conditions were included in the 2025 Background Conditions and are detailed in that section. The total traffic generated by the background developments in 2031 is shown in Table 15.

Trips generated by the approved background developments are included in the Technical Appendix. The traffic volumes generated by background developments and by regional growth along the network were added to the existing traffic volumes in order to establish the 2031 Background traffic volumes. The peak hour traffic volumes generated by background developments is provided in Figure 53. The traffic volumes for the 2031 Background conditions are shown on Figure 54.

**Table 15: Traffic Generated by 2031 Background Developments**

| Development   | Trip Generation |            |              |              |            |              |
|---|-----------------|------------|--------------|--------------|------------|--------------|
|   | AM Peak Hour    |            |              | PM Peak Hour |            |              |
|   | <i>In</i>       | <i>Out</i> | <i>Total</i> | <i>In</i>    | <i>Out</i> | <i>Total</i> |
| <u>Crystal Drive Central District Retail <sup>(1)</sup></u>                         |                 |            |              |              |            |              |
| Total New Vehicle-Trips   | 36              | 20         | 56           | 118          | 204        | 322          |
| <u>1770 Crystal Drive Office/241 S 18<sup>th</sup> Street Office <sup>(2)</sup></u> |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 117             | 17         | 134          | 22           | 117        | 139          |
| <u>Century Center <sup>(3)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle-Trips   | 10              | 43         | 53           | 42           | 22         | 64           |
| <u>1900 S Eads (Crystal House) <sup>(4)</sup></u>                                   |                 |            |              |              |            |              |
| Total New Vehicle-Trips   | 37              | 93         | 130          | 92           | 61         | 153          |
| <u>The Altaire (400 Army Navy Drive) <sup>(5)</sup></u>                             |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 5               | 22         | 27           | 21           | 11         | 32           |
| <u>1800 S Bell Street <sup>(6)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 53              | 8          | 61           | 10           | 54         | 64           |
| <u>Verizon Site <sup>(7)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 12              | 30         | 42           | 23           | 17         | 40           |
| <u>Metropolitan Park 6, 7, 8 <sup>(8)</sup></u>                                     |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 485             | 73         | 558          | 87           | 437        | 524          |
| <u>1900 Crystal Drive <sup>(9)</sup></u>  |                 |            |              |              |            |              |
| Total New Vehicle Trips   | 31              | 78         | 109          | 75           | 62         | 137          |
| <b>Total Background Trips</b>   | <b>786</b>      | <b>384</b> | <b>1,170</b> | <b>490</b>   | <b>985</b> | <b>1,475</b> |

(1): Extracted from Central District Retail Phase I & 1770 Crystal Drive Residential TIS (10.13.2017) prepared by Gorove Slade Associates.

(2): 241 18<sup>th</sup> Street is 77% occupied and 1770 is currently empty and both will be 100% occupied by 2023. Trip Generation was performed to determine the number of trips that will be generated when the offices are fully occupied.

(3): Extracted from Century Center TIS (01.10.2017) prepared by Gorove Slade Associates.

(4): Extracted from Crystal House III TIA (05.24.2017) prepared by Wells + Associates.

(5): Extracted from 400 Army Navy Drive TIS (06.11.2013) prepared by Gorove Slade Associates. Building assumed 25% occupied at the time of data collection.

(6): The office building is currently 42% occupied and will be 100% occupied by 2023. Trip Generation was performed to determine the number of trips that will be generated when the offices are fully occupied.

(7): Extracted from Verizon Site MMTA (07.19.2019) prepared by Gorove Slade Associates.

(8): Extracted from Metropolitan Park 6, 7, 8 MMTA (10.22.2019) prepared by Gorove Slade Associates.

(9): Extracted from 1900 Crystal Drive MMTA (03.15.2019) prepared by Gorove Slade Associates.

### 2031 Mitigated Future Traffic Volumes (with the proposed development)

The 2031 Mitigated Future Conditions traffic volumes consist of the 2031 Background volumes with the addition of the traffic volumes generated by the proposed development (site-generated trips), shown in Table 12. Thus, the 2031 Mitigated Future Conditions traffic volumes include traffic generated by: the existing volumes, background developments, and the proposed development. During the afternoon peak hour, approximately 85% of existing northbound left-turn trips at the Army Navy Drive and S Eads Street intersection was re-routed to reflect more natural travel patterns in the future, given increased demands for capacity along S Eads Street as a result of planned developments, and increase the accuracy of the VISSIM model. No additional re-routes were assumed during the morning peak hour. The re-routed trips were re-routed to the turn left at intersections further south on S Eads Street (i.e., 15<sup>th</sup> Street S and 18<sup>th</sup> Street S) to S Hayes Street where there is available capacity. The number of trips shifted to utilize 12<sup>th</sup> Street S was minimized since the transitway will be running east-west along that corridor in the future. While not included as study intersections where results are reported, the impacts of this shift in volumes are captured in the VISSIM model. Of note, the westbound right-turn at the 15<sup>th</sup> Street S and S Hayes Street intersection increases by approximately 35% and the northbound thru at the 15<sup>th</sup> Street S and S Hayes Street intersection increases by approximately 21%. With this re-route, the difference in delay for the westbound right-turn at the S Hayes Street and 15<sup>th</sup> Street S intersection is marginal (an increase from 25.8 sec/veh to 32.2 sec/veh) and conditions are considered acceptable with additional capacity available for the movement. The maximum queue length is comparable to Background conditions. A diagram of the re-routed peak hour volumes is included in the Technical Appendix.

Trip distribution and assignments for site-generated traffic was primarily determined using StreetLight InSight® data and observations, as detailed in the Travel Demand Assumptions chapter of this report. The origin of outbound and destination of inbound vehicular trips were the access points to the below-grade parking garage on Army Navy Drive, S Eads Street, and S Fern Street. A summary of trip distribution assumptions is shown on Figure 43 for the inbound distribution assumptions and on Figure 44 for the outbound distribution assumptions. Trip distribution and assignment assumptions were vetted and approved by Arlington County and VDOT.

Based on the trip distribution and assignment assumptions, site-generated trips were distributed through the study area intersections. The site-generated traffic volumes for the 2031 horizon year are shown on Figure 55. The 2031 Mitigated Future Conditions traffic volumes, which are comprised of existing volumes, background developments, and the proposed development are shown on Figure 56.

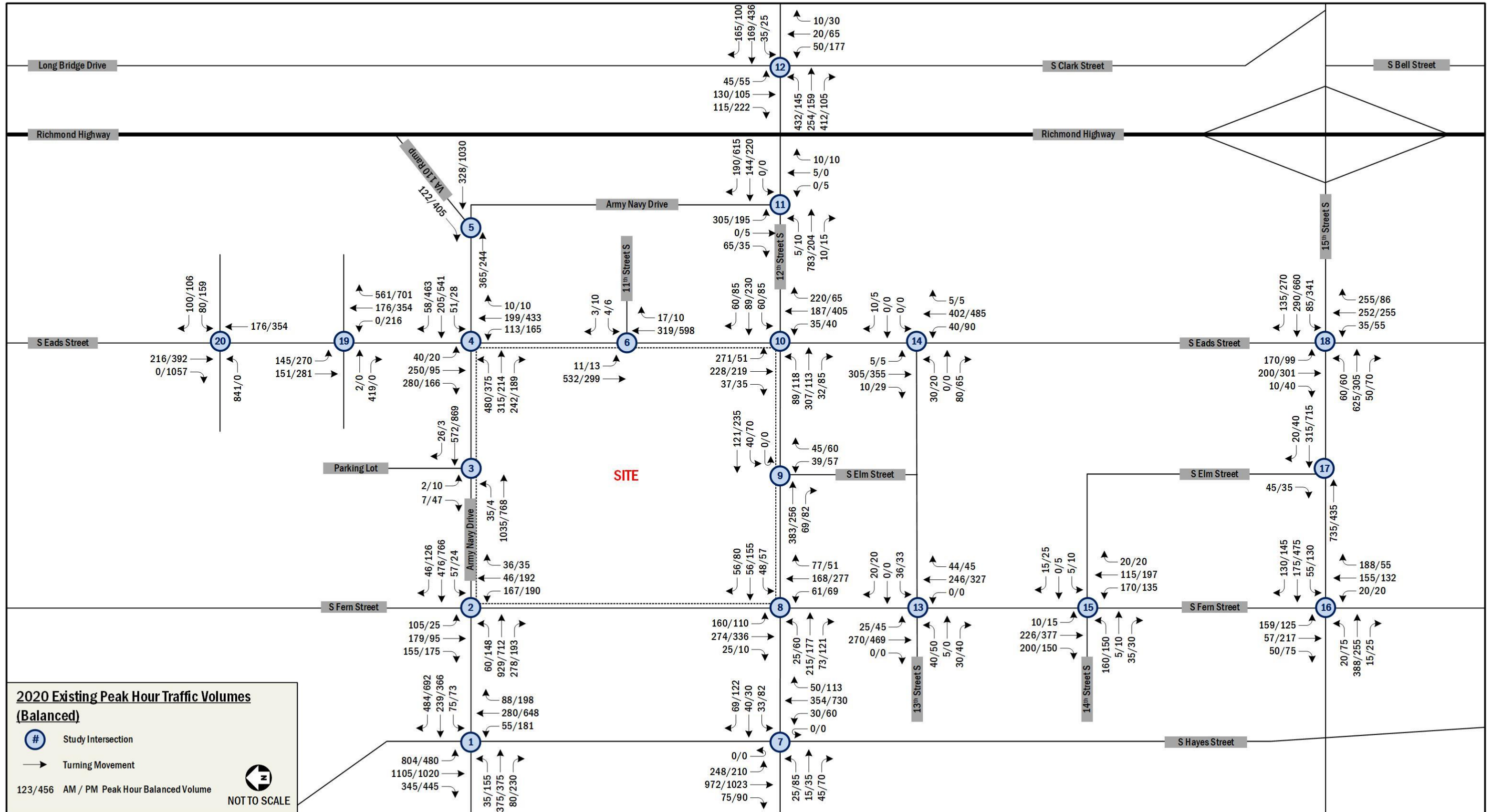


Figure 47: 2020 Existing Peak Hour Traffic Volumes (Balanced)

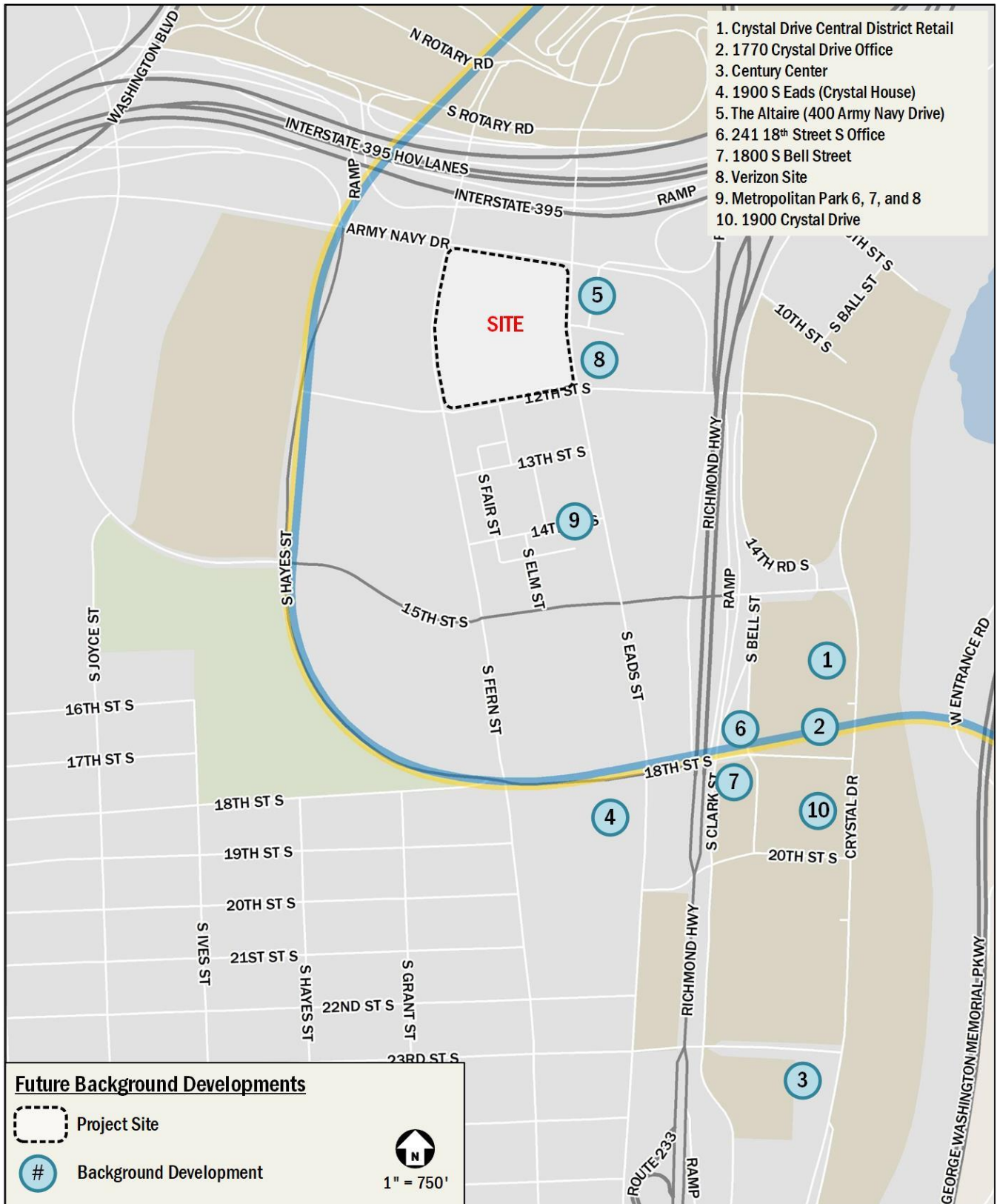


Figure 48: Future Background Developments

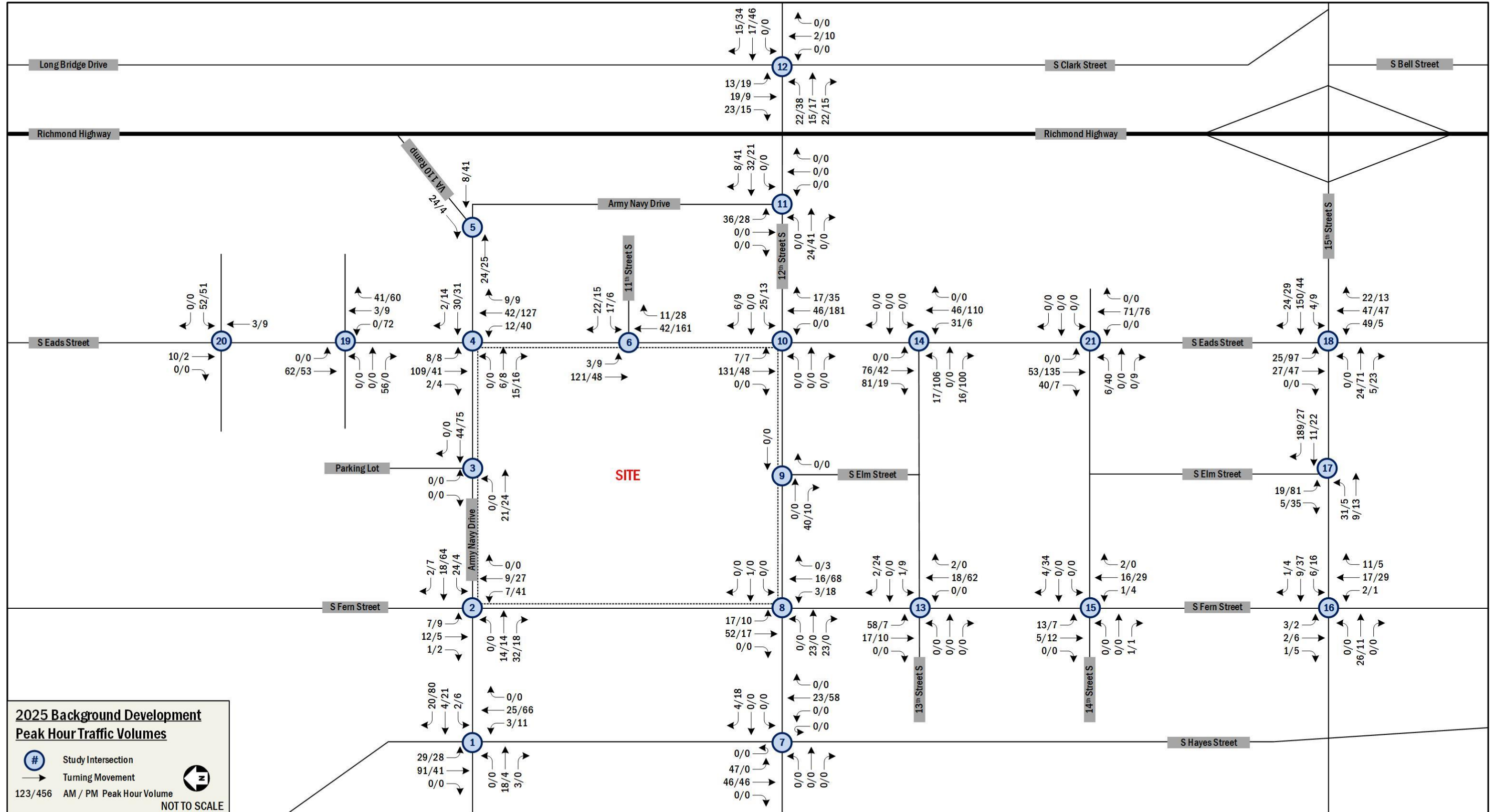


Figure 49: 2025 Background Development Peak Hour Traffic Volumes

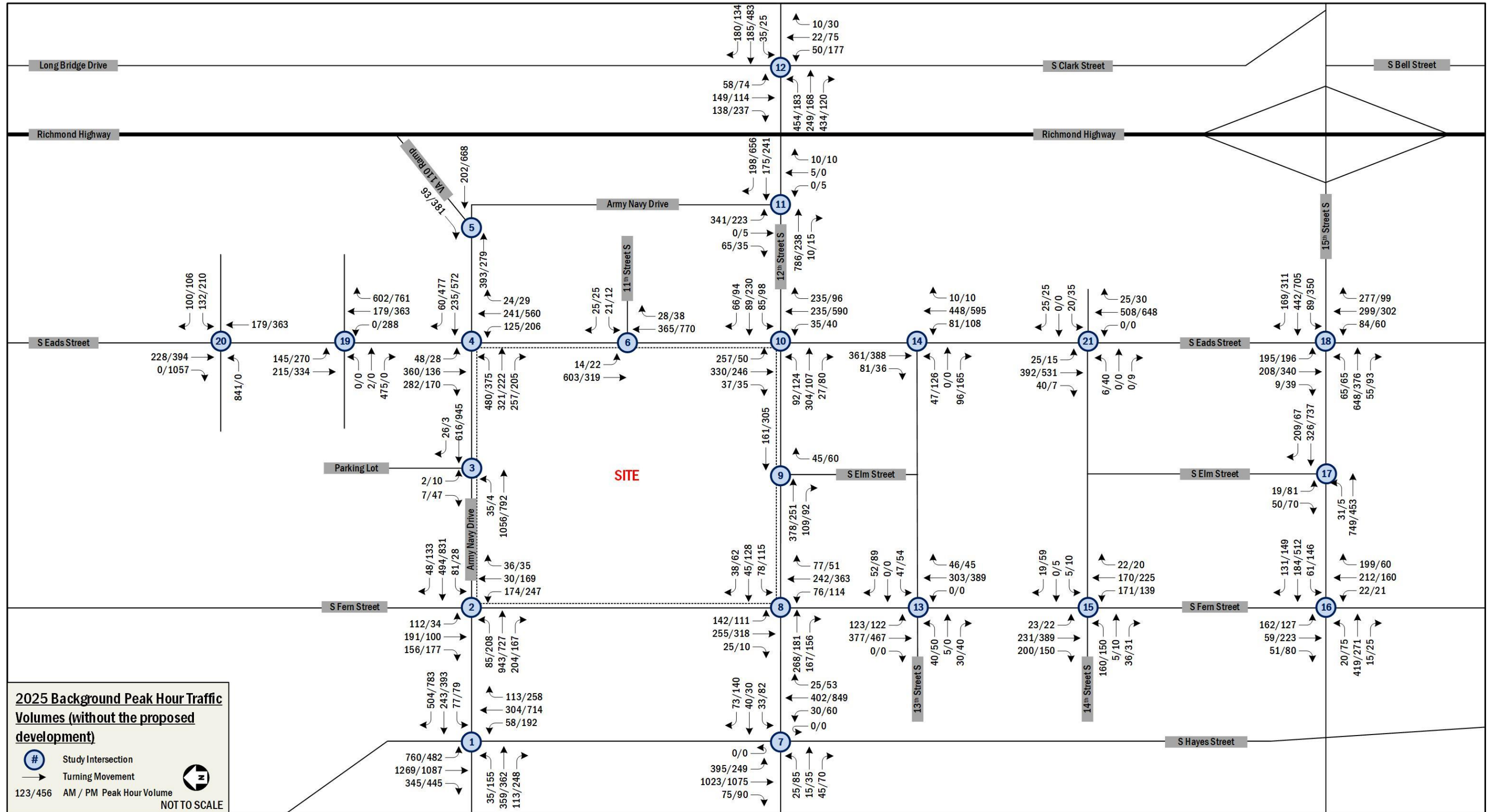


Figure 50: 2025 Background Peak Hour Traffic Volumes (without the proposed development)

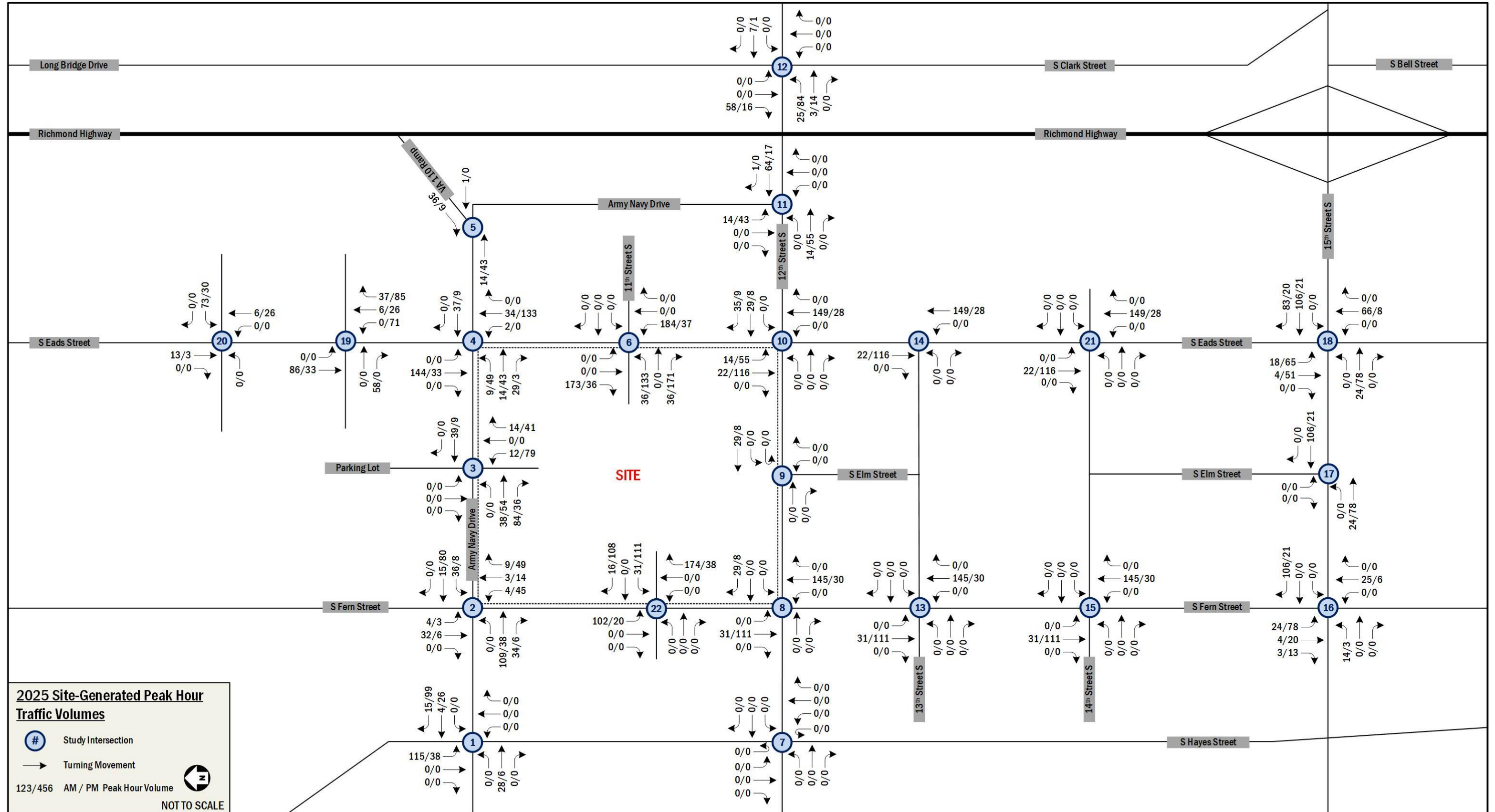


Figure 51: 2025 Site-Generated Peak Hour Traffic Volumes



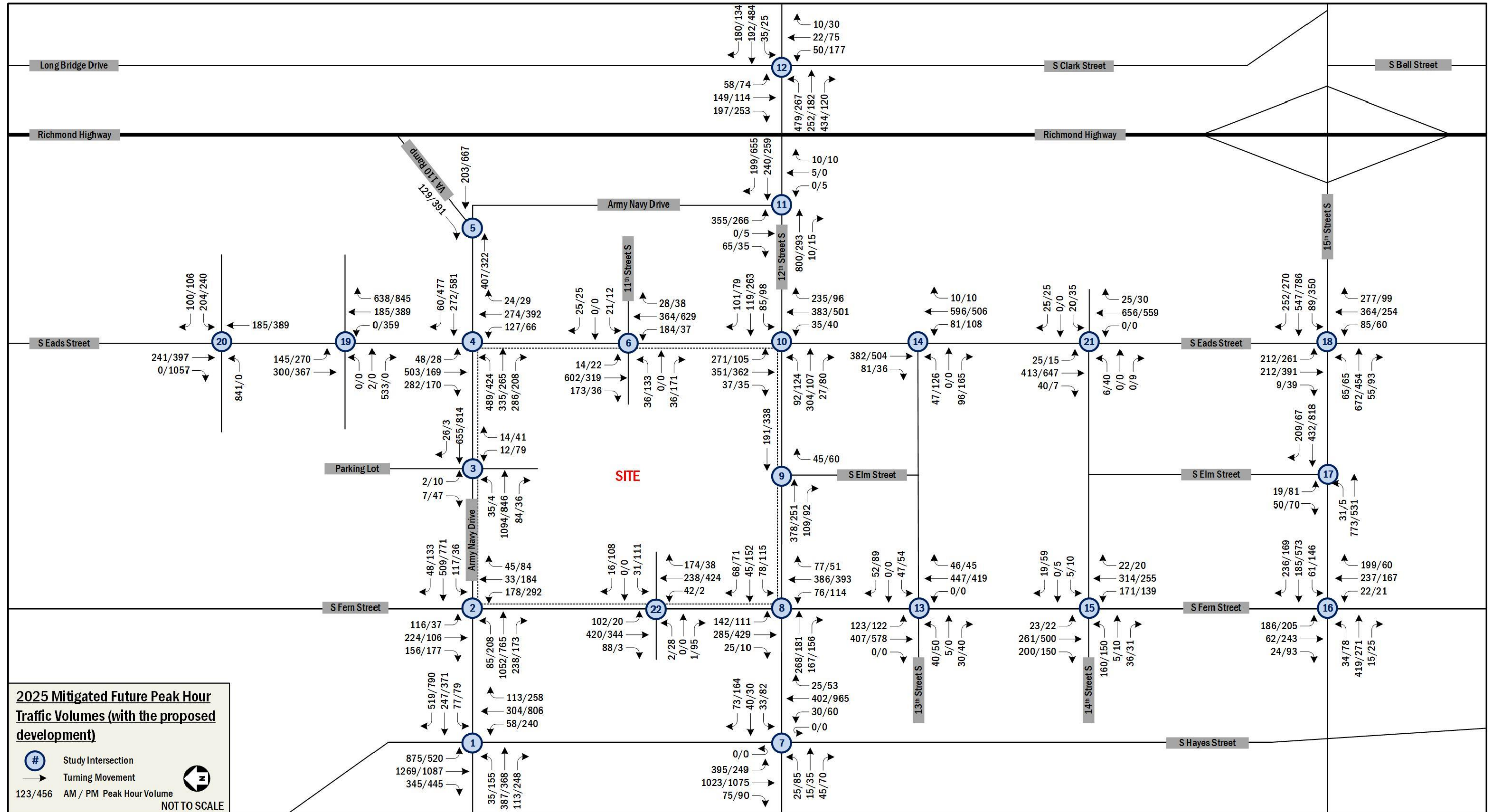


Figure 52: 2025 Mitigated Future Peak Hour Traffic Volumes (with the proposed development)

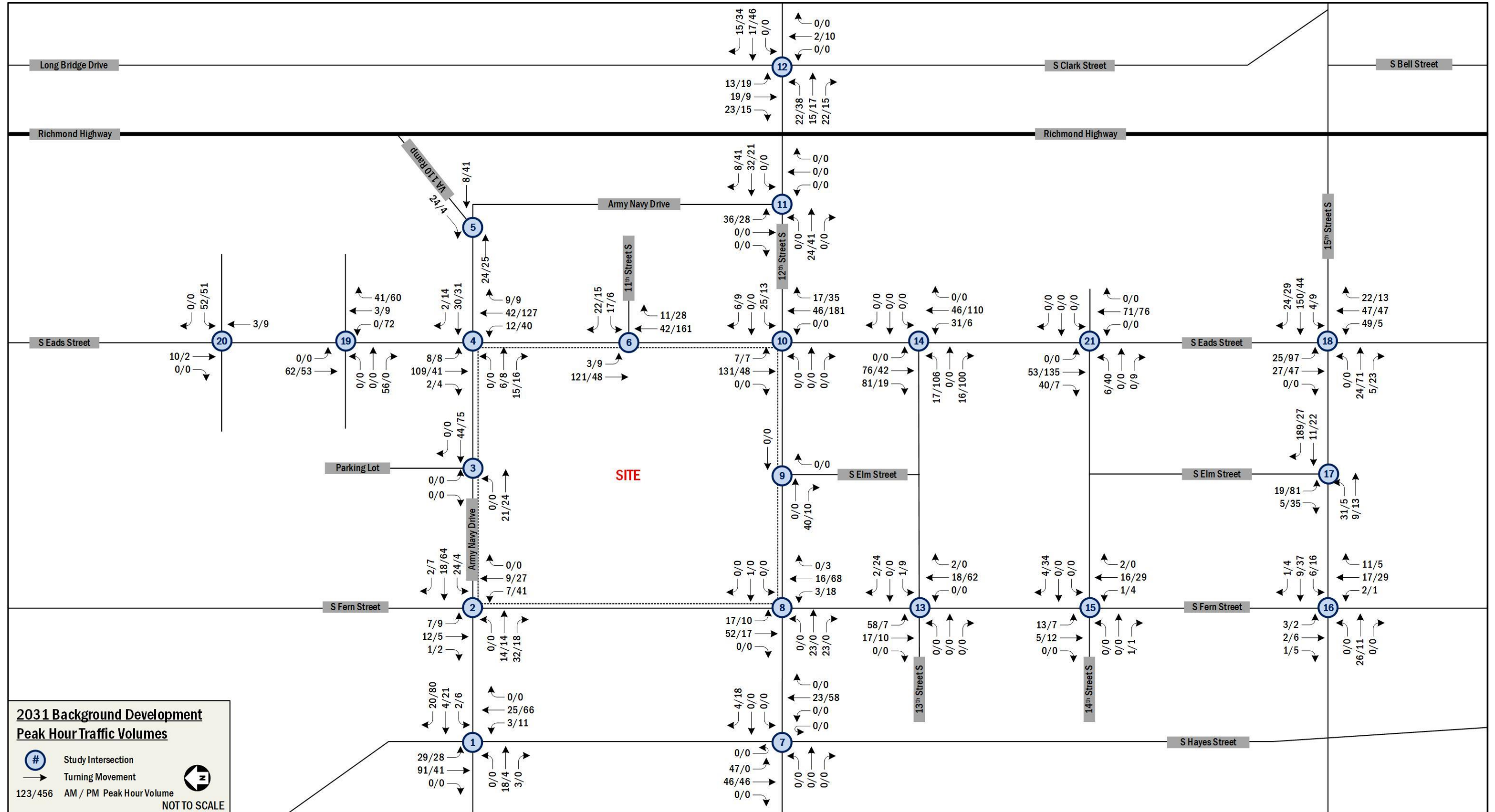


Figure 53: 2031 Background Development Peak Hour Traffic Volumes

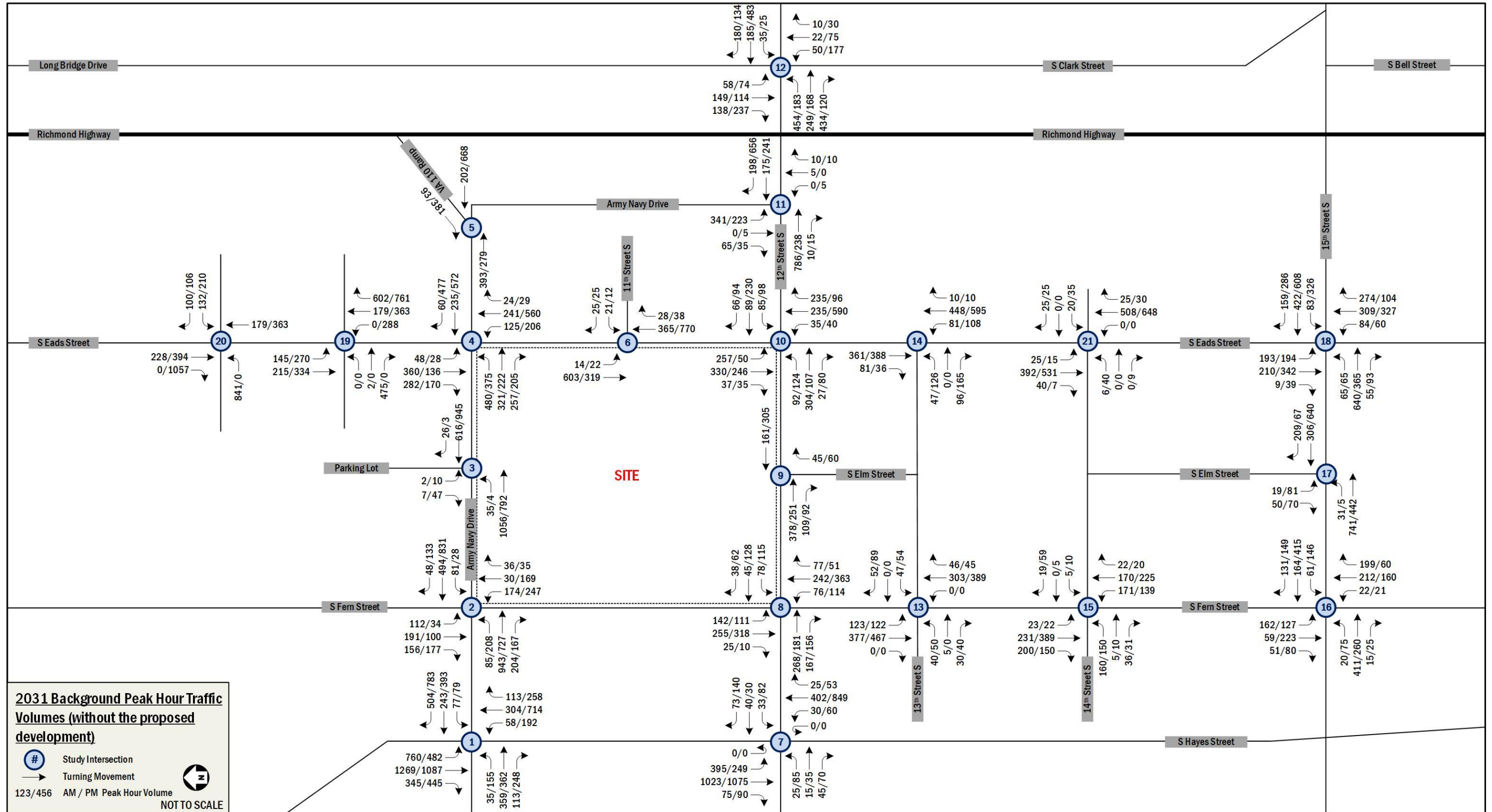


Figure 54: 2031 Background Peak Hour Traffic Volumes (without the proposed development)

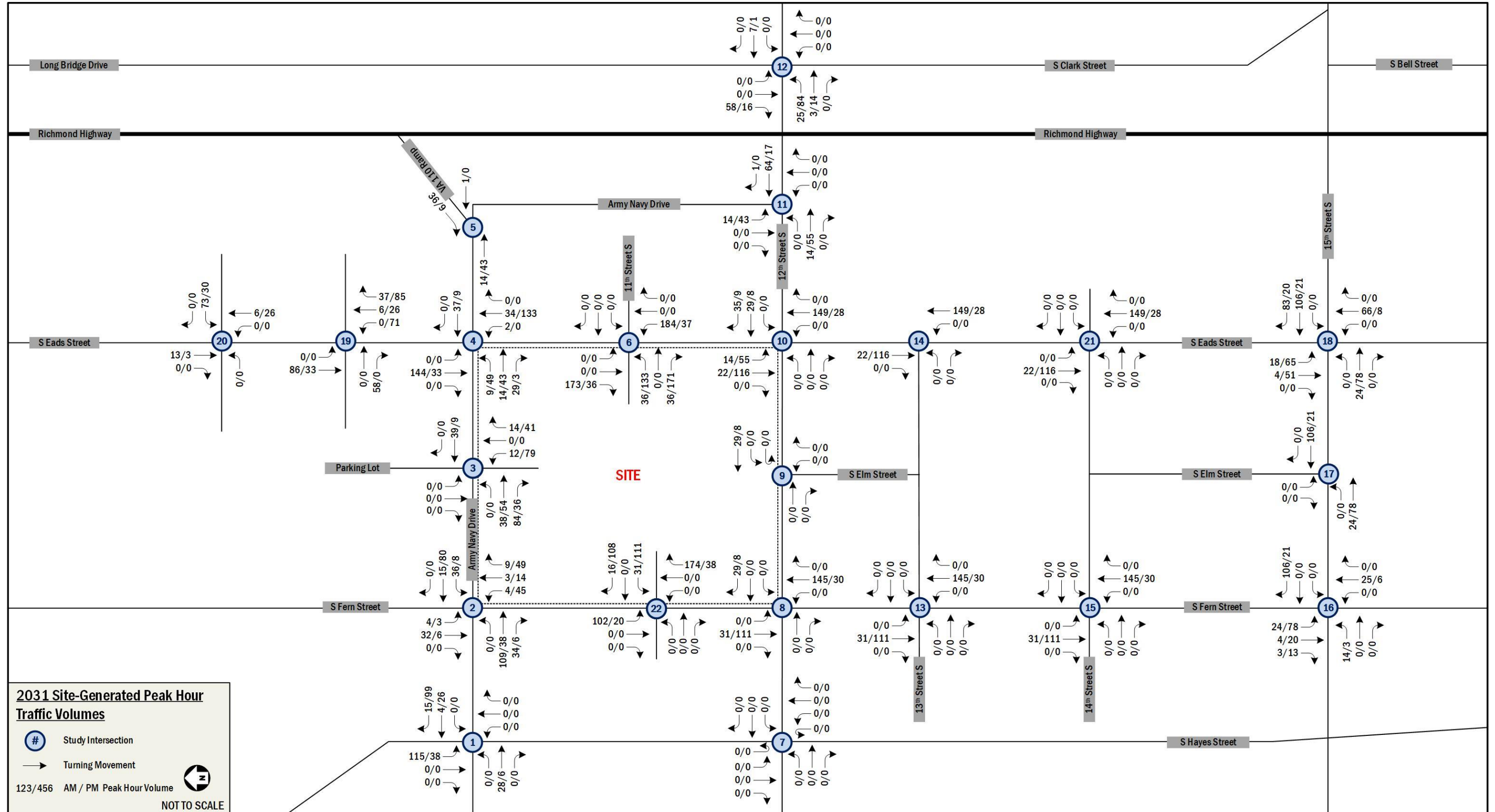


Figure 55: 2031 Site-Generated Peak Hour Traffic Volumes

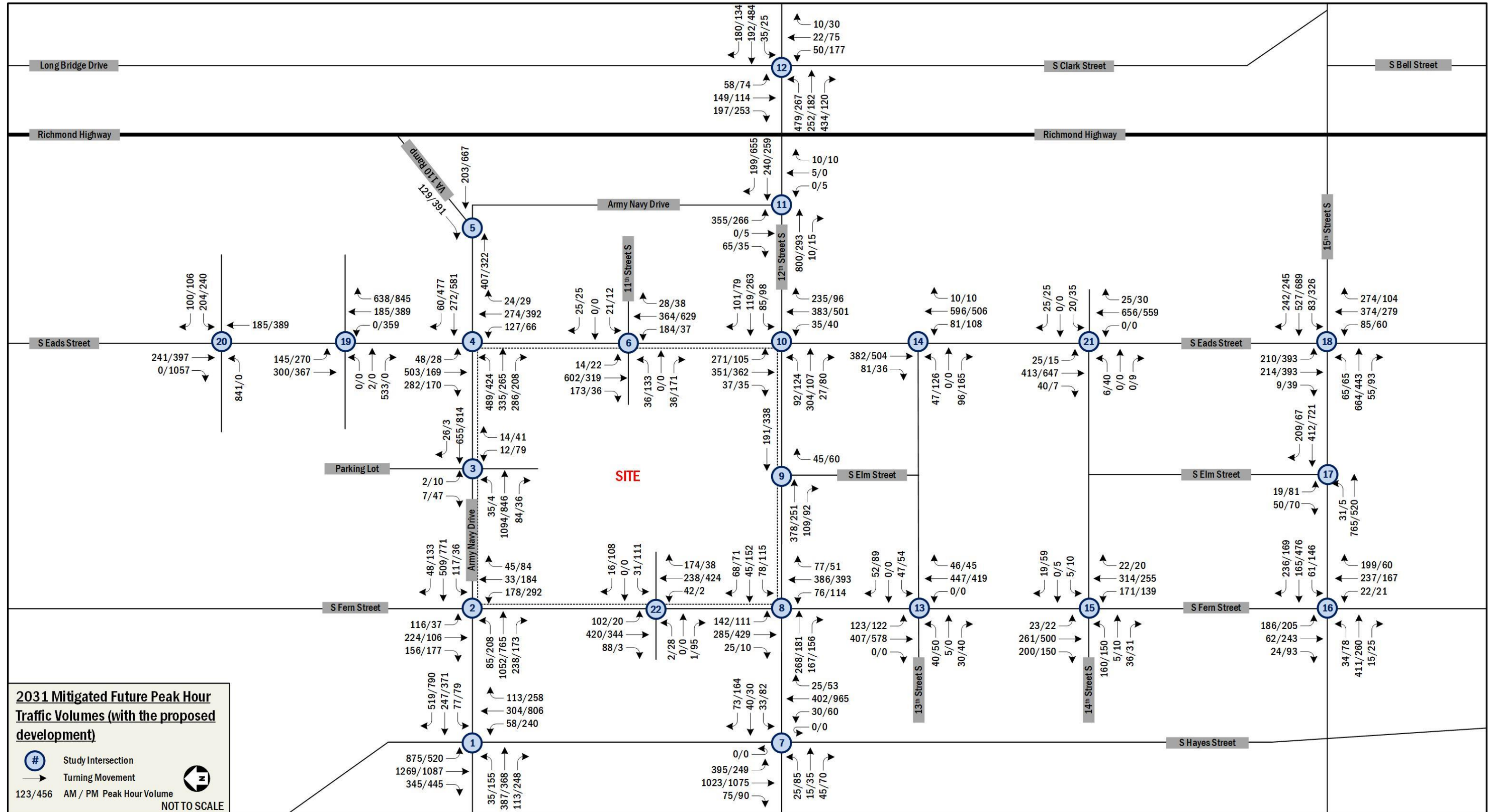


Figure 56: 2031 Mitigated Future Peak Hour Traffic Volumes (with the proposed development)

## **Geometry and Operations Assumptions**

The following section reviews the roadway geometry and operations assumptions made and the methodologies used in the 2025 and 2031 horizon years.

### **2020 Existing Geometry and Operations Assumptions**

The geometry and operations assumed in the existing conditions scenario are those present when the main data collection occurred. Gorove Slade made observations and confirmed the existing lane configurations and traffic controls at the intersections within the study area. Existing signal timings and offsets were obtained from Arlington County and confirmed during field reconnaissance.

A description of the roadways within the study area is presented below in Table 13. The existing local roadway network including lane configurations and intersection control is detailed in and illustrated in Figure 57.

### **2025 Background Geometry and Operations Assumptions (without the proposed development)**

Following industry standard methodologies, a background improvement must meet the following criteria to be incorporated into the analysis:

- Be funded; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, a number of geometry and operations improvements were included in the 2025 Background scenario. Roadway improvements that are part of the Army Navy Drive Complete Street, 12<sup>th</sup> Street Complete Street, Crystal City Transitway Extension, and Metropolitan Park 6, 7, and 8 projects were incorporated into the 2025 Background Conditions scenario.

Roadway improvements along 12<sup>th</sup> Street S are based on the Transitway Extension to Pentagon City provided by Arlington County. The section of 12<sup>th</sup> Street S is planned to include exclusive center transit lanes as part of the extension of the Crystal City/Potomac Yard Transitway. At the time of scoping, signal phasing was understudy as part of a dedicated transitway study effort, led by Arlington County, and is set to be finalized. As such, signal timings, phasing, and lane configuration assumptions were based on the signal timings and phasing included in the 2025 No-Build VISSIM files provided by the

County and discussions with County staff and lane configurations included in the Transitway Extension to Pentagon City plans provided by the County.

### **Army Navy Drive Complete Street**

The Army Navy Drive Complete Street project includes the following changes to roadway geometry and operations to Army Navy Drive from S Hayes Street to 12<sup>th</sup> Street S:

1. The reconfiguration of the Army Navy Drive and S Hayes Street intersection to convert:
  - The eastbound approach from one left-turn lane, two thru lanes, and one thru/right lane to one left-turn lane, two thru lanes, and one right-turn lane; and
  - The westbound approach from one left-turn lane, two thru lanes, and one thru/right lane to one left-turn lane, two thru lanes, and one right-turn lane.
  - Crosswalks are added across the eastbound and southbound approaches.
  - Signal timing and phasing modifications to incorporate an eastbound protected right-turn phase to minimize conflicts with the cycle track along the south side of Army Navy Drive.
2. The reconfiguration of the Army Navy Drive and S Fern Street intersection to include:
  - The conversion of the westbound approach from one left/thru lane, one thru lane, and one thru/right lane to one left-turn lane, one thru lane, and one thru/right lane.
  - Signal timing and phasing modifications to incorporate a new westbound left-turn permissive-protected phase.
  - Signal timing and phasing modifications to incorporate an eastbound right-turn flashing yellow arrow phase to minimize conflicts with the cycle track along the south side of Army Navy Drive.

A portion of existing eastbound right-turning vehicles were re-routed to utilize available capacity along S Hayes Street in the morning and afternoon peak hours to adjust for the reduced capacity along Army Navy Drive. Approximately 30% of trips were re-routed in the morning peak hour and approximately 20% of trips were re-routed in the afternoon peak hour. It is anticipated that this shift in volumes will reflect more natural travel patterns in the future and increase the accuracy of the VISSIM model. A

diagram of the re-routed existing volumes is included in the Technical Appendix.

3. The reconfiguration of the Army Navy Drive and Parking Lot intersection to convert:
  - The eastbound approach from one left/thru lane and one thru lane to one left/thru lane and two thru lanes; and
  - The westbound approach from two thru lanes and one thru/right lane to one thru lane and one thru/right lane.
4. The reconfiguration of the Army Navy Drive and S Eads Street intersection to include:
  - The conversion of the eastbound approach from one left/thru lane and one thru/right lane to one left-turn lane, one thru lane, and one right-turn lane; and
  - The conversion of the westbound approach from one left/thru lane, one thru lane, and one thru/right lane to two thru lanes and one right-turn lane.
  - Signal timings and phasing were modified to incorporate a new southbound left-turn permissive-protected phase.
  - Signal timing and phasing modifications to incorporate an eastbound right-turn flashing yellow arrow phase to minimize conflicts with the cycle track along the south side of Army Navy Drive.
5. The reconfiguration of the Army Navy Drive and VA 110 Off-Ramp intersection to convert:
  - The eastbound approach from two thru lanes to one thru lane; and
  - The westbound approach from two thru lanes to one thru lane.
6. The signalization and reconfiguration of the Army Navy Drive and 12<sup>th</sup> Street S intersection to convert:
  - The eastbound approach from one left/thru lane and one right-turn lane to one thru lane and one thru/right lane;
  - The westbound approach from one left/thru/right lane to two thru lanes and one right-turn lane; and
  - The southbound approach from one left/thru lane and one right-turn lane to one left-turn lane and one thru/right lane.
  - Additionally, the signal timings and phasing at the traffic signal at this intersection were clustered with

the adjacent traffic signal at 12<sup>th</sup> Street S and Long Bridge Drive.

7. Reducing the number of eastbound (and then southbound) lanes between the intersections of Army Navy Drive and S Eads Street, and Army Navy Drive and 12<sup>th</sup> Street S from two lanes to one.
8. Reducing the number of northbound lanes on Army Navy Drive between the intersections of Army Navy Drive and 12<sup>th</sup> Street S, and Army Navy Drive and the Hilton DoubleTree Hotel driveway from two lanes to one.

### Transitway Extension to Pentagon City

The Transitway Extension to Pentagon City includes the following roadway geometry and operations to 12<sup>th</sup> Street S with the incorporation of the transitway:

1. The reconfiguration of the S Hayes Street and 12<sup>th</sup> Street S intersection to convert the westbound approach from one left-turn lane, one thru lane, and one right-turn lane to one left/thru/right lane. Transitway volumes were added based on scheduled headways.
2. The reconfiguration of the S Fern Street and 12<sup>th</sup> Street S intersection to include a center dedicated transit lane and convert the eastbound approach from one left/thru/right lane to one thru/right lane. Transitway volumes were added based on scheduled headways.
3. The signalization and reconfiguration of the S Elm Street and 12<sup>th</sup> Street S intersection to convert:
  - The westbound approach from one left/thru lane to one thru lane; and
  - The northbound approach from one left/right lane to one right-turn lane.
  - Additionally, the intersection was reconfigured to include a center dedicated transit lane. Transitway volumes were added based on scheduled headways.
4. The reconfiguration of the S Eads Street and 12<sup>th</sup> Street S intersection to include a center dedicated transit lane. Transitway volumes were added based on scheduled headways.

At the time of scoping, signal phasing was understudy as part of a dedicated transitway study effort, led by Arlington County. As such, signal timings and phasing were based on those included in the 2025 No-Build VISSIM models provided by Arlington County.

### Crystal City Transitway Extension

The Crystal City Transitway Extension project includes the following changes to roadway geometry and operations to the 12<sup>th</sup> Street S:

1. The reconfiguration of the 12<sup>th</sup> Street S and S Clark Street/Long Bridge Drive intersection. This includes the conversion of the westbound approach from one left-turn lane and one thru/right lane to one left-turn lane, one thru lane, and one right-turn lane. Additionally, the signal timings and phasing were modified to cluster the traffic signal at this intersection with the adjacent traffic signal at 12<sup>th</sup> Street S and Army Navy Drive.

### Metropolitan Park 6, 7, and 8

The Metropolitan Park 6, 7, and 8 project includes the following changes to roadway geometry and operations to S Eads Street and 15<sup>th</sup> Street S:

1. The signalization and reconfiguration of the S Eads Street and 13<sup>th</sup> Street S intersection to convert:
  - The eastbound approach from one left/thru/right lane to one left-turn lane and one right-turn lane;
  - The southbound approach from one left-turn lane and one thru/right lane to one thru lane and one right-turn lane.
  - The westbound driveway for the Meridian at Pentagon City will not be included as part of the signal.
2. 14<sup>th</sup> Street S and S Eads Street is a new intersection that will provide full signalized access to the new internal segment of 14<sup>th</sup> Street S. Each intersection approach is configured with the following:
  - The eastbound approach will include one left/thru/right lane.
  - The westbound approach will include one left/thru/right lane.
  - The northbound approach will include one left-turn lane and one thru/right lane.
  - The southbound approach will include one left-turn lane and one thru/right lane.
3. The signalization and reconfiguration of the S Elm Street and 15<sup>th</sup> Street S intersection to break the existing median and convert:
  - The eastbound approach from two thru lanes to one left-turn lane and two thru lanes; and

- The southbound approach from one right-turn lane to one left-turn lane and one right-turn lane.
4. S Eads Street and 15<sup>th</sup> Street S will be reconfigured as a protected intersection. Each intersection approach is configured with the following:
    - The eastbound approach will include one left-turn lane, one thru lane, and one thru/right lane.
    - The westbound approach will include one left-turn lane, one thru lane, and one thru/right lane.
    - The northbound approach will include one left-turn lane, one thru lane, and one right-turn lane.
    - The southbound approach will include one left-turn lane, one thru lane, and one right-turn lane.

Lane configurations and traffic controls for the 2025 Background Conditions are shown in Figure 58.

### 2025 Mitigated Future Geometry and Operations Assumptions (with the proposed development)

The configurations and traffic controls for the 2025 Mitigated Future Conditions were based on those for the 2025 Background Conditions with the addition of the PenPlace development. One (1) new intersection was added, and 10 intersections were modified to provide access to the below-grade parking garage of the proposed development and create additional capacity at critical locations to allow more vehicles to be processed through the analyzed network.

It should be noted that the intersection of Army Navy Drive and S Hayes Street was reconfigured to include northbound and southbound dual left-turn lanes by converting an adjacent thru lane to a left-turn lane. The opposing left-turning movements is assumed to operate under lead-lag phasing and will not operate concurrently. This mitigation was identified to create additional left-turn capacity at this location, necessitated by congestion that was already present under Background (2025) conditions without the addition of the proposed development; however, this modification was not included in the analysis for Background conditions. Omitting this improvement would result in longer queues and higher delays compared to conditions with the improvements.

The modifications of the roadway network as a result of the proposed development are as follows:

1. The reconfiguration of the Army Navy Drive and S Fern Street intersection to convert the southbound approach



- from one left-turn lane, one thru lane, and one thru/right lane to one left-turn lane, one thru lane, and one right-turn lane and convert the northbound approach from one left-turn lane, one thru lane, and one thru/right lane to one left-turn lane, one thru lane, and one right-turn lane.
2. Army Navy Drive and Parking Lot will be signalized and reconfigured to provide access to the site's below-grade parking garage. Each intersection approach is configured with the following:
    - The eastbound approach will include one left/thru lane, two thru lanes, and one right-turn lane. Signal timings and phasing will incorporate a protected right-turn phase to minimize conflicts between heavy vehicles and the cycle track.
    - The westbound approach will include one thru lane and one thru/right lane.
    - The northbound approach will include one left/thru/right lane.
    - The southbound approach will include one left/thru/right lane.
  3. The reconfiguration of the S Eads Street and Army Navy Drive intersection to include:
    - Reconfiguration of the northbound approach from one left-turn lane and one thru/right lane to one left-turn lane, one thru lane and one thru/right lane.
    - Signal timing and phasing modification to convert the southbound left-turn movement from permissive-protected to permissive phasing.
  4. S Eads Street and 11<sup>th</sup> Street S/Site Driveway will be signalized and reconfigured to provide access to the site's below-grade parking garage. Each intersection approach is configured with the following:
    - The eastbound approach will include one left/thru lane and one right-turn lane.
    - The westbound approach will include one left/thru/right lane.
    - The northbound approach will include one left-turn lane and one thru/right lane.
    - The southbound approach will include one left/thru lane and one right-turn lane.
  5. The reconfiguration of the S Fern Street and 12<sup>th</sup> Street S intersection to include:
    - Reconfiguration of the southbound approach from one left/thru/right lane to one left-turn lane and one thru/right lane.
    - Signal timing and phasing modification to convert the northbound left-turn movement from permissive to permissive-protected phasing.
    - Signal timing and phasing modification to convert the southbound left-turn movement from permissive to permissive-protected phasing.
  6. The reconfiguration of the S Eads Street and 12<sup>th</sup> Street S intersection to convert the southbound approach from one left/thru/right to one left-turn lane and one thru/right lane. Signal timings and phasing modification to convert the southbound left-turn movement from permissive to permissive-protected phasing.
  7. S Fern Street and Site Driveway is a new access point that will provide full signalized access to the site's below-grade parking garage. Each intersection approach is configured with the following:
    - The eastbound approach will include one left/thru/right lane.
    - The westbound approach will include one left/thru lane and one right-turn lane.
    - The northbound approach will include one left-turn lane and one thru/right lane.
    - The southbound approach will include one left-turn lane and one thru/right lane.
  8. The modification of the S Fern Street and 15<sup>th</sup> Street S intersection to convert the southbound left-turn movement from permissive to permissive-protected phasing.
  9. The modification of the S Eads Street and 15<sup>th</sup> Street S intersection to include:
    - Signal timing and phasing modification to convert the eastbound left-turn movement from permissive to permissive-protected phasing.
    - Signal timing and phasing modification to convert the westbound left-turn movement from permissive to permissive-protected phasing.
  10. The modification of the S Eads Street and I-395 Ramps (South) intersection to convert the northbound left-turn movement from protected to permissive-protected phasing.

Lane configurations and traffic controls for the 2025 Mitigated Future Conditions are shown in Figure 59. Figure 60 shows a

comparison of lane configurations and traffic controls between the Existing, 2025 Background, and 2025 Mitigated Future scenarios. Proposed turning lane storage lengths at intersections adjacent to the site are summarized in Figure 61.

**2031 Background Geometry and Operations Assumptions (without the proposed development)**

The geometry and operations assumptions align with that which were assumed under 2025 Background Conditions. Lane configurations and traffic controls for the 2031 Background Conditions are shown in Figure 62.

**2031 Mitigated Future Geometry and Operations Assumptions (with the proposed development)**

Lane configurations and traffic controls for the 2031 Mitigated Future Conditions align with that which were assumed under 2031 Background Conditions, with the addition of the PenPlace development. Lane configurations and traffic controls for the 2031 Mitigated Future Conditions are shown in Figure 63. Figure 64 shows a comparison of lane configurations and traffic controls between the Existing, 2031 Background, and 2031 Mitigated Future scenarios.

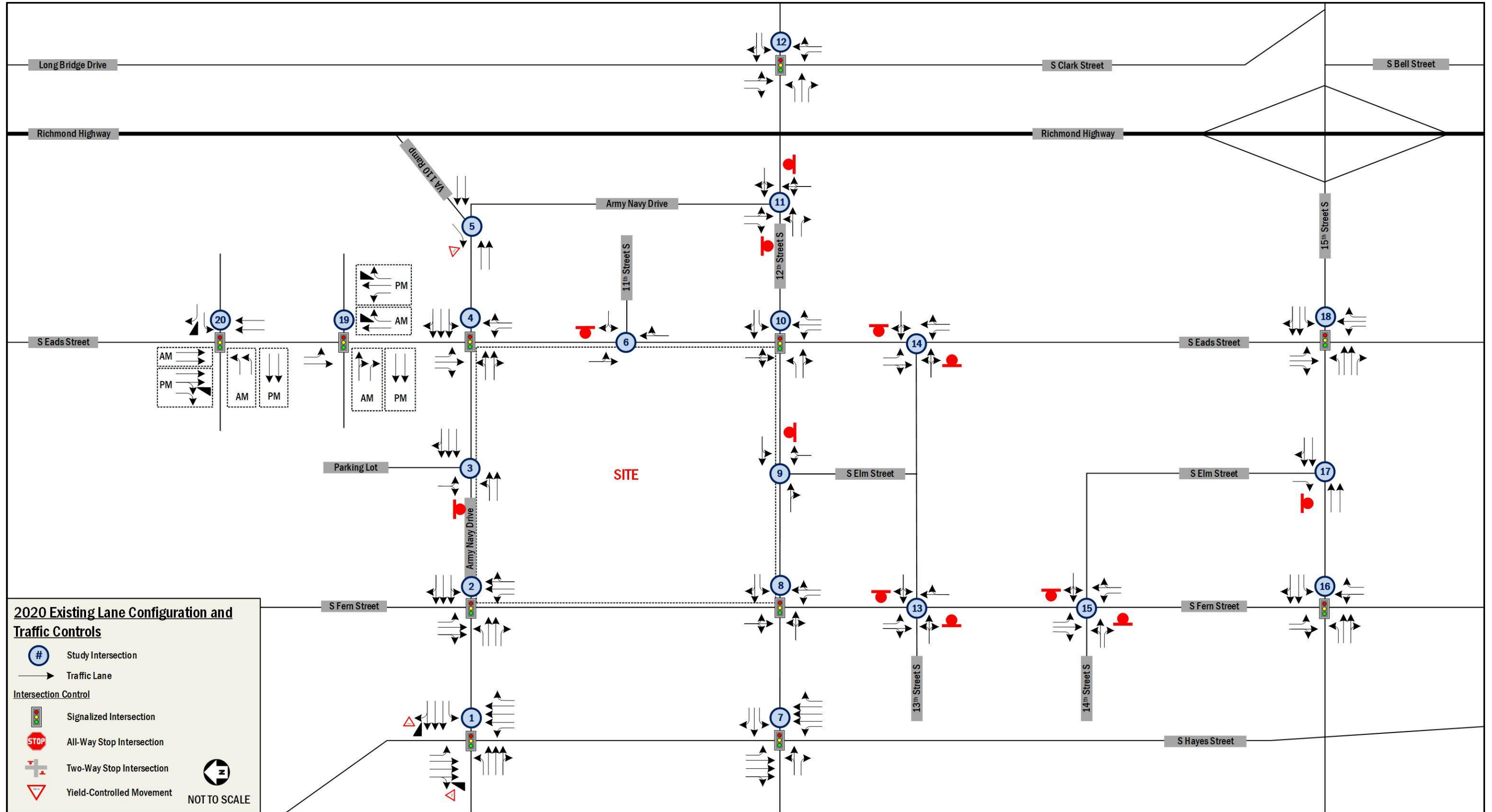


Figure 57: 2020 Existing Lane Configurations and Traffic Controls

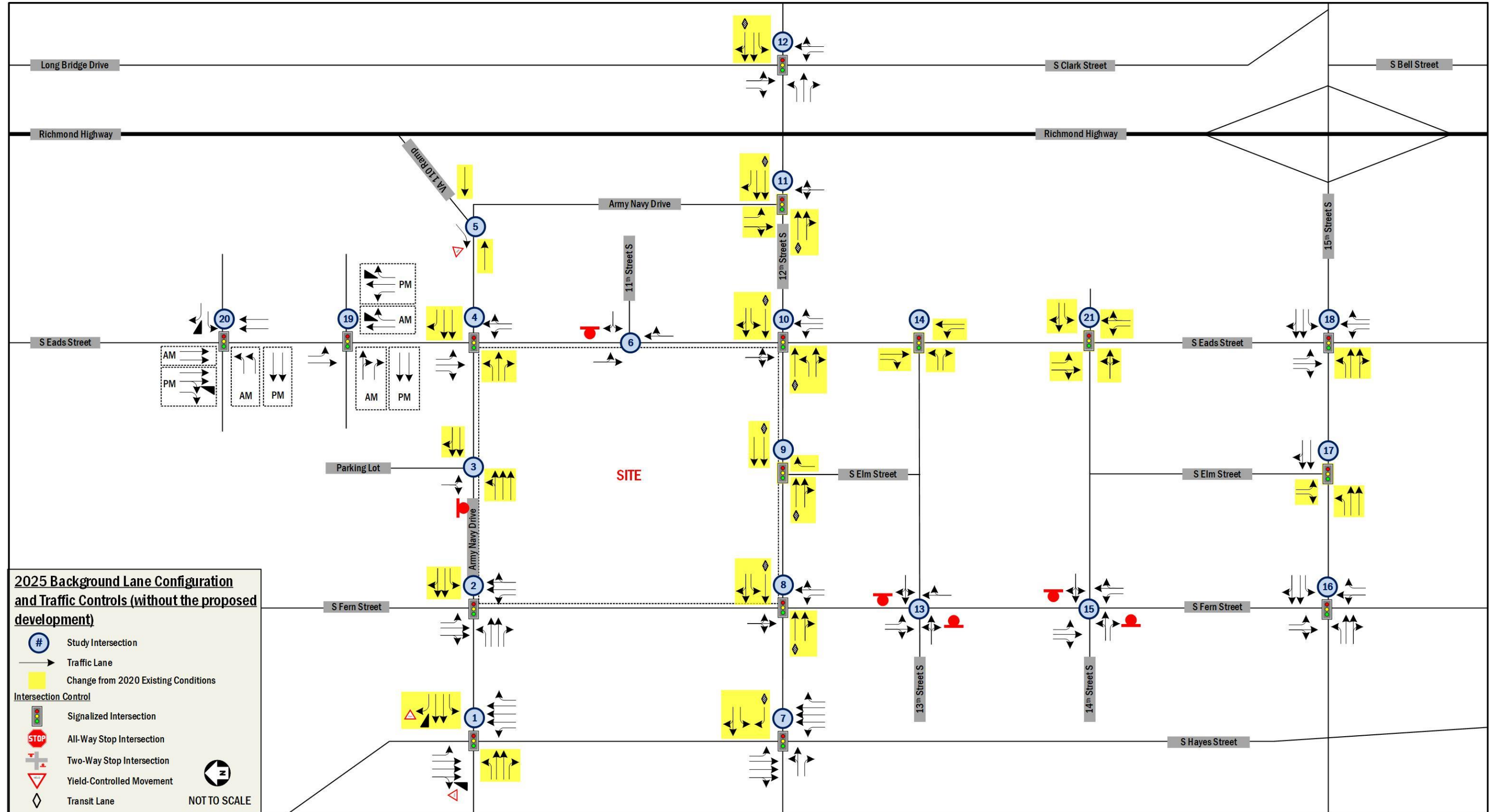


Figure 58: 2025 Background Lane Configuration and Traffic Controls (without the proposed development)

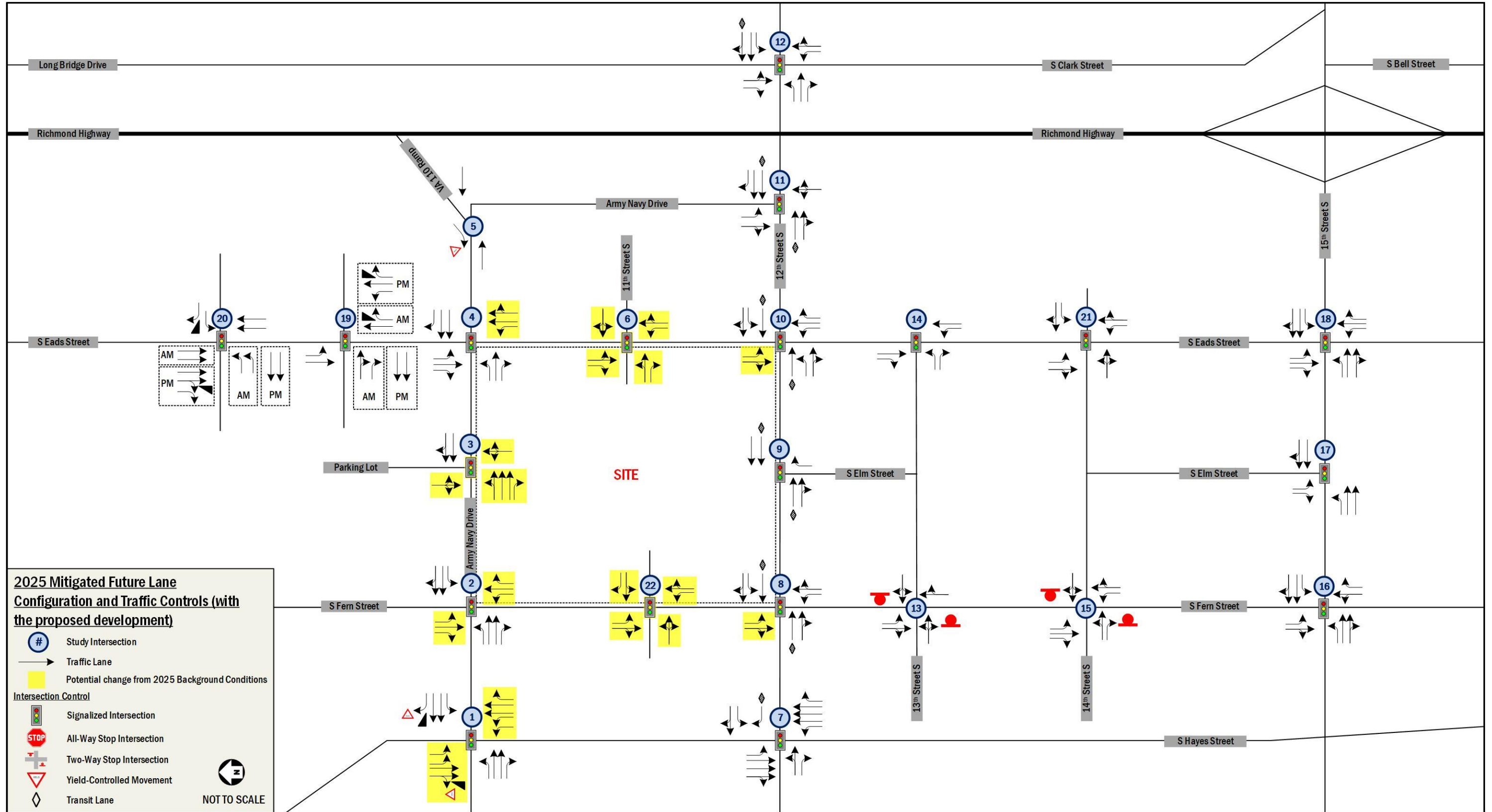


Figure 59: 2025 Mitigated Future Lane Configuration and Traffic Controls (with the proposed development)

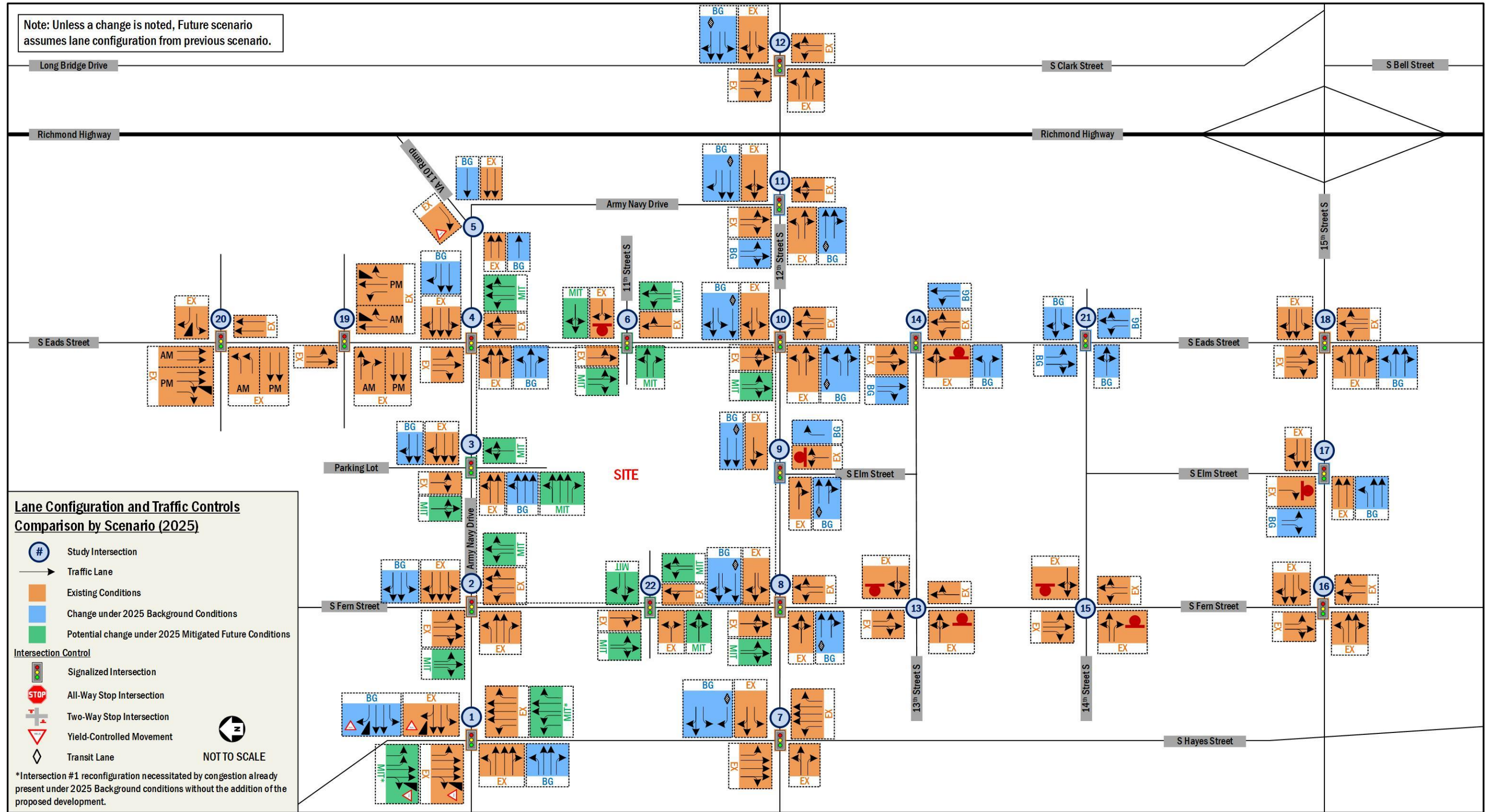


Figure 60: Lane Configuration and Traffic Controls Comparison by Scenario (2025)

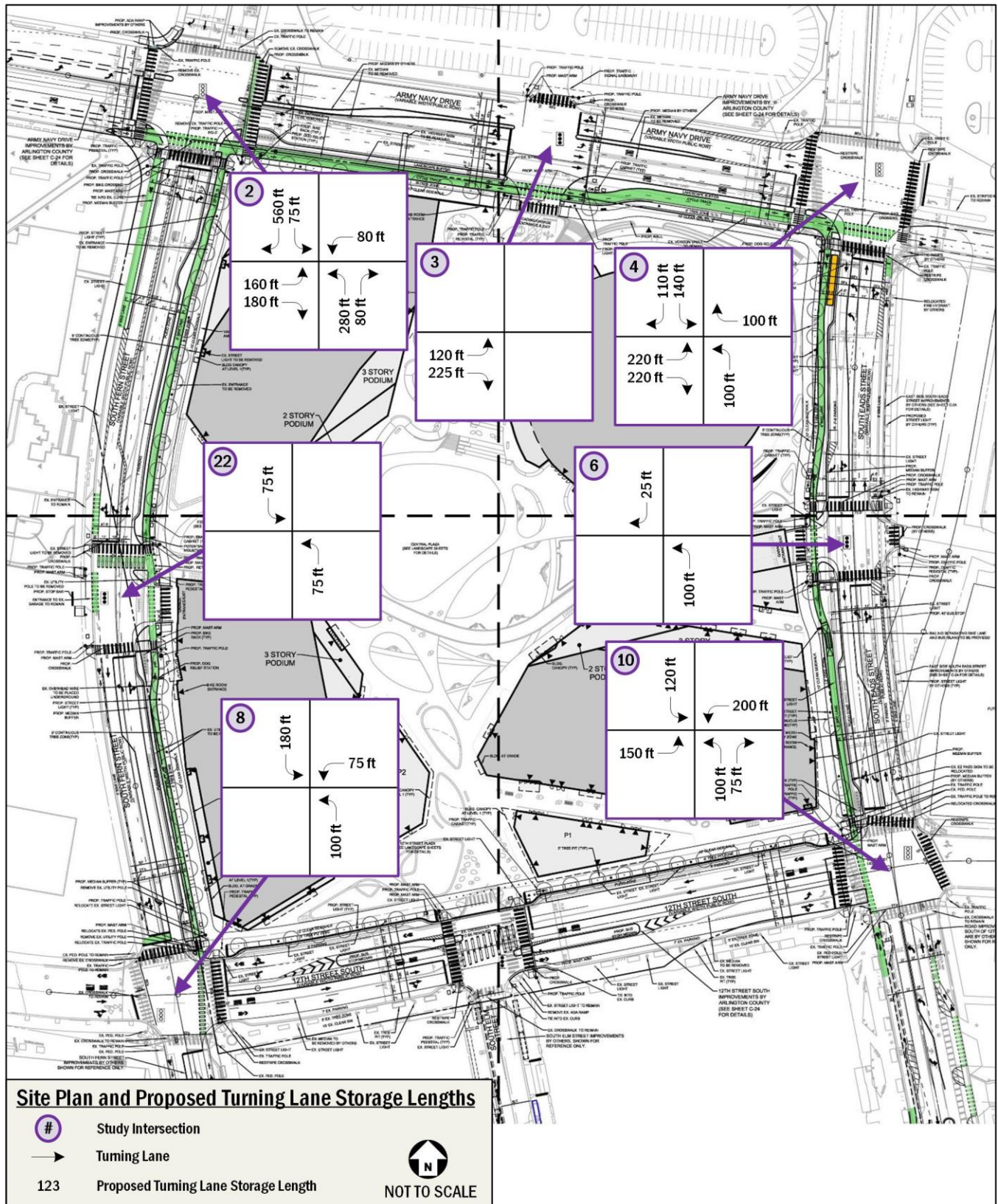


Figure 61: Site Plan and Proposed Turning Lane Storage Lengths

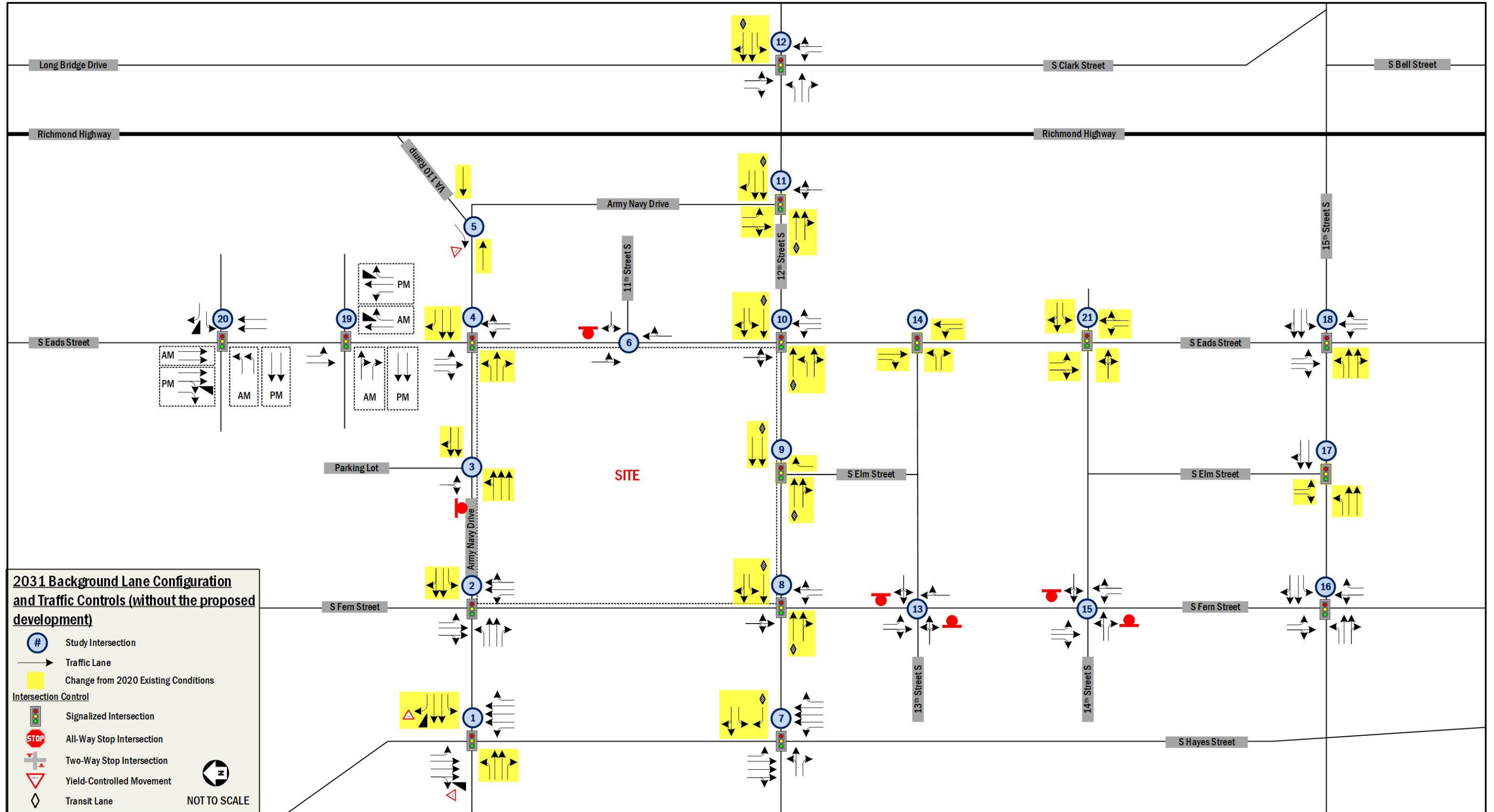


Figure 62: 2031 Background Lane Configuration and Traffic Controls (without the proposed development)



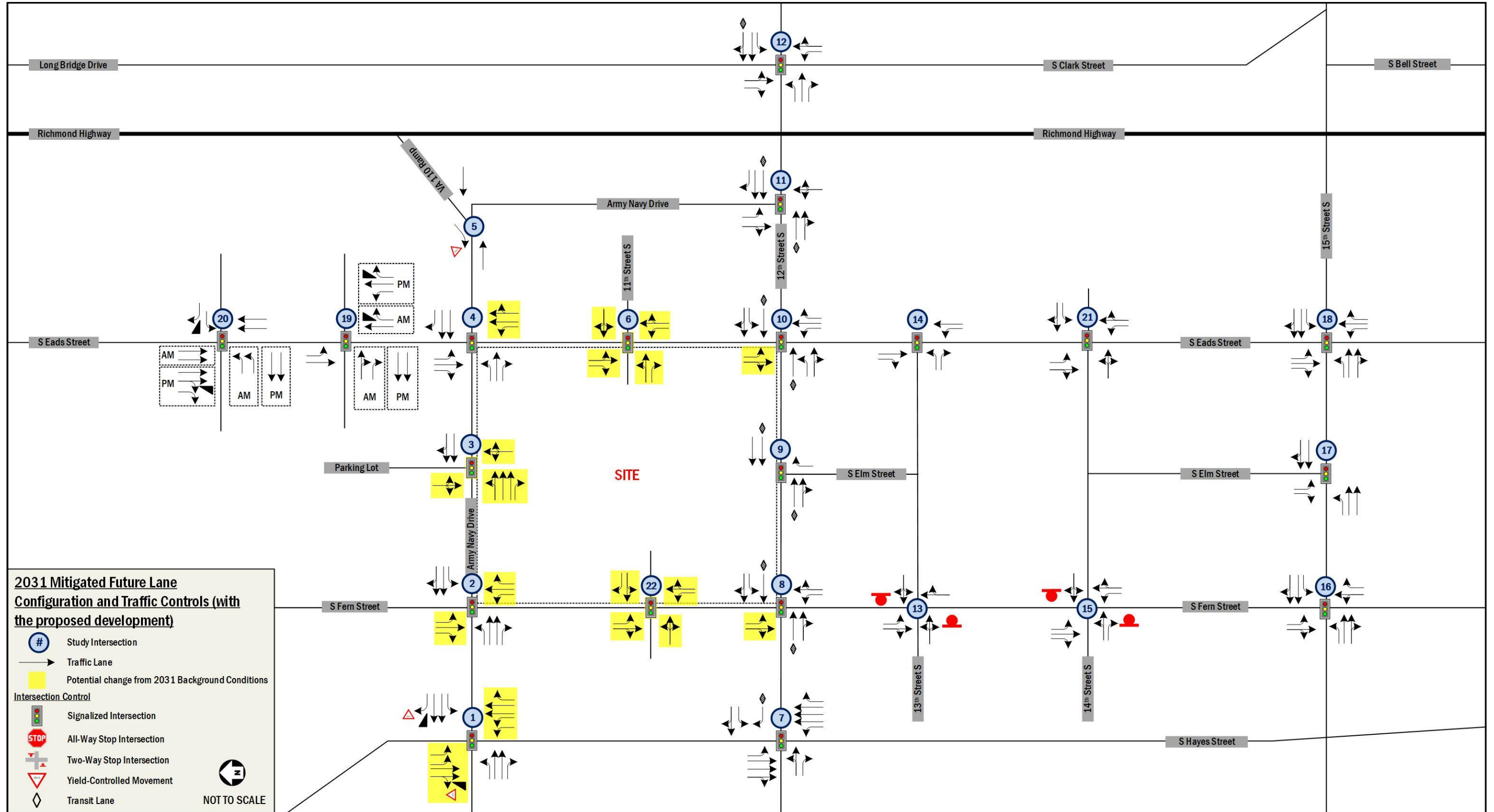


Figure 63: 2031 Mitigated Future Lane Configuration and Traffic Controls (with the proposed development)

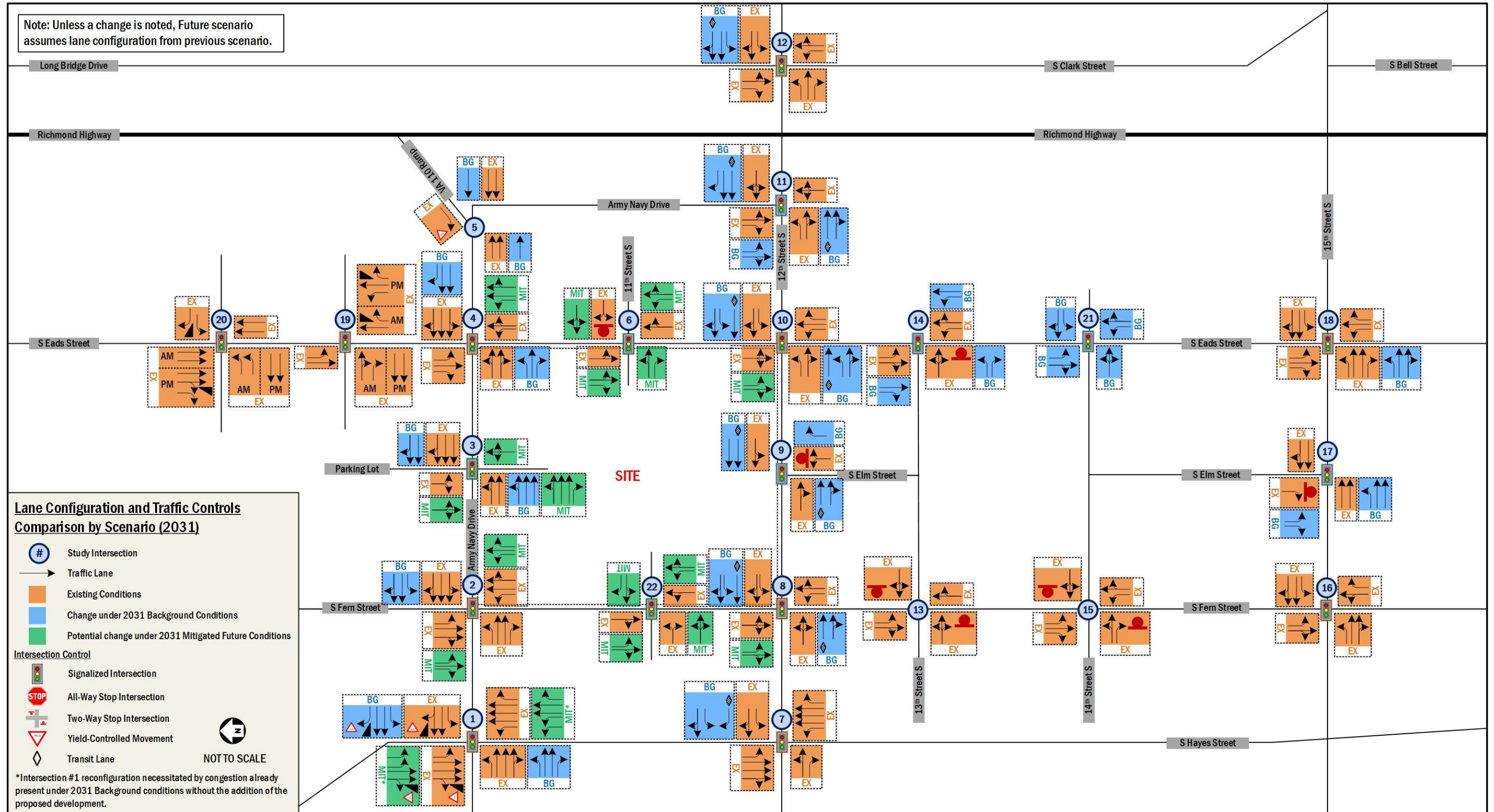


Figure 64: Lane Configuration and Traffic Controls Comparison by Scenario (2031)

## Signal Warrant Analysis

This section presents the evaluation of the traffic signal control warrant for three (3) intersections surrounding the site, where the Applicant has proposed to fund the study and installation of traffic signals as part of the PenPlace development. The signal warrant analyses were performed following the procedures outlined in the 2009 Manual on Uniform Traffic Control Devices (MUTCD) for Warrant 3 (Peak Hour) and Warrant 4 (Pedestrian Volume). According to the MUTCD, only one of the warrants needs to be satisfied to allow for the installation of a traffic control signal. The criterion of each warrant was evaluated using the information obtained for the Existing (2020) and Future (2025 and 2031) with development conditions. Expected future bicycle volumes, shown in Figure 65, were incorporated into the vehicular signal warrants. The pedestrian volumes shown in the warrants are based on existing pedestrian volumes with the addition of expected future pedestrian volumes. The expected future pedestrian volumes are shown in Figure 66. A signal warrant analysis was performed for each of the following intersections:

- Army Navy Drive & Parking Lot/Site Driveway**  
Under existing conditions, neither Warrant 3 (Peak Hour) or Warrant 4 (Pedestrian Volume) are met, as shown in Figure 67 and Figure 68. The southbound approach (the parking lot entrance under existing conditions) is the minor street approach with the higher peak hour volumes, and Army Navy Drive is considered to be the major street.

Warrant 3 (Peak Hour) is satisfied under Future (2025 and 2031) with development conditions during the afternoon peak hour. The northbound approach is the minor street approach with the higher peak hour volumes, and Army Navy Drive is considered to be the major street. Therefore, a traffic signal is warranted at this intersection. Warrant 3 (Pedestrian Volume) is not met as there are no crosswalks present across the major approaches.
- S Eads Street & 11<sup>th</sup> Street S/Site Driveway**  
Under existing conditions neither Warrant 3 (Peak Hour) or Warrant 4 (Pedestrian Volume) are met, as shown in Figure 69 and Figure 70. The westbound approach of 11<sup>th</sup> Street S is the minor street approach with the higher peak hour volumes, and S Eads Street is considered to be the major street.

Warrant 3 (Peak Hour) is satisfied under Future (2025 and 2031) with development conditions during the afternoon peak hour. The eastbound approach is considered to be the minor street approach with the higher peak hour volumes,

and S Eads Street is considered to be the major street. Therefore, a traffic signal is warranted at this intersection. Warrant 4 (Pedestrian Volumes) is not satisfied under Future (2025 and 2031) with development conditions.

- S Fern Street & Site Driveway**  
Under existing conditions, neither Warrant 3 (Peak Hour) or Warrant 4 (Pedestrian Volume) are met, as shown in Figure 71 and Figure 72. The eastbound approach (the existing driveway entrance under existing conditions) is the minor street approach with the higher peak hour volumes, and S Fern Street is considered to be the major street.

Warrant 3 (Peak Hour) is not satisfied under Future (2025 and 2031) with development conditions. Warrant 4 (Pedestrian Volume) is satisfied under Future (2025 and 2031) with development conditions during the morning peak hour. Therefore, a traffic signal is warranted at this intersection.

Given the data that is available at this time, this report only includes Warrant 3 (Peak Hour) and Warrant 4 (Pedestrian Volume). As agreed to by Arlington County and VDOT, if consideration of additional warrants is needed by Arlington County, additional data collection and documentation will be provided at a subsequent stage. A summary of the warrant analysis for each intersection is shown in Table 16.

**Table 16: Signal Warrant Analysis Summary**

|   | Existing (2025)                 |                                | Future (2025 and 2031)          |                                |
|---|---------------------------------|--------------------------------|---------------------------------|--------------------------------|
|   | Warrant 3 (Vehicular Peak Hour) | Warrant 4 (Pedestrian Volumes) | Warrant 3 (Vehicular Peak Hour) | Warrant 4 (Pedestrian Volumes) |
| Army Navy Drive & Parking Lot/Site Driveway             | N                               | N                              | Y                               | N                              |
| S Eads Street & 11 <sup>th</sup> Street S/Site Driveway | N                               | N                              | Y                               | N                              |
| S Fern Street & Site Driveway                           | N                               | N                              | N                               | Y                              |

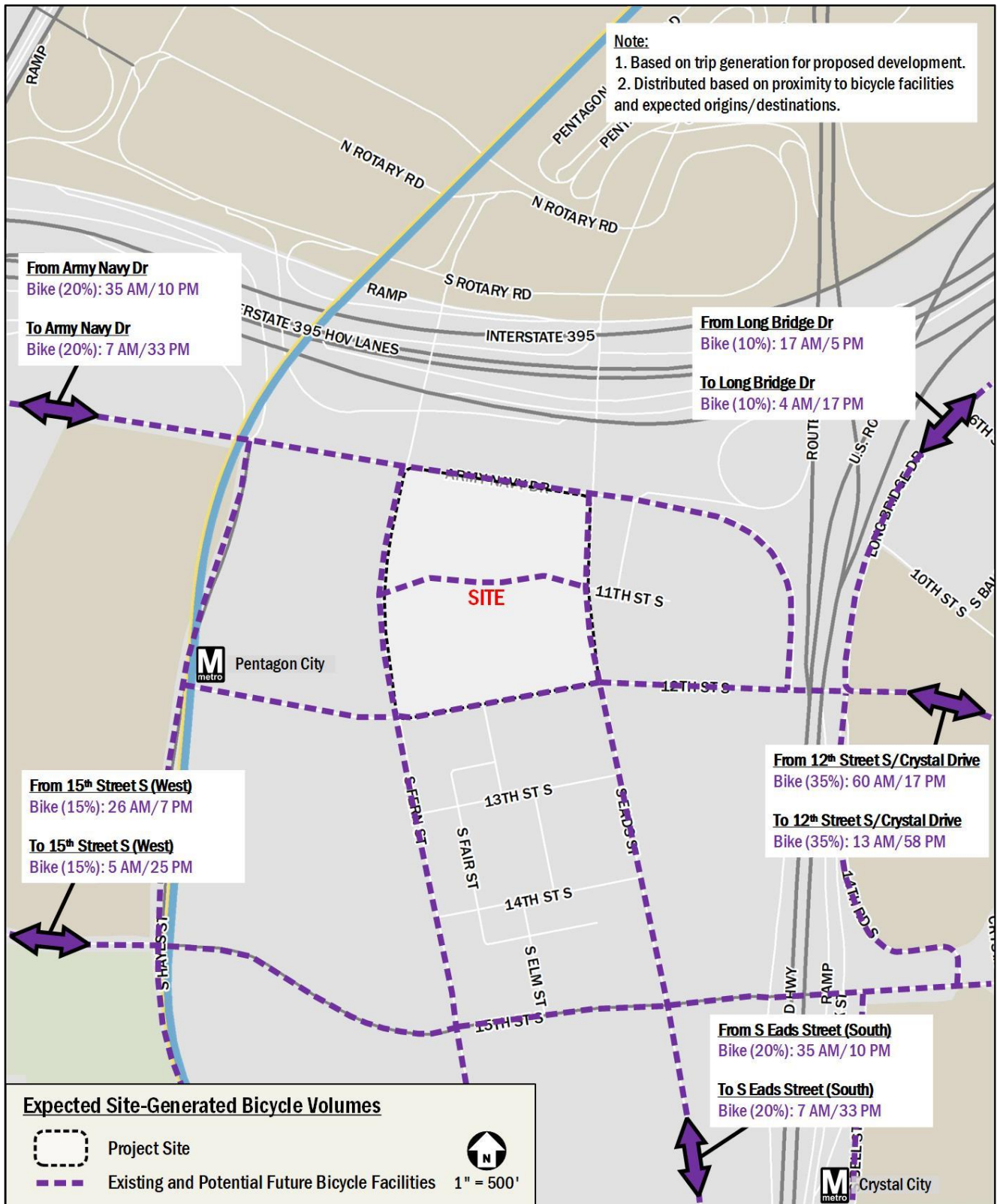


Figure 65: Expected Site Generated Bicycle Volumes

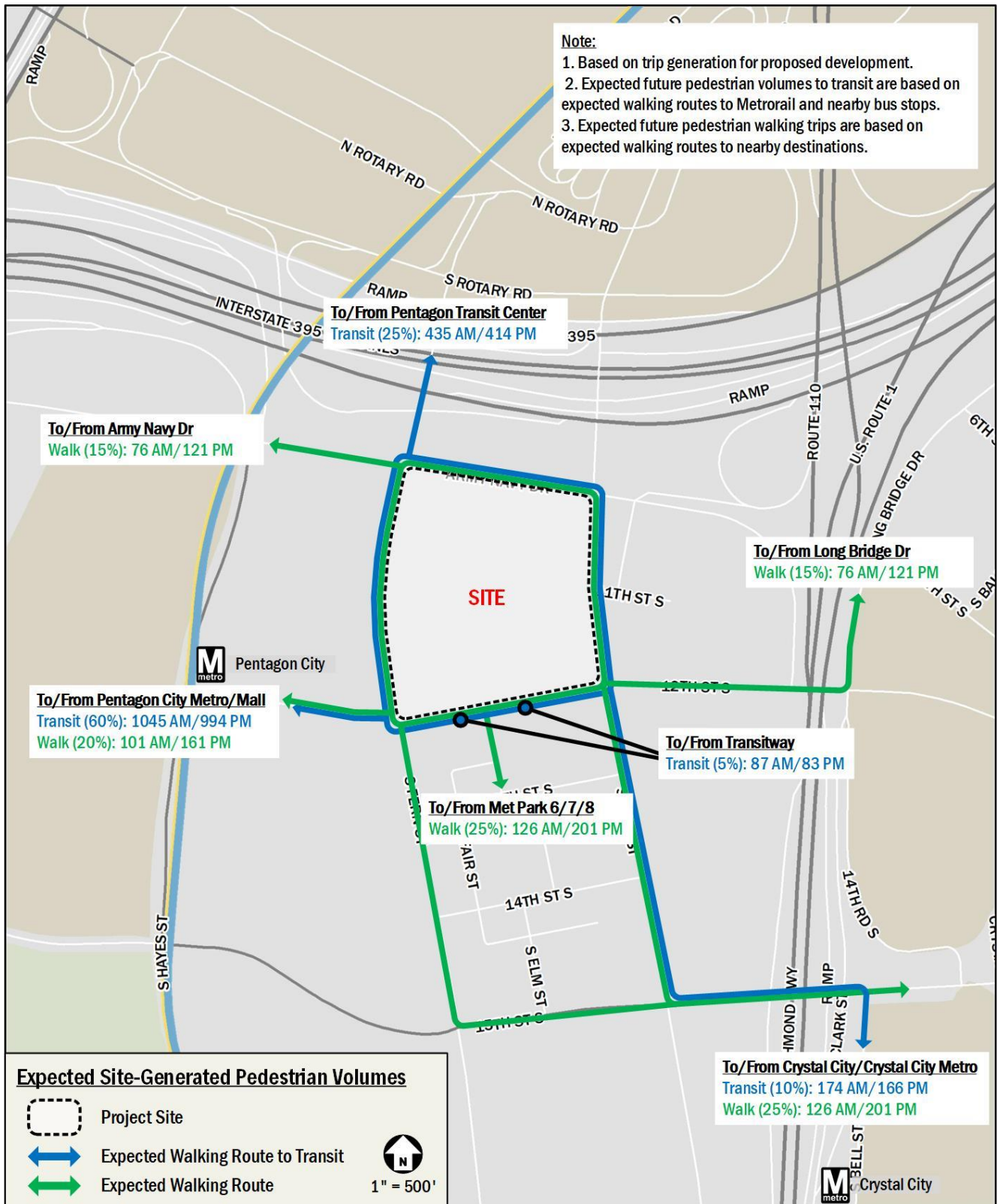


Figure 66: Expected Site Generated Pedestrian Volumes

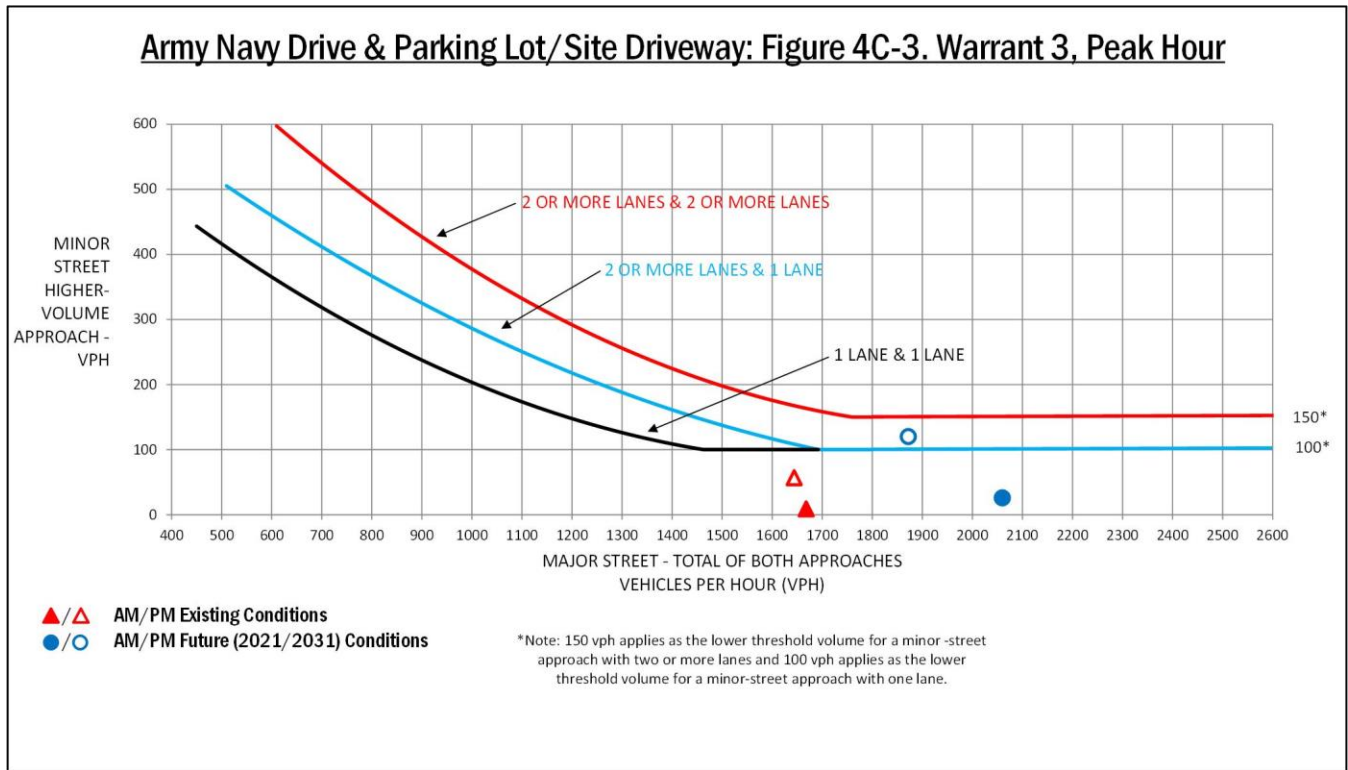


Figure 67: Warrant 3, Peak Hour Vehicle Volume – Army Navy Drive and Parking Lot/Site Driveway

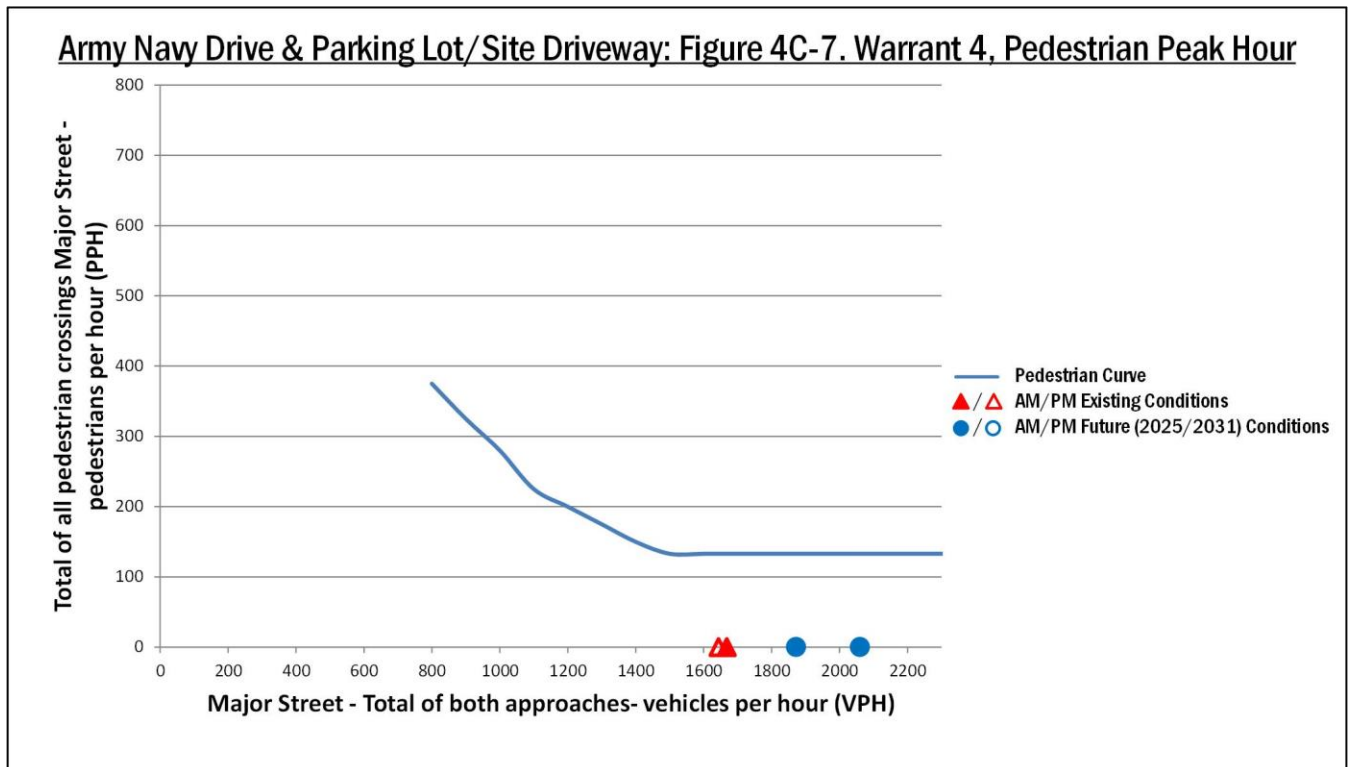


Figure 68: Warrant 4, Pedestrian Peak Hour – Army Navy Drive and Parking Lot/Site Driveway



Figure 69: Warrant 3, Peak Hour Vehicle Volume – S Eads Street and 11<sup>th</sup> Street S/Site Driveway

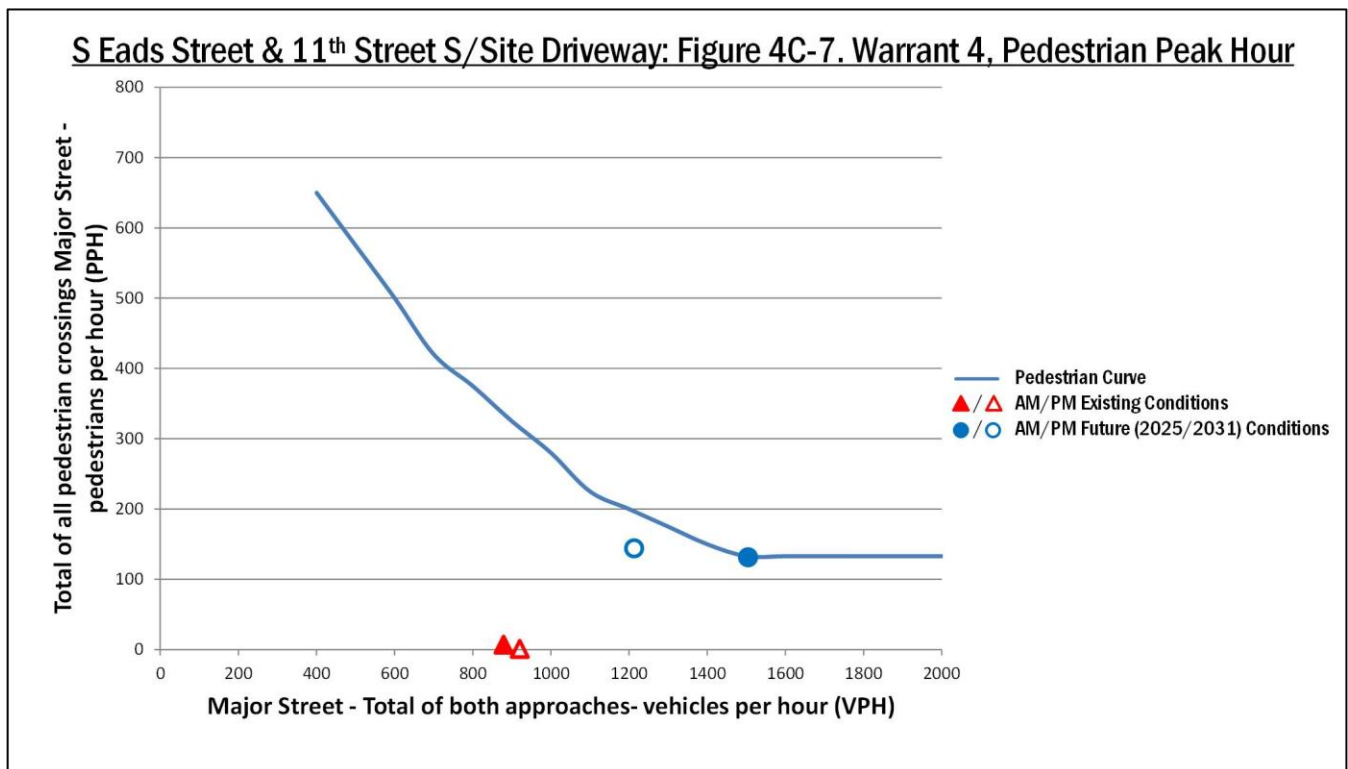


Figure 70: Warrant 4, Pedestrian Peak Hour – S Eads Street and 11<sup>th</sup> Street S/Site Driveway



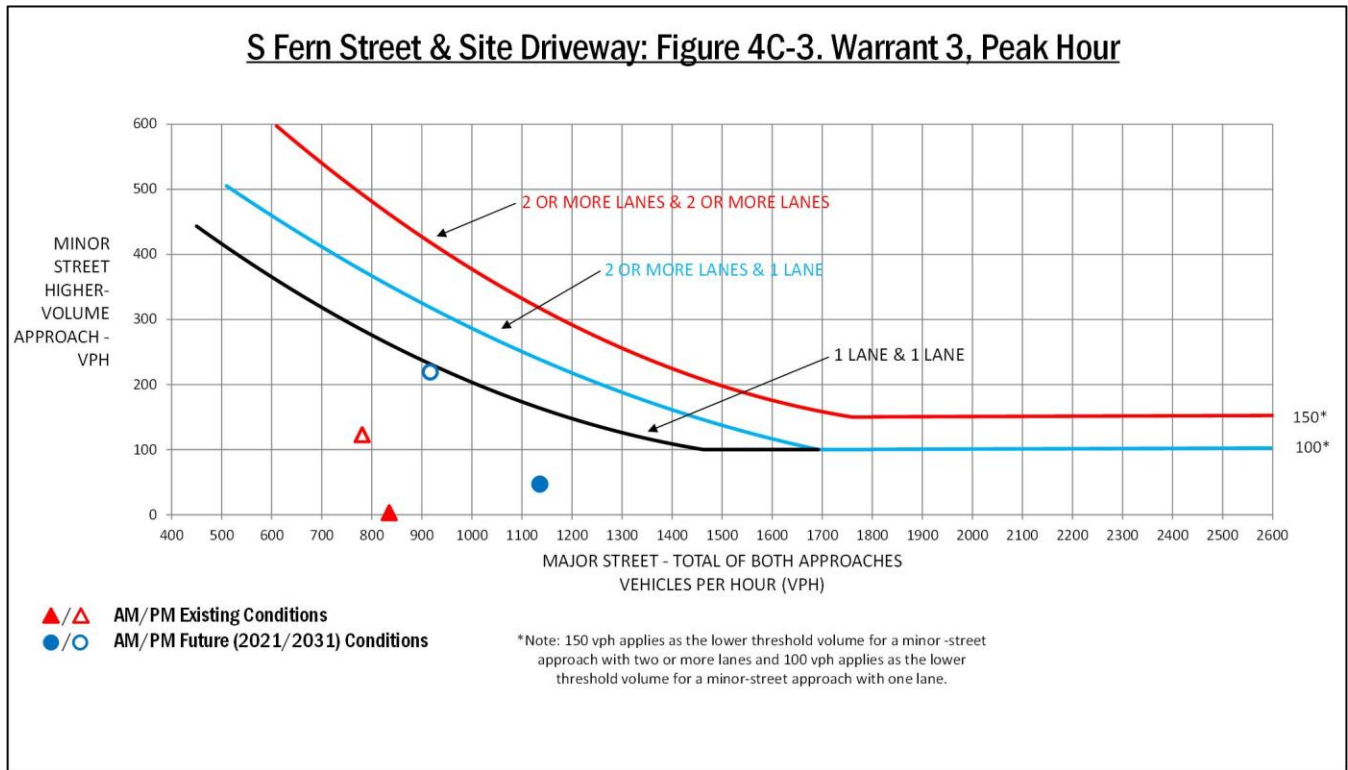


Figure 71: Warrant 3, Peak Hour Vehicle Volume – S Fern Street and Site Driveway

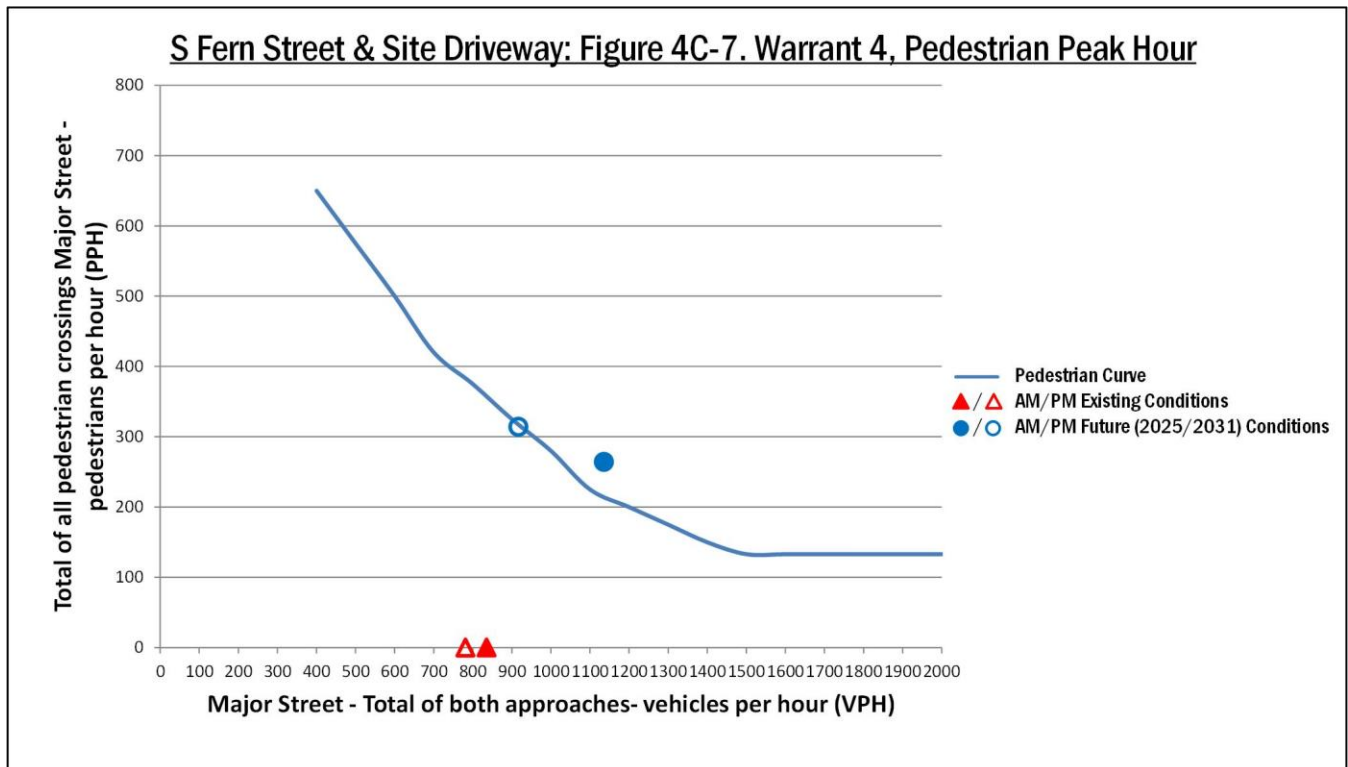


Figure 72: Warrant 4, Pedestrian Peak Hour – S Fern Street and Site Driveway

## Operations Analysis Results

The MOEs used to evaluate the VISSIM microsimulation results were scoped and approved by the County. These MOEs are:

- **Individual Link Vehicular Volumes/Throughput** – measured in vehicles per hour, this metric is used to help identify individual link’s ability to process volumes in each of the analysis scenario, thus identifying issues related to capacity;
- **Simulated Vehicular Travel Times** – measured in seconds, this metric is used to help compare the simulated average amount of time it takes a vehicle to travel between two specified points;
- **Simulated Transit Travel Times along 12<sup>th</sup> Street S Transit Route** – measured in seconds, this metric is used to help compare the simulated average amount of time it takes a transit vehicle to travel between two specified points;
- **Vehicular Delay** – measured in seconds of delay per vehicle, this metric measures the difference between the actual vehicle travel time and its desired travel time.
- **Pedestrian and Bicycle Delay** – measured in seconds of delay per pedestrian/bicycle, this metric measures the difference between the actual pedestrian/bicycle travel time due to stops at a signalized intersection (control delay).

## 2020 Analysis Results

### Simulation Model Development and Existing Calibration

The base VISSIM model provided by Arlington County was reviewed and updated based on the study area characteristics, available data, and VDOT TOSAM criteria. The VISSIM network inputs used for the simulation model development are detailed in the VISSIM Model Recalibration memo approved by Arlington County.

Model calibration is the process of performing adjustments to the model to better simulate local driving behavior and operational performance. The calibration process typically compares field data (volumes, speed, travel time, queue length, etc.) to the simulation output so that the model represents actual traffic conditions in the study area. A model that is appropriately calibrated improves the model’s ability to assess the future conditions of the study area. The calibration criteria were scoped and approved by Arlington County, as outlined in Table 17.

The turning movement volumes at signalized intersections and travel time field measurements, provided by Arlington County, were utilized as metrics to recalibrate the base VISSIM model.

As part of the calibration process, the vehicle routing decisions were combined at some locations to reflect more realistic lane change behavior of drivers. Combining routing decisions were performed on the case-by-case basis during the AM and PM peak periods based on the visual observation of simulated network. Since the volume data for this project was limited to turning movement counts without any origin-destination information, some traffic circulation inside the study area was inevitable. However, considerations were made when combining the routes to prevent unnecessary traffic circulation, where possible.

Some model parameters were adjusted to reflect actual network performance and driver behaviors. The models were run with adjusted parameters and the outputs were examined against field measurements.

The VISSIM modeling calibration used in this analysis met the calibration acceptance targets in 100% of cases, which is consistent with VDOT TOSAM guidance. The approved calibration memo is provided in the Technical Appendix.

### Simulated Vehicular Volumes

Vehicular volume results are used to help identify each scenario’s ability to process vehicular volumes on a macro and micro level. These results are expressed as the number of vehicles denied entry into network, or as individual link vehicular volumes (throughput). Simulated individual link volumes results, also known as throughput results, for the 2020 Existing analysis scenario are included in the Technical Appendix.

### Simulated Vehicular Travel Times

Vehicular travel time is the amount of time it takes for a vehicle to travel from point A to point B. It is a direct reflection of motorist experience. The two (2) vehicular travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound Army Navy Drive from S Joyce Street to 12<sup>th</sup> Street S
2. Westbound Army Navy Drive from 12<sup>th</sup> Street S to S Joyce Street

Simulated travel time results for the two (2) vehicular travel time measurement segments that were analyzed using VISSIM in the 2020 Existing analysis scenario are shown in Table 19 for the AM peak and Table 20 for the PM peak.

### Simulated Vehicular Delay

Simulated vehicular delay results show the difference between the actual vehicle travel time due to stops at a signalized intersection (control delay) and is measured in seconds of delay per vehicle. Tables showing the simulated vehicular delay for study area intersections for the 2020 Existing analysis scenario are included in the Technical Appendix and shown in Table 19 and Table 20. The level of service (LOS) for signalized intersections within the study area under the 2020 Existing scenario is provided in Figure 73 and Figure 74.

Based on the VISSIM results, the majority of intersections operate at acceptable levels of service (LOS E or better) in the 2020 Existing scenario; however, one (1) intersection has one or more approach that operate beyond acceptable thresholds in one or more peak hour:

- S Eads Street & I-395 HOT Lanes (North Node) – AM

### Simulated Bicycle and Pedestrian Delay

Simulated bicycle and pedestrian delay results show the difference between the actual pedestrian/bicycle travel time due to stops at a signalized intersection (control delay) and is measured in seconds of delay per pedestrian/bicycle. For example, a bicycle or pedestrian may experience roughly one minute of wait time at a signalized intersection due to longer cycle lengths or adjustments to signal timings to accommodate additional traffic on the roadway. Tables showing the simulated bicycle and pedestrian delay for study area intersections for the 2020 Existing analysis scenario are included in the Technical Appendix and shown in Table 23. Bicycle delay is reported for the bicycle facilities included in the VISSIM model, as agreed upon during the scoping process, no bicycle facilities are assumed in 2020 Existing.

**Table 17: VISSIM Modeling Calibration Criteria and Results**

| Calibration Criterion <sup>1</sup>              | Calibration Target <sup>1</sup> | Results |         |
|---|---------------------------------|---------|---------|
|   |                                 | AM Peak | PM Peak |
| <b>Simulated Traffic Volume</b>                 |                                 |         |         |
| Within 20% (Flow < 100 veh/h)                   | >85% of cases                   | 100%    | 100%    |
| Within 15% (Flow from 100 veh/h to 1000 veh/h)  | >85% of cases                   | 100%    | 100%    |
| Within 10% (Flow from 1000 veh/h to 5000 veh/h) | >85% of cases                   | 100%    | 100%    |
| Within 500 veh/h (Flow > 5000 veh/h)            | >85% of cases                   | N/A     | N/A     |
| <b>Simulated Travel Time</b>                    |                                 |         |         |
| Within 30% of Observed Travel Times             | >85% of cases                   | 100%    | 100%    |

1) Based on VDOT TOSAM Version 2 Criteria

## 2025 Analysis Results

### Simulated Vehicular Volumes

Vehicular volume results are used to help identify each scenario’s ability to process vehicular volumes on a macro and micro level. These results are expressed as the number of vehicles denied entry into network, or as individual link vehicular volumes (throughput).

Simulated individual link volumes results, also known as throughput results, for the 2020 Existing, 2025 Background, and 2025 Mitigated Future analysis scenarios are included in the Technical Appendix.

### GEH Statistic

The GEH statistic is a formula used in traffic modeling to compare two sets of traffic volumes and indicate whether the model processes enough vehicles in the network to be considered valid. A GEH value that is less than 5 indicates a good fit between the input and simulated volumes. A GEH value between 5 and 10 may require further investigation. A GEH value that is greater than 10 indicates an error in the model. Under 2025 Mitigated Future conditions, all movements operate at acceptable GEH values (GEH value < 5).

### Vehicles Entering the Network

The number of vehicles entered into the network for each of the analysis scenarios is shown in Table 18. The percentage of

vehicles able to enter the network for the 2025 Mitigated Future scenario was evaluated. The proposed mitigations included in the 2025 Mitigated Future scenario, discussed in a later section of this chapter, will create additional capacity at critical locations to allow more vehicles to be processed through the network. The proposed development adds an additional 1,802 vehicles (+6.70%) in the morning peak period and 1,752 vehicles (+5.73%) in the afternoon peak period, increasing the total number of vehicles that needs to be processed through the network. With the recommended mitigations, under the 2025 Mitigated Future scenario, the total number of vehicles processed increases by 1,838 vehicles (+6.85%) and 2,030 vehicles (+6.76%) in the morning and afternoon peak period, respectively.

### Simulated Vehicular Travel Times

Vehicular travel time is the amount of time it takes for a vehicle to travel from point A to point B. It is a direct reflection of motorist experience. The two (2) vehicular travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound Army Navy Drive from S Joyce Street to 12<sup>th</sup> Street S
2. Westbound Army Navy Drive from 12<sup>th</sup> Street S to S Joyce Street

Simulated travel time results for the two (2) vehicular travel time measurement segments that were analyzed using VISSIM in the 2025 Background and 2025 Mitigated Future analysis scenarios are shown in Table 19 for the AM peak and Table 20 for the PM Peak. The travel time along some segments reflect additional local traffic as well as adjustments to the corridor to accommodate a new signal. The 2025 Mitigated Future analysis includes a new signal at the Army Navy Drive and Parking Lot/Site Driveway intersection where the 2025 Background analysis does not.

### Simulated Transit Travel Times

Transit travel time is the amount of time it takes for a transit vehicle to travel from point A to point B. It is a direct reflection of motorist experience. The two (2) transit travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound 12<sup>th</sup> Street S from S Hayes Street to Long Bridge Drive
2. Westbound 12<sup>th</sup> Street S from Long Bridge Drive to S Hayes Street

Simulated travel time results for the two (2) transit travel time measurement segments that were analyzed using VISSIM in the

2025 Background and 2025 Mitigated Future analysis scenarios are shown in Table 19 for the AM peak and Table 20 for the PM Peak. The travel time along some segments reflect additional local traffic as well as adjustments to the corridor to accommodate a new signal.

Due to capacity constraints elsewhere in the network, volumes have been re-routed in PM peak hour under 2025 Mitigated Future conditions. Therefore, the travel times in 2025 Mitigated Future conditions are improved compared to 2025 Background conditions.

### Simulated Vehicular Delay

Simulated vehicular delay results show the difference between the actual vehicle travel time due to stops at a signalized intersection (control delay) and is measured in seconds of delay per vehicle. Tables showing the simulated vehicular delay for study area intersections for the 2025 Background and 2025 Mitigated Future analysis scenarios are included in the Technical Appendix and shown in Table 19 and Table 20. At the majority of intersections in the network, the vehicular delay results under the 2025 Mitigated Future scenario, with added site traffic and recommended mitigation measures, are comparable to that under the 2025 Background scenario. A comparison of the level of service (LOS) between scenarios is provided in Figure 73 and Figure 74 for 2025 Background and 2025 Mitigated Future scenarios.

It is important to note that VISSIM is a microscopic analysis rather than a macroscopic analysis. Mitigation measures are recommended such that the results are comparable or better than the Background conditions throughout the network. The recommended mitigation measures are in place to address targeted issues at specific, as well as increase the vehicular throughput of the overall network, particularly at exterior intersections that are responsible for metering vehicles entering the network. Due to the increased number of vehicles being processed in the network compared to Background conditions, there may be locations where delays are higher than that seen under Background conditions.

#### 2025 Background

Based on the VISSIM results, the majority of intersections operate at acceptable levels of service (LOS E or better) in the 2025 Background scenario; however, four (4) intersections have one or more approach that operate beyond acceptable thresholds in one or more peak hour:

- 12<sup>th</sup> Street S & S Clark Street/Long Bridge Drive – PM
- S Eads Street & 13<sup>th</sup> Street S – PM
- S Eads Street & I-395 HOT Lanes (South Node) – AM
- S Eads Street & 14<sup>th</sup> Street S – PM

#### 2025 Mitigated Future

Based on the VISSIM results, the majority of intersections operate at acceptable levels of service (LOS E or better) in the 2025 Mitigated Future scenario; however, eight (8) intersections have one or more approach that operate beyond acceptable thresholds in one or more peak hour:

- Army Navy Drive & Parking Lot/Site Driveway – PM
- S Eads Street & 12<sup>th</sup> Street S – AM/PM
- 12<sup>th</sup> Street S & S Clark Street/Long Bridge Drive – AM/PM
- S Eads Street & 13<sup>th</sup> Street S – PM
- S Eads Street & I-395 HOT Lanes (South Node) – AM
- S Eads Street & I-395 HOT Lanes (North Node) – AM
- S Eads Street & 14<sup>th</sup> Street S – AM/PM
- S Fern Street & 11<sup>th</sup> Street S/Site Driveway – PM

Most vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. A Transportation Management Plan (TMP) will be provided for the project based on the County's requirements, and a framework for a TMP is included in this report, to further reduce vehicular trips generated by the proposed development during peak period travel times.

#### **Simulated Bicycle and Pedestrian Delay**

Simulated bicycle and pedestrian delay results show the difference between the actual pedestrian/bicycle travel time due

to stops at a signalized intersection (control delay) and is measured in seconds of delay per pedestrian/bicycle. For example, a bicycle or pedestrian may experience roughly one minute of wait time at a signalized intersection due to longer cycle lengths or adjustments to signal timings to accommodate additional traffic on the roadway. Tables showing the simulated bicycle and pedestrian delay for study area intersections for the 2025 Background and 2025 Mitigated Future analysis scenarios are included in the Technical Appendix and shown in Table 23. Note that a number of movements do not report bicycle delays (i.e., along 12<sup>th</sup> Street S where sharrows are planned). Bicycle delay is reported for the bicycle facilities included in the VISSIM model, as agreed upon during the scoping process. Analyzed bicycle facilities include the cycle track along the south side of Army Navy Drive between S Joyce Street and 12<sup>th</sup> Street S, protected bicycle lanes along S Eads Street between Army Navy Drive and 15<sup>th</sup> Street S, and protected bicycle lanes along S Fern Street between Army Navy Drive and 12<sup>th</sup> Street S.

The bicycle and pedestrian delay results under the 2025 Mitigated Future scenario, with added site traffic and recommended mitigation measures, are comparable to that under the 2025 Background scenario.

#### **Evaluation of Recommended Mitigations**

Based on the results of the VISSIM microsimulation analysis, the recommended mitigation measures are detailed in Table 1 and summarized in Figure 1. Tables showing the simulated delay and maximum queues for study area intersections for the 2020 Existing, 2025 Background, and 2025 Mitigated Future analysis scenarios are included in the Technical Appendix. In addition to the mitigation measures below, the analysis includes protected northbound and southbound bike lanes along S Fern Street and S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S.

**Table 18: Number Vehicles Entered into Network (2025)**

|   | Background (2025) |              | Mitigated Future (2025) |              |
|---|-------------------|--------------|-------------------------|--------------|
|   | AM Peak Hour      | PM Peak Hour | AM Peak Hour            | PM Peak Hour |
| Total Vehicle Input (veh/2 hrs)                     | 26,904            | 30,590       | 28,706                  | 32,342       |
| Number of Vehicles Entered into Network (veh/2 hrs) | 26,820            | 30,036       | 28,658                  | 32,066       |
| Percent Vehicles Entered (%)                        | 99.69%            | 98.19%       | 99.83%                  | 99.15%       |

**Table 19: AM Peak Hour Simulated Travel Time Results (2025)**

| Travel Time Segment                                      | Travel Time (sec) |                   |                         | Difference* (sec) |
|--|-------------------|-------------------|-------------------------|-------------------|
|  | Existing (2020)   | Background (2025) | Mitigated Future (2025) |                   |
| <b>Vehicular Travel Time</b>                             |                   |                   |                         |                   |
| EB Army Navy Dr from S Joyce St to 12 <sup>th</sup> St S | 339               | 219               | 226                     | +7                |
| WB Army Navy Dr from 12 <sup>th</sup> St S to S Joyce St | 159               | 196               | 191                     | -5                |
| <b>Transit Travel Time</b>                               |                   |                   |                         |                   |
| EB 12 <sup>th</sup> St from S Hayes St to Long Bridge Dr | --                | 222               | 214                     | -8                |
| WB 12 <sup>th</sup> St from Long Bridge Dr to S Hayes St | --                | 170               | 177                     | +7                |

\* Difference from Background (2025) scenario

**Table 20: PM Peak Hour Simulated Travel Time Results (2025)**

| Travel Time Segment  | Travel Time (sec) |                   |                         | Difference* (sec) |
|--|-------------------|-------------------|-------------------------|-------------------|
|  | Existing (2020)   | Background (2025) | Mitigated Future (2025) |                   |
| <b>Vehicular Travel Time</b>                               |                   |                   |                         |                   |
| EB Army Navy Dr from S Joyce St to 12 <sup>th</sup> St S   | 178               | 232               | 281                     | +49               |
| WB Army Navy Dr from 12 <sup>th</sup> St S to S Joyce St   | 185               | 259               | 261                     | +2                |
| <b>Transit Travel Time</b>                                 |                   |                   |                         |                   |
| EB 12 <sup>th</sup> St S from S Hayes St to Long Bridge Dr | --                | 237               | 181                     | -56               |
| WB 12 <sup>th</sup> St S from Long Bridge Dr to S Hayes St | --                | 256               | 171                     | -85               |

\* Difference from Background (2025) scenario

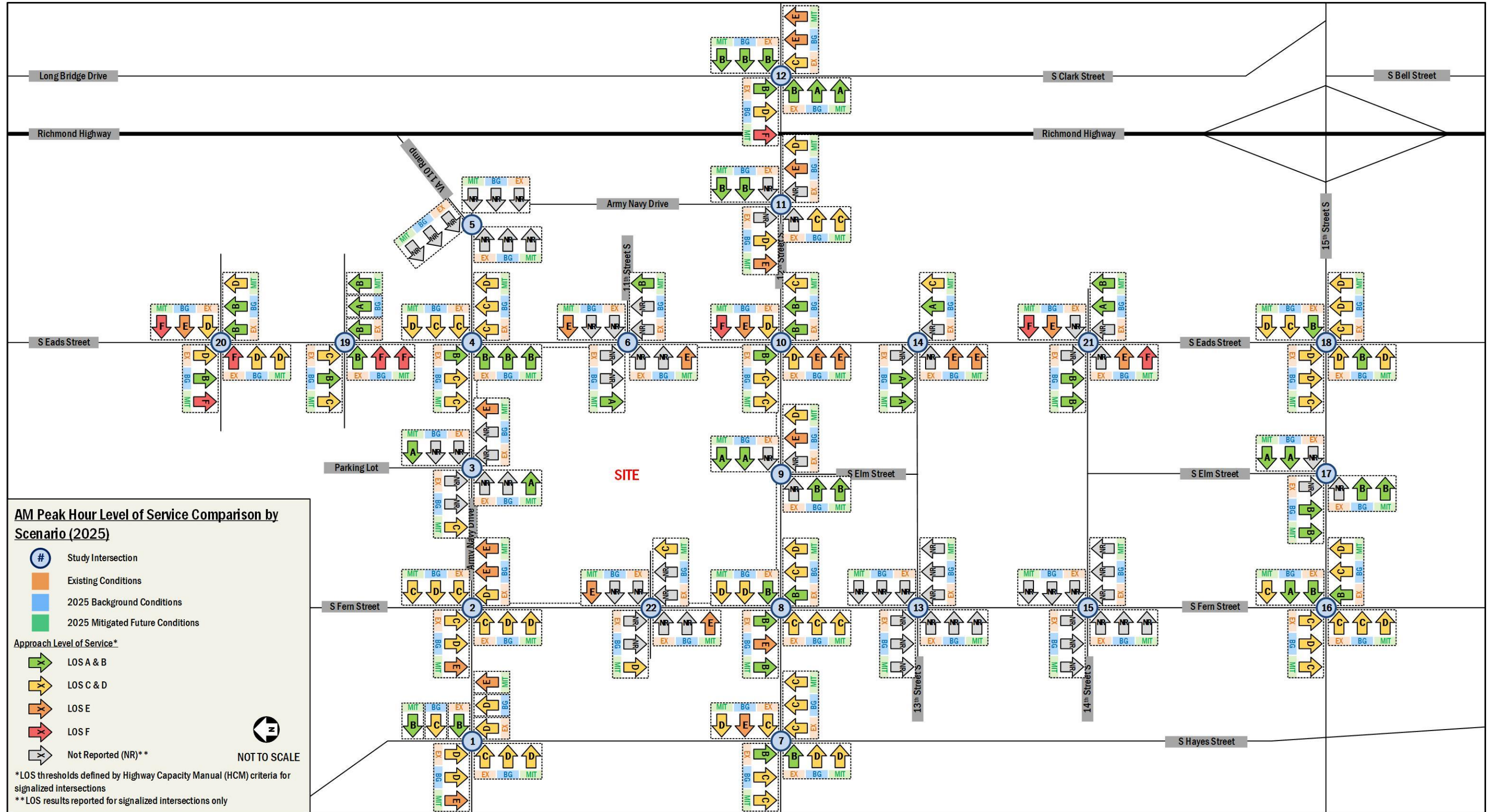


Figure 73: AM Peak Hour Level of Service Comparison by Scenario (2025)

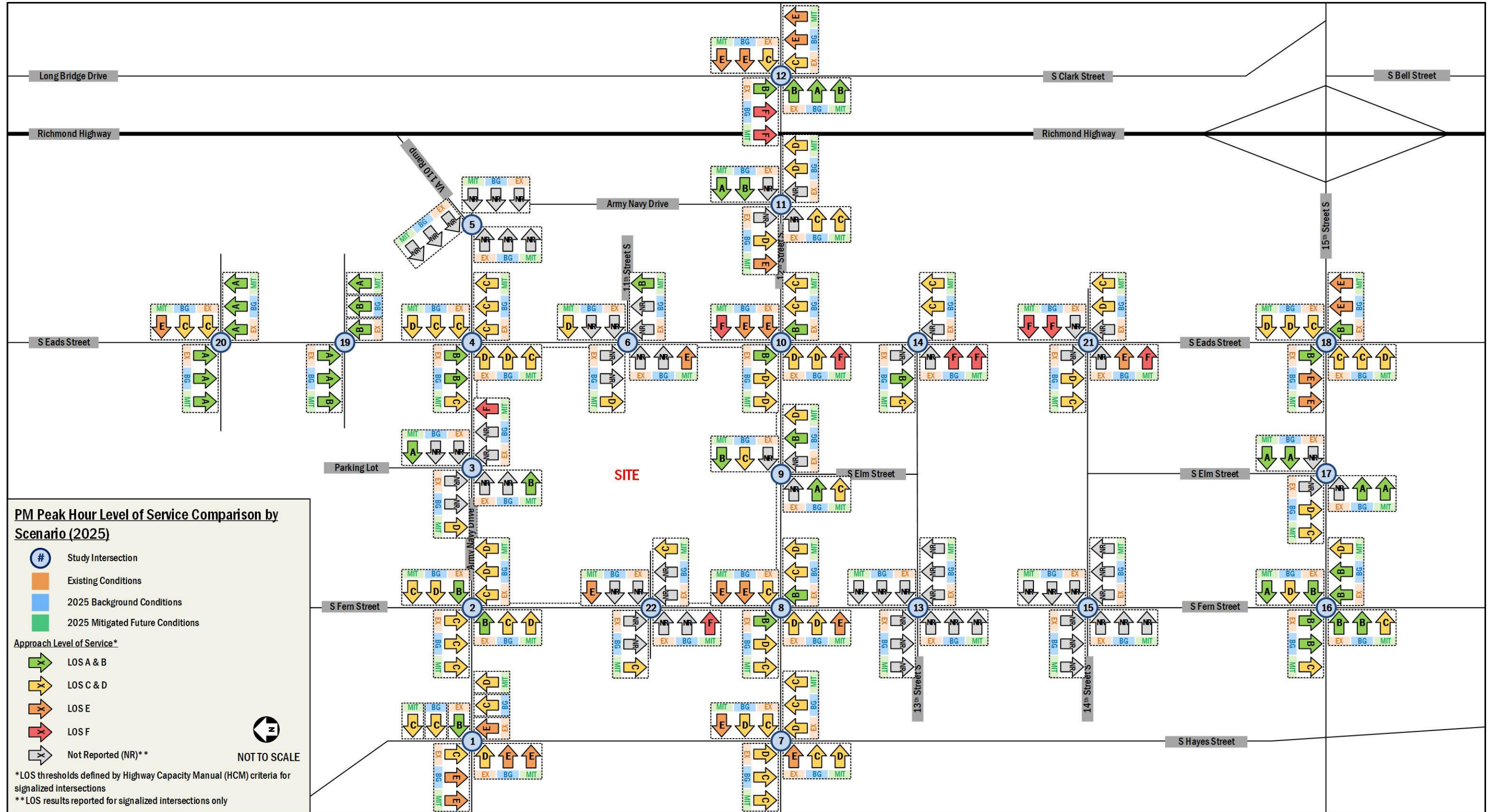


Figure 74: PM Peak Hour Level of Service Comparison by Scenario (2025)



**Table 21: AM Vehicular Delay and Maximum Queue Length (2025)**

| Intersection and Lane Group                    | Storage Length (ft) | AM Peak Hour                         |                     |                  |  |                     |                  |         |          |          |          |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|---------|----------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |         |          |          |          |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |         |          |          |          |
| <b>1. S Hayes Street &amp; Army Navy Drive</b> |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 260                 | 84                                   | 104                 | 110              | 30.8 (C)   | 82.6 (F)            | 77.8 (E)         |         |          |          |          |
| Eastbound Thru                                 | 450                 | 232                                  | 252                 | 278              | 36 (D)   | 52.1 (D)            | 51.6 (D)         |         |          |          |          |
| Eastbound Right                                | 450                 | 256                                  | 252                 | 278              | 32.1 (C)   | 47 (D)              | 54.3 (D)         |         |          |          |          |
| Westbound Left                                 | 190                 | 116                                  | 334                 | 182              | 24.9 (C)   | 185.4 (F)           | 79.7 (E)         |         |          |          |          |
| Westbound Thru                                 | 430                 | 136                                  | 199                 | 188              | 35.7 (D)   | 43.3 (D)            | 37.2 (D)         |         |          |          |          |
| Westbound Right                                | 430                 | 58                                   | 28                  | 38               | 0.5 (A)  | 1 (A)               | 0.5 (A)          |         |          |          |          |
| Northbound Left                                | 200                 | 133                                  | 213                 | 120              | 47 (D)   | 77 (E)              | 74.9 (E)         |         |          |          |          |
| Northbound Thru                                | 750                 | 153                                  | 185                 | 300              | 56.8 (E)   | 37.6 (D)            | 65.5 (E)         |         |          |          |          |
| Northbound Right                               | 115                 | 99                                   | 192                 | 176              | 9 (A)  | 36.8 (D)            | 18.4 (B)         |         |          |          |          |
| Southbound Left                                | 2050                | 952                                  | 3,785               | 2,625            | 52.7 (D)   | 131 (F)             | 110.9 (F)        |         |          |          |          |
| Southbound Thru                                | 1950                | 952                                  | 3,785               | 2,625            | 33.8 (C)   | 30.6 (C)            | 51.9 (D)         |         |          |          |          |
| Southbound Right                               | 1950                | 353                                  | 3,784               | 2,622            | 8.3 (A)  | 17.9 (B)            | 34.9 (C)         |         |          |          |          |
| Overall  | ---                 | ---                                  | ---                 | ---              | 32.3 (C)   | 47.5 (D)            | 56.3 (E)         |         |          |          |          |
| <b>2. S Fern Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 160                 | 156                                  | 132                 | 138              | 26.8 (C)   | 32.5 (C)            | 31 (C)           |         |          |          |          |
| Eastbound Thru                                 | 430                 | 421                                  | 414                 | 597              | 26.5 (C)   | 42.2 (D)            | 40.2 (D)         |         |          |          |          |
| Eastbound Right                                | 180                 | 153                                  | 254                 | 544              | 6.2 (A)  | 33.1 (C)            | 45.1 (D)         |         |          |          |          |
| Westbound Left                                 | 80                  | 312                                  | 346                 | 311              | 52.6 (D)   | 121.3 (F)           | 125.3 (F)        |         |          |          |          |
| Westbound Thru                                 | 260                 | 312                                  | 346                 | 311              | 21.1 (C)   | 31.7 (C)            | 9.5 (A)          |         |          |          |          |
| Westbound Right                                | 260                 | 317                                  | 350                 | 315              | 17.2 (B)   | 32.1 (C)            | 10.4 (B)         |         |          |          |          |
| Northbound Left                                | 280                 | 231                                  | 299                 | 275              | 45.8 (D)   | 68.5 (E)            | 67.1 (E)         |         |          |          |          |
| Northbound Thru                                | 390                 | 67                                   | 105                 | 53               | 27.5 (C)   | 50 (D)              | 24.8 (C)         |         |          |          |          |
| Northbound Right                               | 80                  | 75                                   | 105                 | 70               | 7.5 (A)  | 51.6 (D)            | 31.4 (C)         |         |          |          |          |
| Southbound Left                                | 75                  | 185                                  | 253                 | 388              | 31.8 (C)   | 44.2 (D)            | 51.8 (D)         |         |          |          |          |
| Southbound Thru                                | 560                 | 208                                  | 277                 | 433              | 27 (C)   | 45.5 (D)            | 54.2 (D)         |         |          |          |          |
| Southbound Right                               | 560                 | 215                                  | 284                 | 432              | 17.4 (B)   | 34.4 (C)            | 62.4 (E)         |         |          |          |          |
| Overall  | ---                 | ---                                  | ---                 | ---              | 26.1 (C)   | 43.7 (D)            | 42.1 (D)         |         |          |          |          |
| <b>3. Army Navy Drive &amp; Parking Lot</b>    |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 120                 |                                      |                     | 376              |  |                     | 2.6 (A)          |         |          |          |          |
| Eastbound Thru                                 | 260                 |                                      |                     | 376              |  |                     | 2.5 (A)          |         |          |          |          |
| Eastbound Right                                | 225                 |                                      |                     | 376              |  |                     | 60 (E)           |         |          |          |          |
| Westbound Thru                                 | 230                 |                                      |                     | 215              |  |                     | 3.7 (A)          |         |          |          |          |
| Westbound Right                                | 230                 |                                      |                     | 232              |  |                     | 4.6 (A)          |         |          |          |          |
| Northbound Left                                | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 86               | <i>Un-signalized</i>   | <i>Unsignalized</i> | 75.3 (E)         |         |          |          |          |
| Northbound Thru                                | 100                 |                                      |                     | 89               |  |                     | 0 (A)            |         |          |          |          |
| Northbound Right                               | 100                 |                                      |                     | 86               |  |                     | 73.4 (E)         |         |          |          |          |
| Southbound Left                                | 100                 |                                      |                     | 51               |  |                     | 71.9 (E)         |         |          |          |          |
| Southbound Thru                                | 100                 |                                      |                     | 51               |  |                     | 0 (A)            |         |          |          |          |
| Southbound Right                               | 100                 |                                      |                     | 56               |  |                     | 16.7 (B)         |         |          |          |          |
| Overall  | ---                 |                                      |                     | ---              |  |                     | ---              | 6.5 (A) |          |          |          |
| <b>4. S Eads Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 220                 |                                      |                     | 332              |  |                     | 310              | 235     | 24.2 (C) | 21.3 (C) | 20.5 (C) |
| Eastbound Thru                                 | 220                 |                                      |                     | 331              |  |                     | 309              | 236     | 16.7 (B) | 10.9 (B) | 12.8 (B) |
| Eastbound Right                                | 220                 | 359                                  | 297                 | 234              | 7.9 (A)  | 16.3 (B)            | 18 (B)           |         |          |          |          |
| Westbound Thru                                 | 1100                | 181                                  | 170                 | 184              | 48.9 (D)   | 31.8 (C)            | 55.5 (E)         |         |          |          |          |
| Westbound Right                                | 100                 | 181                                  | 180                 | 194              | 30.6 (C)   | 11.8 (B)            | 20.3 (C)         |         |          |          |          |

| Intersection and Lane Group                  | Storage Length (ft) | AM Peak Hour                         |                     |                  |  |                     |                  |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |
| Northbound Left                              | 100                 | 191                                  | 321                 | 262              | 18 (B)   | 36.4 (D)            | 71.3 (E)         |
| Northbound Thru                              | 240                 | 299                                  | 321                 | 274              | 35.4 (D)   | 25.9 (C)            | 14.5 (B)         |
| Northbound Right                             | 240                 | 299                                  | 321                 | 274              | 32.1 (C)   | 26.1 (C)            | 11.4 (B)         |
| Southbound Left                              | 140                 | 302                                  | 352                 | 357              | 32.1 (C)   | 35.2 (D)            | 26.9 (C)         |
| Southbound Thru                              | 140                 | 298                                  | 352                 | 357              | 30.2 (C)   | 41.4 (D)            | 37.2 (D)         |
| Southbound Right                             | 110                 | 298                                  | 352                 | 367              | 32.9 (C)   | 20.6 (C)            | 7 (A)            |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 6.3 (A)  | 25.1 (C)            | 26.4 (C)         |
| <b>5. Army Navy Drive &amp; 110 Ramp</b>     |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | ---                 |                                      |                     | 0                |  |                     | 0.1 (A)          |
| Westbound Thru                               | 1000                | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 111              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 3.2 (A)          |
| Southbound Right                             | 900                 |                                      |                     | 0                |  |                     | 2.1 (A)          |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 1.3 (A)          |
| <b>6. S Eads Street &amp; 11th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 200                 |                                      |                     | 105              |  |                     | 56.9 (E)         |
| Eastbound Thru                               | 200                 |                                      |                     | 105              |  |                     | 0 (A)            |
| Eastbound Right                              | 200                 |                                      |                     | 105              |  |                     | 53.2 (D)         |
| Westbound Left                               | 300                 |                                      |                     | 112              |  |                     | 60.7 (E)         |
| Westbound Thru                               | 300                 |                                      |                     | 112              |  |                     | 0 (A)            |
| Westbound Right                              | 300                 |                                      |                     | 112              |  |                     | 57.6 (E)         |
| Northbound Left                              | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 254              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 17.4 (B)         |
| Northbound Thru                              | 250                 |                                      |                     | 243              |  |                     | 9.2 (A)          |
| Northbound Right                             | 250                 |                                      |                     | 246              |  |                     | 7.3 (A)          |
| Southbound Left                              | 250                 |                                      |                     | 362              |  |                     | 11.7 (B)         |
| Southbound Thru                              | 250                 |                                      |                     | 362              |  |                     | 10.3 (B)         |
| Southbound Right                             | 25                  |                                      |                     | 365              |  |                     | 6.5 (A)          |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 14.2 (B)         |
| <b>7. S Hayes Street &amp; 12th Street S</b> |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 450                 | 95                                   | 145                 | 134              | 30.3 (C)   | 51.3 (D)            | 53.5 (D)         |
| Eastbound Thru                               | 450                 | 95                                   | 145                 | 134              | 27.8 (C)   | 42.6 (D)            | 39.8 (D)         |
| Eastbound Right                              | 65                  | 94                                   | 143                 | 132              | 5.3 (A)  | 47.9 (D)            | 49.6 (D)         |
| Westbound Left                               | 100                 | 161                                  | 240                 | 191              | 31.6 (C)   | 73.5 (E)            | 60 (E)           |
| Westbound Thru                               | 620                 | 161                                  | 240                 | 191              | 27.8 (C)   | 65.1 (E)            | 51.5 (D)         |
| Westbound Right                              | 620                 | 171                                  | 240                 | 191              | 12.5 (B)   | 67.8 (E)            | 51.9 (D)         |
| Northbound Left                              | 75                  | 125                                  | 172                 | 182              | 59.2 (E)   | 73.3 (E)            | 75.7 (E)         |
| Northbound Thru                              | 775                 | 125                                  | 172                 | 182              | 21.1 (C)   | 24 (C)              | 28.4 (C)         |
| Northbound Right                             | 75                  | 129                                  | 176                 | 187              | 5.8 (A)  | 10 (A)              | 11.3 (B)         |
| Southbound Left                              | 250                 | 499                                  | 497                 | 497              | 71 (E)   | 57.7 (E)            | 65.6 (E)         |
| Southbound Thru                              | 770                 | 499                                  | 497                 | 497              | 7.1 (A)  | 26.7 (C)            | 13.7 (B)         |
| Southbound Right                             | 770                 | 506                                  | 497                 | 497              | 1.9 (A)  | 28.5 (C)            | 15.9 (B)         |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 22.9 (C)   | 35.8 (D)            | 30.6 (C)         |
| <b>8. S Fern Street &amp; 12th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | 640                 | 373                                  | 551                 | 589              | 31.4 (C)   | 33 (C)              | 30.5 (C)         |
| Eastbound Right                              | 640                 | 373                                  | 560                 | 598              | 28.6 (C)   | 31.3 (C)            | 28.7 (C)         |
| Westbound Left                               | 75                  | 379                                  | 193                 | 238              | 26 (C)   | 83.9 (F)            | 87.3 (F)         |
| Westbound Thru                               | 225                 | 126                                  | 193                 | 242              | 31.7 (C)   | 15.1 (B)            | 4.8 (A)          |
| Westbound Right                              | 225                 | 126                                  | 202                 | 241              | 19.3 (B)   | 8.4 (A)             | 8.3 (A)          |
| Northbound Left                              | 100                 | 135                                  | 403                 | 425              | 11.5 (B)   | 43.5 (D)            | 42.3 (D)         |
| Northbound Thru                              | 280                 | 257                                  | 370                 | 383              | 21 (C)   | 34.1 (C)            | 50.1 (D)         |

| Intersection and Lane Group                                  | Storage Length (ft) | AM Peak Hour                         |            |                  |  |            |                  |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |
| Northbound Right   | 280                 | 257                                  | 369        | 383              | 10.6 (B)   | 28.3 (C)   | 45.7 (D)         |
| Southbound Left  | 130                 | 257                                  | 517        | 345              | 10.1 (B)   | 70.4 (E)   | 55.2 (E)         |
| Southbound Thru  | 275                 | 415                                  | 517        | 426              | 19.3 (B)   | 59.6 (E)   | 18.2 (B)         |
| Southbound Right   | 275                 | 415                                  | 523        | 426              | 15.5 (B)   | 56 (E)     | 14.9 (B)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 14 (B)   | 43.5 (D)   | 37.1 (D)         |
| <b>9. S Elm Street &amp; 12th Street S</b>                   |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 225                 |                                      | 398        | 349              |  | 15.3 (B)   | 17.3 (B)         |
| Eastbound Right  | 225                 | <i>Un-signalized</i>                 | 390        | 351              | <i>Un-signalized</i>   | 8.1 (A)    | 14.5 (B)         |
| Westbound Thru   | 325                 |                                      | 67         | 56               |  | 1.2 (A)    | 0.9 (A)          |
| Northbound Right   | 270                 |                                      | 125        | 95               |  | 59.5 (E)   | 45 (D)           |
| Overall  | ---                 |                                      | ---        | ---              |  | ---        | 13.8 (B)         |
| <b>10. S Eads Street &amp; 12th Street S</b>                 |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 150                 | 413                                  | 380        | 384              | 38.3 (D)   | 112.5 (F)  | 106 (F)          |
| Eastbound Thru   | 320                 | 413                                  | 380        | 384              | 40.4 (D)   | 66.9 (E)   | 67.2 (E)         |
| Eastbound Right  | 320                 | 417                                  | 380        | 384              | 36.8 (D)   | 70.8 (E)   | 67.1 (E)         |
| Westbound Left   | 200                 | 231                                  | 244        | 445              | 63.7 (E)   | 85.3 (F)   | 95.2 (F)         |
| Westbound Thru   | 575                 | 231                                  | 244        | 445              | 33.8 (C)   | 65.3 (E)   | 87.9 (F)         |
| Westbound Right  | 575                 | 231                                  | 244        | 445              | 38.4 (D)   | 69.4 (E)   | 88.3 (F)         |
| Northbound Left  | 100                 | 195                                  | 341        | 368              | 17.6 (B)   | 24.7 (C)   | 33.8 (C)         |
| Northbound Thru  | 270                 | 195                                  | 341        | 368              | 11.2 (B)   | 17 (B)     | 29.1 (C)         |
| Northbound Right   | 100                 | 199                                  | 345        | 259              | 10.3 (B)   | 9.8 (A)    | 11.6 (B)         |
| Southbound Left  | 120                 | 343                                  | 339        | 302              | 20.5 (C)   | 23.6 (C)   | 33.4 (C)         |
| Southbound Thru  | 250                 | 343                                  | 339        | 302              | 19.1 (B)   | 21.4 (C)   | 13.7 (B)         |
| Southbound Right   | 250                 | 342                                  | 344        | 301              | 18.2 (B)   | 20.9 (C)   | 11 (B)           |
| Overall  | ---                 | ---                                  | ---        | ---              | 31 (C)   | 39.6 (D)   | 43.1 (D)         |
| <b>11. 12th Street S &amp; Army Navy Drive</b>               |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 575                 |                                      | 598        | 647              |  | 21.7 (C)   | 28 (C)           |
| Eastbound Right  | 575                 |                                      | 609        | 647              |  | 17.6 (B)   | 30.4 (C)         |
| Westbound Thru   | 120                 |                                      | 236        | 232              |  | 11.7 (B)   | 14.6 (B)         |
| Westbound Right  | 120                 |                                      | 236        | 232              |  | 16 (B)     | 15.2 (B)         |
| Northbound Left  | 50                  | <i>Un-signalized</i>                 | 62         | 57               | <i>Un-signalized</i>   | 0 (A)      | 0 (A)            |
| Northbound Thru  | 50                  |                                      | 62         | 57               |  | 62.7 (E)   | 61.5 (E)         |
| Northbound Right   | 50                  |                                      | 62         | 57               |  | 56.6 (E)   | 51.9 (D)         |
| Southbound Left  | 1000                |                                      | 243        | 268              |  | 43.8 (D)   | 60.2 (E)         |
| Southbound Thru  | 1000                |                                      | 243        | 268              |  | 0 (A)      | 0 (A)            |
| Southbound Right   | 1000                |                                      | 243        | 268              |  | 44.4 (D)   | 62.4 (E)         |
| Overall  | ---                 | ---                                  | ---        | ---              | ---  | 25.2 (C)   | 32.7 (C)         |
| <b>12. S Clark Street/Long Bridge Dr &amp; 12th Street S</b> |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 120                 | 259                                  | 210        | 215              | 23 (C)   | 4.6 (A)    | 5.4 (A)          |
| Eastbound Thru   | 120                 | 259                                  | 210        | 215              | 13.5 (B)   | 2 (A)      | 2.5 (A)          |
| Eastbound Right  | 120                 | 260                                  | 210        | 215              | 7.2 (A)  | 2.9 (A)    | 3.1 (A)          |
| Westbound Left   | 100                 | 64                                   | 76         | 74               | 15.3 (B)   | 22.4 (C)   | 21.5 (C)         |
| Westbound Thru   | 1500                | 365                                  | 355        | 323              | 13.5 (B)   | 25.8 (C)   | 26 (C)           |
| Westbound Right  | 1500                | 368                                  | 366        | 334              | 13.2 (B)   | 9.8 (A)    | 10.6 (B)         |
| Northbound Left  | 100                 | 86                                   | 136        | 138              | 26.7 (C)   | 67.3 (E)   | 69.3 (E)         |
| Northbound Thru  | 1200                | 67                                   | 136        | 138              | 20.6 (C)   | 43 (D)     | 46.2 (D)         |
| Northbound Right   | 1200                | 69                                   | 141        | 143              | 10.4 (B)   | 21.4 (C)   | 18.8 (B)         |
| Southbound Left  | 450                 | 195                                  | 450        | 870              | 24 (C)   | 54.7 (D)   | 82.7 (F)         |

| Intersection and Lane Group                  | Storage Length (ft) | AM Peak Hour                         |            |                  |  |            |                  |          |          |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |          |          |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |          |          |
| Southbound Thru                              | 450                 | 195                                  | 450        | 870              | 22.1 (C)   | 52.3 (D)   | 80.2 (F)         |          |          |
| Southbound Right                             | 150                 | 80                                   | 326        | 870              | 7.1 (A)  | 56.8 (E)   | 91.1 (F)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 17.4 (B)   | 17.9 (B)   | 24.9 (C)         |          |          |
| <b>14. S Eads Street &amp; 13th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 350                 |                                      | 185        | 198              |  | 61.7 (E)   | 72.6 (E)         |          |          |
| Eastbound Right                              | 350                 |                                      | 185        | 198              |  | 58.2 (E)   | 56.7 (E)         |          |          |
| Northbound Left                              | 150                 | <i>Un-signalized</i>                 | 294        | 427              | <i>Un-signalized</i>   | 1.8 (A)    | 8.9 (A)          |          |          |
| Northbound Thru                              | 300                 |                                      | 294        | 427              |  | 2.8 (A)    | 23.4 (C)         |          |          |
| Southbound Thru                              | 280                 |                                      | 152        | 167              |  | 4.7 (A)    | 5.6 (A)          |          |          |
| Southbound Right                             | 280                 |                                      | 154        | 169              |  | 2.3 (A)    | 3 (A)            |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 10.6 (B)         | 20.3 (C) |          |
| <b>16. S Fern Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 130                 |                                      | 338        | 280              |  | 297        | 21.2 (C)         | 23.5 (C) | 43.6 (D) |
| Eastbound Thru                               | 630                 | 338                                  | 280        | 297              | 29.7 (C)   | 24.7 (C)   | 38.1 (D)         |          |          |
| Eastbound Right                              | 630                 | 340                                  | 282        | 299              | 17.2 (B)   | 22.4 (C)   | 31 (C)           |          |          |
| Westbound Left                               | 120                 | 114                                  | 122        | 243              | 21.1 (C)   | 14.7 (B)   | 34.5 (C)         |          |          |
| Westbound Thru                               | 260                 | 114                                  | 122        | 243              | 11.8 (B)   | 8.2 (A)    | 23.8 (C)         |          |          |
| Westbound Right                              | 260                 | 116                                  | 124        | 246              | 6.2 (A)  | 5.2 (A)    | 20.2 (C)         |          |          |
| Northbound Left                              | 750                 | 266                                  | 467        | 840              | 19.8 (B)   | 49.9 (D)   | 62.9 (E)         |          |          |
| Northbound Thru                              | 750                 | 266                                  | 467        | 840              | 16.9 (B)   | 47 (D)     | 68.2 (E)         |          |          |
| Northbound Right                             | 75                  | 272                                  | 472        | 845              | 8.4 (A)  | 19.7 (B)   | 34.7 (C)         |          |          |
| Southbound Left                              | 160                 | 214                                  | 295        | 331              | 30.2 (C)   | 64.6 (E)   | 41.6 (D)         |          |          |
| Southbound Thru                              | 300                 | 214                                  | 295        | 331              | 16 (B)   | 42.3 (D)   | 25.7 (C)         |          |          |
| Southbound Right                             | 300                 | 229                                  | 309        | 336              | 10.8 (B)   | 19.9 (B)   | 11.5 (B)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 20.3 (C)   | 27.9 (C)   | 37.2 (D)         |          |          |
| <b>17. 15th Street S &amp; S Elm Street</b>  |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 60                  |                                      | 359        | 325              |  | 12 (B)     | 9.1 (A)          |          |          |
| Eastbound Thru                               | 270                 |                                      | 359        | 325              |  | 13.7 (B)   | 12.2 (B)         |          |          |
| Westbound Thru                               | 300                 | <i>Un-signalized</i>                 | 145        | 136              | <i>Un-signalized</i>   | 4 (A)      | 1.5 (A)          |          |          |
| Westbound Right                              | 300                 |                                      | 145        | 136              |  | 4.7 (A)    | 2.1 (A)          |          |          |
| Southbound Left                              | 250                 |                                      | 55         | 61               |  | 43.5 (D)   | 44.5 (D)         |          |          |
| Southbound Right                             | 250                 |                                      | 66         | 72               |  | 8.2 (A)    | 10 (A)           |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 10.2 (B)         | 8 (A)    |          |
| <b>18. S Eads Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 170                 | 345                                  | 271        | 339              | 31.1 (C)   | 27.6 (C)   | 46.8 (D)         |          |          |
| Eastbound Thru                               | 300                 | 413                                  | 369        | 411              | 46.8 (D)   | 17.7 (B)   | 44.9 (D)         |          |          |
| Eastbound Right                              | 300                 | 418                                  | 369        | 411              | 8.6 (A)  | 21.1 (C)   | 44.5 (D)         |          |          |
| Westbound Left                               | 300                 | 169                                  | 374        | 489              | 38.1 (D)   | 75.4 (E)   | 33.1 (C)         |          |          |
| Westbound Thru                               | 300                 | 169                                  | 374        | 489              | 15.8 (B)   | 25.7 (C)   | 43.5 (D)         |          |          |
| Westbound Right                              | 300                 | 181                                  | 374        | 489              | 12.7 (B)   | 33.8 (C)   | 59.2 (E)         |          |          |
| Northbound Left                              | 130                 | 335                                  | 895        | 927              | 24 (C)   | 46.2 (D)   | 43.8 (D)         |          |          |
| Northbound Thru                              | 760                 | 335                                  | 895        | 927              | 20.1 (C)   | 57.9 (E)   | 54.5 (D)         |          |          |
| Northbound Right                             | 130                 | 399                                  | 836        | 920              | 20.5 (C)   | 29.8 (C)   | 28.3 (C)         |          |          |
| Southbound Left                              | 250                 | 377                                  | 322        | 324              | 89.7 (F)   | 41.3 (D)   | 43.2 (D)         |          |          |
| Southbound Thru                              | 300                 | 345                                  | 322        | 324              | 27 (C)   | 34 (C)     | 23.6 (C)         |          |          |
| Southbound Right                             | 75                  | 348                                  | 326        | 327              | 26.9 (C)   | 12.5 (B)   | 8.9 (A)          |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 34 (C)   | 32.5 (C)   | 43.4 (D)         |          |          |

| Intersection and Lane Group                             | Storage Length (ft) | AM Peak Hour                         |                            |                  |  |                            |                  |
|---|---------------------|--------------------------------------|----------------------------|------------------|--|----------------------------|------------------|
|   |                     | Average of Maximum Queue Length (ft) |                            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                            |                  |
|   |                     | Existing                             | Background                 | Mitigated Future | Existing   | Background                 | Mitigated Future |
| <b>19. S Eads Street &amp; I-395 Ramps (South Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Thru  | 1000                | 199                                  | 973                        | 934              | 34.5 (C)   | 80.6 (F)                   | 56.7 (E)         |
| Eastbound Right   | 1000                | 243                                  | 973                        | 934              | 12.1 (B)   | 167.6 (F)                  | 102.6 (F)        |
| Northbound Left   | 150                 | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Northbound Thru   | 170                 | 148                                  | 193                        | 226              | 19.3 (B)   | 9.8 (A)                    | 49.5 (D)         |
| Northbound Right  | 170                 | 206                                  | 250                        | 285              | 10.8 (B)   | 7.1 (A)                    | 7.2 (A)          |
| Southbound Left   | 100                 | 197                                  | 197                        | 234              | 33.8 (C)   | 3.1 (A)                    | 11 (B)           |
| Southbound Thru   | 100                 | 194                                  | 194                        | 234              | 9 (A)  | 29.7 (C)                   | 43 (D)           |
| Overall   | ---                 | ---                                  | ---                        | ---              | 14.3 (B)   | 59.1 (E)                   | 47.2 (D)         |
| <b>20. S Eads Street &amp; I-395 Ramps (North Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 875                 | 1,217                                | 480                        | 481              | 120.2 (F)  | 49.3 (D)                   | 50.9 (D)         |
| Westbound Left  | 1250                | 177                                  | 233                        | 701              | 57.5 (E)   | 69.8 (E)                   | 208.1 (F)        |
| Westbound Right   | 1250                | 224                                  | 233                        | 701              | 23.5 (C)   | 60.4 (E)                   | 40.4 (D)         |
| Northbound Thru   | 100                 | 178                                  | 183                        | 267              | 12 (B)   | 16.1 (B)                   | 50.5 (D)         |
| Southbound Thru   | 100                 | 151                                  | 121                        | 255              | 37.6 (D)   | 16.7 (B)                   | 111.3 (F)        |
| Southbound Right  | 100                 | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Overall   | ---                 | ---                                  | ---                        | ---              | 14.3 (B)   | 43 (D)                     | 78.8 (E)         |
| <b>21. S Eads Street &amp; 14th Street S</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 200                 |                                      | 43                         | 45               |  | 78.5 (E)                   | 85.4 (F)         |
| Eastbound Thru  | 200                 |                                      | 43                         | 45               |  | 0 (A)                      | 0 (A)            |
| Eastbound Right   | 200                 |                                      | 42                         | 45               |  | 0 (A)                      | 0 (A)            |
| Westbound Left  | 150                 |                                      | 96                         | 98               |  | 49.4 (D)                   | 50.7 (D)         |
| Westbound Thru  | 150                 |                                      | 96                         | 98               |  | 0 (A)                      | 0 (A)            |
| Westbound Right   | 150                 |                                      | 96                         | 98               |  | 95.3 (F)                   | 123 (F)          |
| Northbound Left   | 100                 | <i>Future Intersection</i>           | 219                        | 406              | <i>Future Intersection</i>   | 0 (A)                      | 0 (A)            |
| Northbound Thru   | 350                 |                                      | 219                        | 406              |  | 3.5 (A)                    | 18.4 (B)         |
| Northbound Right  | 350                 |                                      | 232                        | 414              |  | 3.7 (A)                    | 18 (B)           |
| Southbound Left   | 100                 |                                      | 313                        | 312              |  | 68.6 (E)                   | 77.8 (E)         |
| Southbound Thru   | 290                 |                                      | 313                        | 312              |  | 6.3 (A)                    | 8.3 (A)          |
| Southbound Right  | 290                 |                                      | 316                        | 315              |  | 5.8 (A)                    | 7.6 (A)          |
| Overall   | ---                 |                                      | ---                        | ---              |  | 10.1 (B)                   | 19.2 (B)         |
| <b>22. S Fern Street &amp; Site Driveway</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 450                 |                                      |                            | 73               |  |                            | 68.8 (E)         |
| Eastbound Thru  | 450                 |                                      |                            | 73               |  |                            | 0 (A)            |
| Eastbound Right   | 450                 |                                      |                            | 73               |  |                            | 70.2 (E)         |
| Westbound Left  | 150                 |                                      |                            | 70               |  |                            | 52.1 (D)         |
| Westbound Thru  | 150                 |                                      |                            | 70               |  |                            | 0 (A)            |
| Westbound Right   | 150                 |                                      |                            | 70               |  |                            | 65.2 (E)         |
| Northbound Left   | 140                 | <i>Future Intersection</i>           | <i>Future Intersection</i> | 194              | <i>Future Intersection</i>   | <i>Future Intersection</i> | 64.4 (E)         |
| Northbound Thru   | 275                 |                                      |                            | 347              |  |                            | 28.2 (C)         |
| Northbound Right  | 275                 |                                      |                            | 347              |  |                            | 30.2 (C)         |
| Southbound Left   | 75                  |                                      |                            | 375              |  |                            | 29.6 (C)         |
| Southbound Thru   | 390                 |                                      |                            | 533              |  |                            | 45.1 (D)         |
| Southbound Right  | 390                 |                                      |                            | 537              |  |                            | 35.6 (D)         |
| Overall   | ---                 |                                      |                            | ---              |  |                            | 38.2 (D)         |

**Table 22: PM Vehicular Delay and Maximum Queue Length (2025)**

| Intersection and Lane Group                    | Storage Length (ft) | PM Peak Hour                         |                     |                  |  |                     |                  |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |
| <b>1. S Hayes Street &amp; Army Navy Drive</b> |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                                 | 260                 | 223                                  | 313                 | 399              | 40.1 (D)   | 66.6 (E)            | 74.3 (E)         |
| Eastbound Thru                                 | 450                 | 460                                  | 358                 | 525              | 37.1 (D)   | 62 (E)              | 51.1 (D)         |
| Eastbound Right                                | 450                 | 483                                  | 358                 | 525              | 35.8 (D)   | 38 (D)              | 107.3 (F)        |
| Westbound Left                                 | 190                 | 101                                  | 162                 | 309              | 33.7 (C)   | 74.7 (E)            | 206.1 (F)        |
| Westbound Thru                                 | 430                 | 239                                  | 348                 | 303              | 32.1 (C)   | 65.8 (E)            | 53.9 (D)         |
| Westbound Right                                | 430                 | 206                                  | 162                 | 131              | 1.1 (A)  | 1.6 (A)             | 2.2 (A)          |
| Northbound Left                                | 200                 | 366                                  | 334                 | 281              | 234 (F)  | 56.2 (E)            | 60.8 (E)         |
| Northbound Thru                                | 750                 | 345                                  | 327                 | 364              | 47.2 (D)   | 28.3 (C)            | 35.4 (D)         |
| Northbound Right                               | 115                 | 208                                  | 203                 | 341              | 13.1 (B)   | 5.4 (A)             | 26.8 (C)         |
| Southbound Left                                | 2050                | 716                                  | 2,911               | 1,421            | 37.7 (D)   | 164.7 (F)           | 164.9 (F)        |
| Southbound Thru                                | 1950                | 716                                  | 2,911               | 1,421            | 44.4 (D)   | 42.4 (D)            | 47.2 (D)         |
| Southbound Right                               | 1950                | 274                                  | 2,910               | 1,421            | 7.9 (A)  | 25.2 (C)            | 31 (C)           |
| Overall  | ---                 | ---                                  | ---                 | ---              | 36.4 (D)   | 45.1 (D)            | 55 (E)           |
| <b>2. S Fern Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                                 | 160                 | 218                                  | 334                 | 467              | 33.5 (C)   | 36.4 (D)            | 56.4 (E)         |
| Eastbound Thru                                 | 430                 | 303                                  | 472                 | 482              | 20.4 (C)   | 29.2 (C)            | 34.4 (C)         |
| Eastbound Right                                | 180                 | 96                                   | 135                 | 225              | 5 (A)  | 9.2 (A)             | 19.3 (B)         |
| Westbound Left                                 | 80                  | 383                                  | 402                 | 349              | 18.2 (B)   | 87.2 (F)            | 91 (F)           |
| Westbound Thru                                 | 260                 | 383                                  | 402                 | 349              | 18 (B)   | 34.8 (C)            | 26.2 (C)         |
| Westbound Right                                | 260                 | 388                                  | 406                 | 353              | 24.5 (C)   | 39.6 (D)            | 34.4 (C)         |
| Northbound Left                                | 280                 | 274                                  | 273                 | 450              | 35.5 (D)   | 45.8 (D)            | 71.2 (E)         |
| Northbound Thru                                | 390                 | 140                                  | 138                 | 205              | 25 (C)   | 28.9 (C)            | 21.4 (C)         |
| Northbound Right                               | 80                  | 148                                  | 138                 | 86               | 10.8 (B)   | 30 (C)              | 24.4 (C)         |
| Southbound Left                                | 75                  | 73                                   | 171                 | 115              | 47.6 (D)   | 40.6 (D)            | 36.7 (D)         |
| Southbound Thru                                | 560                 | 174                                  | 241                 | 193              | 24 (C)   | 41.3 (D)            | 40.8 (D)         |
| Southbound Right                               | 560                 | 181                                  | 248                 | 204              | 15.7 (B)   | 25.9 (C)            | 14 (B)           |
| Overall  | ---                 | ---                                  | ---                 | ---              | 22.6 (C)   | 33 (C)              | 35.4 (D)         |
| <b>3. Army Navy Drive &amp; Parking Lot</b>    |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                                 | 120                 |                                      |                     | 370              |  |                     | 25.9 (C)         |
| Eastbound Thru                                 | 260                 |                                      |                     | 370              |  |                     | 10.9 (B)         |
| Eastbound Right                                | 225                 |                                      |                     | 370              |  |                     | 67.9 (E)         |
| Westbound Thru                                 | 230                 |                                      |                     | 333              |  |                     | 8.4 (A)          |
| Westbound Right                                | 230                 |                                      |                     | 350              |  |                     | 9.1 (A)          |
| Northbound Left                                | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 237              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 81.3 (F)         |
| Northbound Thru                                | 100                 |                                      |                     | 237              |  |                     | 0 (A)            |
| Northbound Right                               | 100                 |                                      |                     | 237              |  |                     | 86.6 (F)         |
| Southbound Left                                | 100                 |                                      |                     | 156              |  |                     | 74.8 (E)         |
| Southbound Thru                                | 100                 |                                      |                     | 156              |  |                     | 0 (A)            |
| Southbound Right                               | 100                 |                                      |                     | 154              |  |                     | 27.3 (C)         |
| Overall  | ---                 |                                      |                     |                  |  |                     |                  |
| <b>4. S Eads Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                                 | 220                 | 354                                  | 340                 | 292              | 59.5 (E)   | 65 (E)              | 34.5 (C)         |
| Eastbound Thru                                 | 220                 | 354                                  | 338                 | 292              | 20.7 (C)   | 11 (B)              | 15.2 (B)         |
| Eastbound Right                                | 220                 | 382                                  | 334                 | 292              | 13.8 (B)   | 13.3 (B)            | 38.6 (D)         |

| Intersection and Lane Group                  | Storage Length (ft) | PM Peak Hour                         |                     |                  |  |                     |                  |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |
| Westbound Thru                               | 1100                | 212                                  | 196                 | 214              | 32 (C)   | 30.8 (C)            | 48.8 (D)         |
| Westbound Right                              | 100                 | 212                                  | 206                 | 224              | 30.4 (C)   | 20.5 (C)            | 28.9 (C)         |
| Northbound Left                              | 100                 | 229                                  | 335                 | 238              | 27.4 (C)   | 26.1 (C)            | 37.6 (D)         |
| Northbound Thru                              | 240                 | 325                                  | 335                 | 325              | 31.2 (C)   | 26.4 (C)            | 29 (C)           |
| Northbound Right                             | 240                 | 325                                  | 335                 | 325              | 31.8 (C)   | 28.3 (C)            | 27.4 (C)         |
| Southbound Left                              | 140                 | 331                                  | 222                 | 329              | 24.2 (C)   | 20.5 (C)            | 41.3 (D)         |
| Southbound Thru                              | 140                 | 167                                  | 222                 | 329              | 58.4 (E)   | 31.2 (C)            | 54 (D)           |
| Southbound Right                             | 110                 | 167                                  | 222                 | 329              | 27.3 (C)   | 5.3 (A)             | 3.2 (A)          |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 6.1 (A)  | 27.8 (C)            | 32 (C)           |
| <b>5. Army Navy Drive &amp; 110 Ramp</b>     |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | ---                 |                                      |                     | 0                |  |                     | 0.1 (A)          |
| Westbound Thru                               | 1000                | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 649              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 28.9 (C)         |
| Southbound Right                             | 900                 |                                      |                     | 258              |  |                     | 10.4 (B)         |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 16.6 (B)         |
| <b>6. S Eads Street &amp; 11th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 200                 |                                      |                     | 407              |  |                     | 57.8 (E)         |
| Eastbound Thru                               | 200                 |                                      |                     | 407              |  |                     | 0 (A)            |
| Eastbound Right                              | 200                 |                                      |                     | 407              |  |                     | 94.5 (F)         |
| Westbound Left                               | 300                 |                                      |                     | 99               |  |                     | 40.8 (D)         |
| Westbound Thru                               | 300                 |                                      |                     | 95               |  |                     | 0 (A)            |
| Westbound Right                              | 300                 |                                      |                     | 95               |  |                     | 56 (E)           |
| Northbound Left                              | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 80               | <i>Un-signalized</i>   | <i>Unsignalized</i> | 21.9 (C)         |
| Northbound Thru                              | 250                 |                                      |                     | 345              |  |                     | 12 (B)           |
| Northbound Right                             | 250                 |                                      |                     | 347              |  |                     | 8.8 (A)          |
| Southbound Left                              | 250                 |                                      |                     | 336              |  |                     | 44.1 (D)         |
| Southbound Thru                              | 250                 |                                      |                     | 336              |  |                     | 41.9 (D)         |
| Southbound Right                             | 25                  |                                      |                     | 340              |  |                     | 25.4 (C)         |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 35 (C)           |
| <b>7. S Hayes Street &amp; 12th Street S</b> |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 450                 | 281                                  | 212                 | 190              | 99.5 (F)   | 46.2 (D)            | 64.7 (E)         |
| Eastbound Thru                               | 450                 | 281                                  | 210                 | 234              | 97.5 (F)   | 41.7 (D)            | 57 (E)           |
| Eastbound Right                              | 65                  | 291                                  | 208                 | 232              | 17.8 (B)   | 2.2 (A)             | 2.9 (A)          |
| Westbound Left                               | 100                 | 302                                  | 402                 | 440              | 43.5 (D)   | 54.3 (D)            | 69.3 (E)         |
| Westbound Thru                               | 620                 | 302                                  | 402                 | 440              | 33.6 (C)   | 49.1 (D)            | 67.4 (E)         |
| Westbound Right                              | 620                 | 313                                  | 402                 | 440              | 19.1 (B)   | 51.2 (D)            | 66.9 (E)         |
| Northbound Left                              | 75                  | 529                                  | 282                 | 360              | 93.1 (F)   | 76.6 (E)            | 65.9 (E)         |
| Northbound Thru                              | 775                 | 529                                  | 282                 | 360              | 44.1 (D)   | 27.6 (C)            | 29.2 (C)         |
| Northbound Right                             | 75                  | 533                                  | 286                 | 364              | 13.8 (B)   | 13.4 (B)            | 19 (B)           |
| Southbound Left                              | 250                 | 606                                  | 412                 | 429              | 78.9 (E)   | 79 (E)              | 70.6 (E)         |
| Southbound Thru                              | 770                 | 607                                  | 412                 | 429              | 35.5 (D)   | 10.2 (B)            | 15.8 (B)         |
| Southbound Right                             | 770                 | 607                                  | 412                 | 429              | 9.5 (A)  | 9.6 (A)             | 14.9 (B)         |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 43.1 (D)   | 27.9 (C)            | 32.1 (C)         |
| <b>8. S Fern Street &amp; 12th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | 640                 | 533                                  | 573                 | 537              | 46.7 (D)   | 50.3 (D)            | 59.7 (E)         |
| Eastbound Right                              | 640                 | 533                                  | 583                 | 546              | 43.8 (D)   | 45.6 (D)            | 50.2 (D)         |
| Westbound Left                               | 75                  | 540                                  | 352                 | 368              | 40.2 (D)   | 112.8 (F)           | 95.1 (F)         |
| Westbound Thru                               | 225                 | 261                                  | 352                 | 368              | 39.2 (D)   | 46.2 (D)            | 39.7 (D)         |
| Westbound Right                              | 225                 | 261                                  | 361                 | 368              | 24.6 (C)   | 39.3 (D)            | 42.1 (D)         |

| Intersection and Lane Group                                  | Storage Length (ft) | PM Peak Hour                         |            |                  |  |            |                  |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |
| Northbound Left  | 100                 | 271                                  | 372        | 381              | 19.5 (B)   | 27.8 (C)   | 45.5 (D)         |
| Northbound Thru  | 280                 | 324                                  | 372        | 381              | 21.7 (C)   | 19.2 (B)   | 42.9 (D)         |
| Northbound Right   | 280                 | 324                                  | 372        | 380              | 12.8 (B)   | 17.2 (B)   | 39.4 (D)         |
| Southbound Left  | 130                 | 329                                  | 503        | 195              | 14 (B)   | 42.9 (D)   | 45.2 (D)         |
| Southbound Thru  | 275                 | 383                                  | 503        | 434              | 20.1 (C)   | 33.6 (C)   | 31.3 (C)         |
| Southbound Right   | 275                 | 383                                  | 509        | 434              | 15.7 (B)   | 27.7 (C)   | 26.8 (C)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 13.5 (B)   | 39.9 (D)   | 42.8 (D)         |
| <b>9. S Elm Street &amp; 12th Street S</b>                   |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 225                 | <i>Un-signalized</i>                 | 239        | 359              | <i>Un-signalized</i>   | 6.3 (A)    | 25.8 (C)         |
| Eastbound Right  | 225                 |                                      | 231        | 361              |  | 4.1 (A)    | 19 (B)           |
| Westbound Thru   | 325                 |                                      | 298        | 273              |  | 23.4 (C)   | 14.4 (B)         |
| Northbound Right   | 270                 |                                      | 101        | 123              |  | 14.1 (B)   | 45.4 (D)         |
| Overall  | ---                 |                                      | ---        | ---              |  | ---        | 13.9 (B)         |
| <b>10. S Eads Street &amp; 12th Street S</b>                 |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 150                 | 350                                  | 328        | 389              | 69.6 (E)   | 65.4 (E)   | 127.9 (F)        |
| Eastbound Thru   | 320                 | 350                                  | 328        | 389              | 39.1 (D)   | 45.2 (D)   | 60.9 (E)         |
| Eastbound Right  | 320                 | 354                                  | 328        | 389              | 31.4 (C)   | 48.1 (D)   | 66.5 (E)         |
| Westbound Left   | 200                 | 497                                  | 514        | 606              | 55.6 (E)   | 90.4 (F)   | 244.1 (F)        |
| Westbound Thru   | 575                 | 497                                  | 514        | 606              | 55.1 (E)   | 65.2 (E)   | 93.5 (F)         |
| Westbound Right  | 575                 | 510                                  | 514        | 606              | 67.2 (E)   | 68.1 (E)   | 96.4 (F)         |
| Northbound Left  | 100                 | 369                                  | 388        | 333              | 19.4 (B)   | 46.8 (D)   | 45.4 (D)         |
| Northbound Thru  | 270                 | 369                                  | 388        | 333              | 20.5 (C)   | 36.4 (D)   | 29.5 (C)         |
| Northbound Right   | 100                 | 374                                  | 389        | 66               | 6.9 (A)  | 10 (A)     | 14.8 (B)         |
| Southbound Left  | 120                 | 296                                  | 337        | 320              | 25.4 (C)   | 62.4 (E)   | 57.4 (E)         |
| Southbound Thru  | 250                 | 296                                  | 337        | 351              | 18.5 (B)   | 45.3 (D)   | 42.4 (D)         |
| Southbound Right   | 250                 | 299                                  | 343        | 351              | 15.9 (B)   | 41.4 (D)   | 37.9 (D)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 35.2 (D)   | 49.3 (D)   | 64.9 (E)         |
| <b>11. 12th Street S &amp; Army Navy Drive</b>               |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 575                 | <i>Un-signalized</i>                 | 181        | 235              | <i>Un-signalized</i>   | 32.4 (C)   | 28.2 (C)         |
| Eastbound Right  | 575                 |                                      | 192        | 235              |  | 20.4 (C)   | 29.2 (C)         |
| Westbound Thru   | 120                 |                                      | 245        | 247              |  | 13.2 (B)   | 17.2 (B)         |
| Westbound Right  | 120                 |                                      | 245        | 247              |  | 8.3 (A)    | 5.9 (A)          |
| Northbound Left  | 50                  |                                      | 58         | 58               |  | 49.1 (D)   | 69.9 (E)         |
| Northbound Thru  | 50                  |                                      | 58         | 58               |  | 0 (A)      | 0 (A)            |
| Northbound Right   | 50                  |                                      | 58         | 58               |  | 45.3 (D)   | 45.5 (D)         |
| Southbound Left  | 1000                |                                      | 206        | 287              |  | 38.6 (D)   | 71.3 (E)         |
| Southbound Thru  | 1000                |                                      | 206        | 287              |  | 37 (D)     | 77.4 (E)         |
| Southbound Right   | 1000                |                                      | 206        | 287              |  | 35.4 (D)   | 95.3 (F)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 19 (B)   | 26.6 (C)   |                  |
| <b>12. S Clark Street/Long Bridge Dr &amp; 12th Street S</b> |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 120                 | 191                                  | 121        | 187              | 34.9 (C)   | 16.8 (B)   | 19.1 (B)         |
| Eastbound Thru   | 120                 | 191                                  | 121        | 187              | 15 (B)   | 1.4 (A)    | 4.4 (A)          |
| Eastbound Right  | 120                 | 192                                  | 121        | 187              | 5.4 (A)  | 2.6 (A)    | 2.3 (A)          |
| Westbound Left   | 100                 | 43                                   | 180        | 43               | 28 (C)   | 73.8 (E)   | 58.2 (E)         |
| Westbound Thru   | 1500                | 509                                  | 1,532      | 1,370            | 25.7 (C)   | 81 (F)     | 65.8 (E)         |
| Westbound Right  | 1500                | 513                                  | 1,543      | 1,380            | 23.7 (C)   | 30.1 (C)   | 32.6 (C)         |
| Northbound Left  | 100                 | 263                                  | 397        | 323              | 35.8 (D)   | 92.3 (F)   | 83.6 (F)         |
| Northbound Thru  | 1200                | 116                                  | 397        | 323              | 16.2 (B)   | 59.8 (E)   | 58.1 (E)         |



| Intersection and Lane Group                  | Storage Length (ft) | PM Peak Hour                         |            |                  |  |            |                  |          |          |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |          |          |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |          |          |
| Northbound Right                             | 1200                | 118                                  | 402        | 328              | 9.4 (A)  | 48 (D)     | 43.5 (D)         |          |          |
| Southbound Left                              | 450                 | 177                                  | 937        | 1,151            | 21.2 (C)   | 88.5 (F)   | 158.5 (F)        |          |          |
| Southbound Thru                              | 450                 | 177                                  | 937        | 1,151            | 17.1 (B)   | 79.7 (E)   | 157.8 (F)        |          |          |
| Southbound Right                             | 150                 | 169                                  | 971        | 1,154            | 11.1 (B)   | 97.8 (F)   | 122.3 (F)        |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 24.6 (C)   | 60.8 (E)   | 62.2 (E)         |          |          |
| <b>14. S Eads Street &amp; 13th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 350                 |                                      | 564        | 940              |  | 88.3 (F)   | 93.1 (F)         |          |          |
| Eastbound Right                              | 350                 |                                      | 564        | 940              |  | 73.7 (E)   | 156.9 (F)        |          |          |
| Northbound Left                              | 150                 | <i>Un-signalized</i>                 | 434        | 436              | <i>Un-signalized</i>   | 8.8 (A)    | 9.6 (A)          |          |          |
| Northbound Thru                              | 300                 |                                      | 434        | 436              |  | 35.8 (D)   | 37.9 (D)         |          |          |
| Southbound Thru                              | 280                 |                                      | 336        | 389              |  | 16.7 (B)   | 24.6 (C)         |          |          |
| Southbound Right                             | 280                 |                                      | 339        | 392              |  | 7.2 (A)    | 11.4 (B)         |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 37.3 (D)         | 48.5 (D) |          |
| <b>16. S Fern Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 130                 |                                      | 121        | 159              |  | 167        | 23.2 (C)         | 33.1 (C) | 48.2 (D) |
| Eastbound Thru                               | 630                 | 121                                  | 159        | 167              | 12.8 (B)   | 12.3 (B)   | 23.3 (C)         |          |          |
| Eastbound Right                              | 630                 | 121                                  | 161        | 168              | 9.4 (A)  | 9.7 (A)    | 18.3 (B)         |          |          |
| Westbound Left                               | 120                 | 297                                  | 363        | 170              | 16.5 (B)   | 55.5 (E)   | 8.3 (A)          |          |          |
| Westbound Thru                               | 260                 | 297                                  | 363        | 170              | 9.9 (A)  | 44.2 (D)   | 5.9 (A)          |          |          |
| Westbound Right                              | 260                 | 300                                  | 367        | 171              | 10.1 (B)   | 40.3 (D)   | 7.9 (A)          |          |          |
| Northbound Left                              | 750                 | 203                                  | 252        | 350              | 25.7 (C)   | 22.2 (C)   | 57.6 (E)         |          |          |
| Northbound Thru                              | 750                 | 203                                  | 252        | 350              | 18.5 (B)   | 19.3 (B)   | 54.6 (D)         |          |          |
| Northbound Right                             | 75                  | 209                                  | 258        | 355              | 8.9 (A)  | 6.3 (A)    | 19 (B)           |          |          |
| Southbound Left                              | 160                 | 365                                  | 343        | 409              | 21.9 (C)   | 21.9 (C)   | 40.1 (D)         |          |          |
| Southbound Thru                              | 300                 | 365                                  | 343        | 409              | 15.3 (B)   | 16 (B)     | 31.6 (C)         |          |          |
| Southbound Right                             | 300                 | 379                                  | 357        | 415              | 11.7 (B)   | 12.5 (B)   | 25.2 (C)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 16.8 (B)   | 28.4 (C)   | 22.3 (C)         |          |          |
| <b>17. 15th Street S &amp; S Elm Street</b>  |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 60                  |                                      | 193        | 166              |  | 2.7 (A)    | 7.3 (A)          |          |          |
| Eastbound Thru                               | 270                 |                                      | 193        | 166              |  | 5.1 (A)    | 7.8 (A)          |          |          |
| Westbound Thru                               | 300                 | <i>Un-signalized</i>                 | 164        | 173              | <i>Un-signalized</i>   | 7.6 (A)    | 2.8 (A)          |          |          |
| Westbound Right                              | 300                 |                                      | 168        | 177              |  | 3.5 (A)    | 2.6 (A)          |          |          |
| Southbound Left                              | 250                 |                                      | 146        | 140              |  | 56.8 (E)   | 45.9 (D)         |          |          |
| Southbound Right                             | 250                 |                                      | 149        | 143              |  | 18.3 (B)   | 12.4 (B)         |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 10.1 (B)         | 7 (A)    |          |
| <b>18. S Eads Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 170                 | 162                                  | 267        | 305              | 46.5 (D)   | 101.4 (F)  | 46.1 (D)         |          |          |
| Eastbound Thru                               | 300                 | 244                                  | 326        | 412              | 20.5 (C)   | 18.7 (B)   | 38.7 (D)         |          |          |
| Eastbound Right                              | 300                 | 227                                  | 326        | 412              | 9.1 (A)  | 23.4 (C)   | 42.8 (D)         |          |          |
| Westbound Left                               | 300                 | 395                                  | 474        | 406              | 43.8 (D)   | 24.4 (C)   | 38.1 (D)         |          |          |
| Westbound Thru                               | 300                 | 395                                  | 474        | 406              | 20.8 (C)   | 36.6 (D)   | 34.1 (C)         |          |          |
| Westbound Right                              | 300                 | 408                                  | 474        | 406              | 19.1 (B)   | 105.5 (F)  | 46.7 (D)         |          |          |
| Northbound Left                              | 130                 | 193                                  | 882        | 785              | 21.6 (C)   | 78.6 (E)   | 65.7 (E)         |          |          |
| Northbound Thru                              | 760                 | 193                                  | 882        | 785              | 13.1 (B)   | 88.6 (F)   | 82.5 (F)         |          |          |
| Northbound Right                             | 130                 | 62                                   | 378        | 108              | 5.7 (A)  | 40.2 (D)   | 31.7 (C)         |          |          |
| Southbound Left                              | 250                 | 212                                  | 474        | 472              | 22.9 (C)   | 83.8 (F)   | 107.2 (F)        |          |          |
| Southbound Thru                              | 300                 | 278                                  | 474        | 472              | 17.7 (B)   | 67.7 (E)   | 49.6 (D)         |          |          |
| Southbound Right                             | 75                  | 282                                  | 474        | 475              | 17.8 (B)   | 40.4 (D)   | 32.6 (C)         |          |          |

| Intersection and Lane Group                             | Storage Length (ft) | PM Peak Hour                         |                            |                  |  |                            |                  |
|---|---------------------|--------------------------------------|----------------------------|------------------|--|----------------------------|------------------|
|   |                     | Average of Maximum Queue Length (ft) |                            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                            |                  |
|   |                     | Existing                             | Background                 | Mitigated Future | Existing   | Background                 | Mitigated Future |
| Overall   | ---                 | ---                                  | ---                        | ---              | 24 (C)   | 54.7 (D)                   | 49.3 (D)         |
| <b>19. S Eads Street &amp; I-395 Ramps (South Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Thru  | 1000                | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Eastbound Right   | 1000                | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Northbound Left   | 150                 | 335                                  | 281                        | 323              | 30.6 (C)   | 28 (C)                     | 6.1 (A)          |
| Northbound Thru   | 170                 | 335                                  | 281                        | 323              | 16.4 (B)   | 7.3 (A)                    | 6.4 (A)          |
| Northbound Right  | 170                 | 393                                  | 330                        | 323              | 12.8 (B)   | 7.8 (A)                    | 4 (A)            |
| Southbound Left   | 100                 | 160                                  | 224                        | 205              | 14.1 (B)   | 3.1 (A)                    | 10.7 (B)         |
| Southbound Thru   | 100                 | 157                                  | 221                        | 198              | 5.5 (A)  | 5.2 (A)                    | 12.2 (B)         |
| Overall   | ---                 | ---                                  | ---                        | ---              | 14.7 (B)   | 9.4 (A)                    | 7 (A)            |
| <b>20. S Eads Street &amp; I-395 Ramps (North Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 875                 | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Westbound Left  | 1250                | 270                                  | 211                        | 551              | 24.1 (C)   | 33.2 (C)                   | 88.7 (F)         |
| Westbound Right   | 1250                | 339                                  | 211                        | 551              | 26.3 (C)   | 25.9 (C)                   | 51.5 (D)         |
| Northbound Thru   | 100                 | 179                                  | 186                        | 205              | 8.6 (A)  | 5.7 (A)                    | 7.4 (A)          |
| Southbound Thru   | 100                 | 217                                  | 158                        | 193              | 13.8 (B)   | 4.8 (A)                    | 12.3 (B)         |
| Southbound Right  | 100                 | 139                                  | 154                        | 190              | 0.7 (A)  | 0.3 (A)                    | 0.5 (A)          |
| Overall   | ---                 | ---                                  | ---                        | ---              | 7.7 (A)  | 6.7 (A)                    | 16.4 (B)         |
| <b>21. S Eads Street &amp; 14th Street S</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 200                 |                                      | 124                        | 164              |  | 73.3 (E)                   | 113.1 (F)        |
| Eastbound Thru  | 200                 |                                      | 124                        | 164              |  | 0 (A)                      | 0 (A)            |
| Eastbound Right   | 200                 |                                      | 124                        | 163              |  | 79 (E)                     | 122.3 (F)        |
| Westbound Left  | 150                 |                                      | 119                        | 165              |  | 59.4 (E)                   | 211.5 (F)        |
| Westbound Thru  | 150                 |                                      | 123                        | 165              |  | 0 (A)                      | 0 (A)            |
| Westbound Right   | 150                 |                                      | 119                        | 165              |  | 120.6 (F)                  | 216.9 (F)        |
| Northbound Left   | 100                 | <i>Future Intersection</i>           | 462                        | 418              | <i>Future Intersection</i>   | 0 (A)                      | 0 (A)            |
| Northbound Thru   | 350                 |                                      | 462                        | 418              |  | 38.7 (D)                   | 27.6 (C)         |
| Northbound Right  | 350                 |                                      | 476                        | 428              |  | 37.2 (D)                   | 20.7 (C)         |
| Southbound Left   | 100                 |                                      | 380                        | 388              |  | 84.8 (F)                   | 96.7 (F)         |
| Southbound Thru   | 290                 |                                      | 380                        | 388              |  | 35.6 (D)                   | 32.9 (C)         |
| Southbound Right  | 290                 |                                      | 382                        | 392              |  | 30.2 (C)                   | 20.9 (C)         |
| Overall   | ---                 |                                      | ---                        | ---              |  | 41.7 (D)                   | 42.6 (D)         |
| <b>22. S Fern Street &amp; Site Driveway</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 450                 |                                      |                            | 540              |  |                            | 353 (F)          |
| Eastbound Thru  | 450                 |                                      |                            | 540              |  |                            | 0 (A)            |
| Eastbound Right   | 450                 |                                      |                            | 540              |  |                            | 362.6 (F)        |
| Westbound Left  | 150                 |                                      |                            | 256              |  |                            | 51.7 (D)         |
| Westbound Thru  | 150                 |                                      |                            | 256              |  |                            | 0 (A)            |
| Westbound Right   | 150                 |                                      |                            | 256              |  |                            | 65.1 (E)         |
| Northbound Left   | 140                 | <i>Future Intersection</i>           | <i>Future Intersection</i> | 6                | <i>Future Intersection</i>   | <i>Future Intersection</i> | 28 (C)           |
| Northbound Thru   | 275                 |                                      |                            | 334              |  |                            | 25.5 (C)         |
| Northbound Right  | 275                 |                                      |                            | 336              |  |                            | 21.9 (C)         |
| Southbound Left   | 75                  |                                      |                            | 59               |  |                            | 31.9 (C)         |
| Southbound Thru   | 390                 |                                      |                            | 374              |  |                            | 34.4 (C)         |
| Southbound Right  | 390                 |                                      |                            | 376              |  |                            | 14.1 (B)         |
| Overall   | ---                 |                                      |                            | ---              |  |                            | 68 (E)           |

**Table 23: Bicycle and Pedestrian Delay (2025)**

| Intersection/<br>Approach  | Average Pedestrian Delay (sec/ped) |         |                   |             |                         |             | Average Bicycle Delay (sec/bike) |         |                   |             |                         |             |
|--|------------------------------------|---------|-------------------|-------------|-------------------------|-------------|----------------------------------|---------|-------------------|-------------|-------------------------|-------------|
|  | Existing (2020)                    |         | Background (2025) |             | Mitigated Future (2025) |             | Existing (2020)                  |         | Background (2025) |             | Mitigated Future (2025) |             |
|  | AM Peak                            | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     | AM Peak                          | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     |
| <b>1. Army Navy Drive and S Hayes Street</b>                       |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | <b>69.0</b>       | <b>65.3</b> | <b>76.8</b>             | <b>63.7</b> | ---                              | ---     | <b>81.9</b>       | <b>51.2</b> | <b>52.0</b>             | <b>55.6</b> |
| Eastbound  | 46.5                               | 49.9    | 69.6              | 65.1        | 76.5                    | 64.0        | ---                              | ---     | 86.6              | 43.3        | 52.3                    | 57.6        |
| Westbound  | 0.0                                | 0.2     | 57.9              | 67.8        | 96.9                    | 50.4        | ---                              | ---     | 79.0              | 63.4        | 51.7                    | 53.9        |
| Northbound   | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound   | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>2. Army Navy Drive and S Fern Street</b>                        |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | <b>65.5</b>       | <b>62.5</b> | <b>65.3</b>             | <b>65.0</b> | ---                              | ---     | <b>10.3</b>       | <b>6.4</b>  | <b>14.0</b>             | <b>15.9</b> |
| Eastbound  | 49.4                               | 46.9    | 67.0              | 65.6        | 66.6                    | 66.1        | ---                              | ---     | 6.6               | 4.2         | 23.7                    | 21.5        |
| Westbound  | 49.6                               | 47.2    | 65.5              | 58.6        | 64.8                    | 65.1        | ---                              | ---     | 12.5              | 9.2         | 4.5                     | 12.1        |
| Northbound   | 51.3                               | 50.7    | 66.8              | 60.9        | 64.5                    | 64.4        | ---                              | ---     | ---               | ---         | 15.2                    | 14.4        |
| Southbound   | 50.0                               | 49.5    | 64.3              | 63.1        | 65.2                    | 64.5        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>3. Army Navy Drive and Parking Lot</b>                          |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | ---               | ---         | <b>60.8</b>             | <b>62.3</b> | ---                              | ---     | ---               | ---         | <b>1.9</b>              | <b>5.2</b>  |
| Eastbound  | ---                                | ---     | ---               | ---         | 65.8                    | 64.6        | ---                              | ---     | ---               | ---         | 4.2                     | 7.9         |
| Westbound  | ---                                | ---     | ---               | ---         | 32.1                    | 49.3        | ---                              | ---     | ---               | ---         | 0.8                     | 0.2         |
| Northbound   | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound   | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>4. Army Navy Drive and S Eads Street</b>                        |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | <b>70.2</b>       | <b>69.0</b> | <b>66.5</b>             | <b>67.2</b> | ---                              | ---     | <b>26.3</b>       | <b>10.4</b> | <b>24.4</b>             | <b>20.2</b> |
| Eastbound  | 52.4                               | 51.1    | 89.9              | 75.6        | 68.5                    | 67.6        | ---                              | ---     | 22.2              | 2.3         | 12.0                    | 14.0        |
| Westbound  | 50.4                               | 50.9    | 67.7              | 63.8        | 67.2                    | 65.9        | ---                              | ---     | 35.2              | 3.2         | 29.4                    | 46.7        |
| Northbound   | 49.6                               | 51.8    | 66.2              | 68.9        | 63.8                    | 68.9        | ---                              | ---     | 24.0              | 26.4        | 26.6                    | 11.9        |
| Southbound   | 50.7                               | 49.4    | 63.7              | 70.7        | 65.8                    | 68.3        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>5. Army Navy Drive and 110 Ramp</b>                             | <i>Unsignalized Intersection</i>   |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>6. S Eads Street and 11<sup>th</sup> Street S/Site Driveway</b> |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | ---               | ---         | <b>65.9</b>             | <b>63.6</b> | ---                              | ---     | ---               | ---         | <b>4.7</b>              | <b>8.0</b>  |
| Eastbound  | ---                                | ---     | ---               | ---         | 65.1                    | 65.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | ---                                | ---     | ---               | ---         | 63.6                    | 64.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | ---                                | ---     | ---               | ---         | 66.1                    | 64.0        | ---                              | ---     | ---               | ---         | 0.5                     | 3.7         |
| Southbound   | ---                                | ---     | ---               | ---         | 67.6                    | 62.0        | ---                              | ---     | ---               | ---         | 8.2                     | 12.5        |
| <b>7. 12<sup>th</sup> Street S and S Hayes Street</b>              |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | <b>63.4</b>       | <b>64.0</b> | <b>64.0</b>             | <b>65.3</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound  | 51.6                               | 49.7    | 63.3              | 64.6        | 64.1                    | 64.9        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | 49.7                               | 50.7    | 63.2              | 60.8        | 64.9                    | 66.0        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | 50.6                               | 48.5    | 65.1              | 63.0        | 64.4                    | 64.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound   | 0.0                                | 0.0     | 0.0               | 0.0         | 62.3                    | 66.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>8. 12<sup>th</sup> Street S and S Fern Street</b>               |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>   | ---                                | ---     | <b>64.3</b>       | <b>64.6</b> | <b>64.6</b>             | <b>64.2</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound  | 35.0                               | 34.4    | 65.1              | 64.6        | 64.5                    | 64.5        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | 34.9                               | 34.5    | 62.3              | 65.1        | 64.5                    | 64.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |

| Intersection/<br>Approach  | Average Pedestrian Delay (sec/ped) |         |                   |             |                         |             | Average Bicycle Delay (sec/bike) |         |                   |             |                         |             |
|--|------------------------------------|---------|-------------------|-------------|-------------------------|-------------|----------------------------------|---------|-------------------|-------------|-------------------------|-------------|
|  | Existing (2020)                    |         | Background (2025) |             | Mitigated Future (2025) |             | Existing (2020)                  |         | Background (2025) |             | Mitigated Future (2025) |             |
|  | AM Peak                            | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     | AM Peak                          | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     |
| Northbound   | 34.6                               | 34.3    | 62.8              | 65.4        | 64.0                    | 63.7        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound   | 34.9                               | 34.2    | 64.4              | 64.4        | 65.3                    | 64.0        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>9. 12<sup>th</sup> Street S and S Elm Street</b>                    |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>24.6</b>       | <b>70.0</b> | <b>36.0</b>             | <b>67.4</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound  | ---                                | ---     | 3.3               | 70.2        | 3.5                     | 69.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | ---                                | ---     | 65.0              | 69.4        | 64.6                    | 65.6        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>10. 12<sup>th</sup> Street S and S Eads Street</b>                  |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>64.7</b>       | <b>64.9</b> | <b>64.8</b>             | <b>65.9</b> | ---                              | ---     | <b>14.9</b>       | <b>25.1</b> | <b>17.7</b>             | <b>27.5</b> |
| Eastbound  | 50.0                               | 34.9    | 64.5              | 66.0        | 64.2                    | 65.9        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | 48.3                               | 36.0    | 64.4              | 65.0        | 65.1                    | 66.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | 51.0                               | 34.9    | 64.3              | 63.5        | 64.7                    | 65.1        | ---                              | ---     | 8.3               | 35.3        | 17.3                    | 35.9        |
| Southbound   | 25.3                               | 34.7    | 68.0              | 63.7        | 65.7                    | 66.2        | ---                              | ---     | 22.6              | 20.2        | 18.5                    | 24.2        |
| <b>11. 12<sup>th</sup> Street S and Army Navy Drive</b>                |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>65.4</b>       | <b>63.9</b> | <b>65.7</b>             | <b>64.4</b> | ---                              | ---     | <b>39.4</b>       | <b>50.4</b> | <b>33.1</b>             | <b>52.6</b> |
| Eastbound  | ---                                | ---     | 65.1              | 65.6        | 65.3                    | 65.4        | ---                              | ---     | 34.8              | 49.7        | 26.0                    | 52.7        |
| Westbound  | ---                                | ---     | 65.7              | 63.6        | 65.8                    | 64.0        | ---                              | ---     | 43.7              | 50.9        | 35.9                    | 52.5        |
| Northbound   | ---                                | ---     | 0.0               | 0.0         | 0.0                     | 0.0         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound   | ---                                | ---     | 0.0               | 65.2        | 0.0                     | 64.5        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>12. 12<sup>th</sup> Street and Long Bridge Drive/S Clark Street</b> |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>63.5</b>       | <b>64.0</b> | <b>63.9</b>             | <b>64.8</b> | ---                              | ---     | <b>43.4</b>       | <b>41.0</b> | <b>44.2</b>             | <b>41.5</b> |
| Eastbound  | 34.8                               | 34.3    | 64.3              | 63.7        | 64.2                    | 64.9        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | 34.3                               | 34.8    | 63.0              | 64.4        | 64.1                    | 64.8        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | 35.5                               | 34.7    | 63.1              | 61.8        | 62.8                    | 64.1        | ---                              | ---     | 32.7              | 24.0        | 32.7                    | 28.0        |
| Southbound   | 31.7                               | 35.7    | 63.9              | 68.1        | 64.2                    | 66.6        | ---                              | ---     | 57.6              | 54.9        | 57.3                    | 54.1        |
| <b>13. S Fern Street and 13<sup>th</sup> Street S</b>                  | <i>Unsignalized Intersection</i>   |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>14. 13<sup>th</sup> Street S and S Eads Street</b>                  |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>61.6</b>       | <b>31.1</b> | <b>61.1</b>             | <b>62.4</b> | ---                              | ---     | <b>0.6</b>        | <b>2.0</b>  | <b>0.5</b>              | <b>2.0</b>  |
| Eastbound  | ---                                | ---     | 69.4              | 39.4        | 67.6                    | 65.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | 0.1               | 0.0         | 0.2                     | 0.4         |
| Southbound   | ---                                | ---     | 53.2              | 26.5        | 58.8                    | 61.6        | ---                              | ---     | 1.1               | 3.7         | 1.3                     | 2.8         |
| <b>15. S Fern Street and 14<sup>th</sup> Street S</b>                  | <i>Unsignalized Intersection</i>   |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>16. 15<sup>th</sup> Street S and S Fern Street</b>                  |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>67.1</b>       | <b>64.6</b> | <b>65.9</b>             | <b>65.0</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound  | 34.8                               | 35.2    | 68.4              | 63.0        | 64.9                    | 64.7        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound  | 38.0                               | 34.5    | 65.7              | 64.5        | 63.0                    | 65.9        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound   | 36.8                               | 34.8    | 67.7              | 65.7        | 68.2                    | 64.6        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound   | 35.2                               | 34.6    | 66.1              | 64.1        | 66.1                    | 65.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>17. 15<sup>th</sup> Street S and S Elm Street</b>                   |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall  | ---                                | ---     | <b>62.6</b>       | <b>51.4</b> | <b>65.8</b>             | <b>63.7</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound  | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |

| Intersection/<br>Approach   | Average Pedestrian Delay (sec/ped) |         |                   |              |                         |              | Average Bicycle Delay (sec/bike) |         |                   |             |                         |             |
|---|------------------------------------|---------|-------------------|--------------|-------------------------|--------------|----------------------------------|---------|-------------------|-------------|-------------------------|-------------|
|   | Existing (2020)                    |         | Background (2025) |              | Mitigated Future (2025) |              | Existing (2020)                  |         | Background (2025) |             | Mitigated Future (2025) |             |
|   | AM Peak                            | PM Peak | AM Peak           | PM Peak      | AM Peak                 | PM Peak      | AM Peak                          | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     |
| Westbound   | ---                                | ---     | 63.0              | 45.0         | 66.3                    | 63.6         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | 61.4              | 75.5         | 61.4                    | 65.2         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>18. 15<sup>th</sup> Street S and S Eads Street</b>               |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | <b>127.6</b>      | <b>127.4</b> | <b>128.1</b>            | <b>126.4</b> | ---                              | ---     | <b>38.1</b>       | <b>35.3</b> | <b>23.7</b>             | <b>21.2</b> |
| Eastbound   | 33.6                               | 35.2    | 64.6              | 64.9         | 66.0                    | 64.6         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 32.7                               | 35.8    | 65.0              | 64.2         | 65.8                    | 65.0         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | 39.1                               | 34.8    | 186.4             | 185.5        | 185.7                   | 185.8        | ---                              | ---     | 37.5              | 43.5        | 27.2                    | 33.2        |
| Southbound  | 35.3                               | 34.4    | 190.3             | 186.9        | 189.7                   | 188.3        | ---                              | ---     | 38.5              | 24.8        | 18.8                    | 9.9         |
| <b>19. S Eads Street and I-395 HOT Lanes (South Node)</b>           |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>20. S Eads Street and I-395 HOT Lanes (North Node)</b>           |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>21. 14<sup>th</sup> Street S and S Eads Street</b>               |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | <b>58.5</b>       | <b>65.7</b>  | <b>58.6</b>             | <b>66.7</b>  | ---                              | ---     | <b>3.3</b>        | <b>2.1</b>  | <b>4.3</b>              | <b>6.6</b>  |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | 65.3              | 65.9         | 66.4                    | 65.1         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | 52.6              | 65.6         | 51.4                    | 68.5         | ---                              | ---     | 0.7               | 1.8         | 0.5                     | 2.5         |
| Southbound  | ---                                | ---     | 60.5              | 65.3         | 66.5                    | 64.3         | ---                              | ---     | 6.2               | 2.6         | 12.1                    | 9.9         |
| <b>22. S Fern Street and 11<sup>th</sup> Street S/Site Driveway</b> |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | ---               | ---          | <b>64.9</b>             | <b>65.6</b>  | ---                              | ---     | ---               | ---         | <b>16.0</b>             | <b>18.0</b> |
| Eastbound   | ---                                | ---     | ---               | ---          | 66.7                    | 64.9         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | ---               | ---          | 65.7                    | 65.0         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---          | 62.7                    | 66.5         | ---                              | ---     | ---               | ---         | 13.3                    | 18.2        |
| Southbound  | ---                                | ---     | ---               | ---          | 63.7                    | 65.0         | ---                              | ---     | ---               | ---         | 17.9                    | 17.8        |

## 2031 Analysis Results

### Simulated Vehicular Volumes

Vehicular volume results are used to help identify each scenario's ability to process vehicular volumes on a macro and micro level. These results are expressed as the number of vehicles denied entry into network, or as individual link vehicular volumes (throughput).

Simulated individual link volumes results, also known as throughput results, for 2031 Background and 2031 Mitigated Future analysis scenarios are included in the Technical Appendix.

#### GEH Statistic

The GEH statistic is a formula used in traffic modeling to compare two sets of traffic volumes and indicate whether the model processes enough vehicles in the network to be considered valid. A GEH value that is less than 5 indicates a good fit between the input and simulated volumes. A GEH value between 5 and 10 may require further investigation. A GEH value that is greater than 10 indicates an error in the model.

Under 2031 Mitigated Future conditions, most movements operate at acceptable GEH values (GEH value < 5); however, the three (3) intersections along 15<sup>th</sup> Street S, at S Eads Street, S Elm Street, and S Fern Street, have one or more movements that operate above the acceptable GEH value (GEH > 5) in the afternoon peak hour. This is primarily due to vehicles being metered by the new at-grade Richmond Highway and 15<sup>th</sup> Street S intersection. Based on the VISSIM simulation, Richmond Highway experiences congestion as a result of the intersection at 15<sup>th</sup> Street S coming down to grade. This intersection will be studied further as part of Phase 2 of the Route 1 Multimodal Improvements Study, which aims to further analyze the recommended alternative and identify TDM measures to mitigate future congestion. No additional site-generated trips were assumed at this intersection compared to 2025.

#### Vehicles Entering the Network

The number of vehicles entered into the network for each of the analysis scenarios is shown in Table 24. The percentage of vehicles able to enter the network for the 2031 Mitigated Future scenario was evaluated. The proposed mitigations included in the 2031 Mitigated Future scenario, discussed in a later section of this chapter, will create additional capacity at critical locations to allow more vehicles to be processed through the network. The proposed development adds an additional 1,798 vehicles

(+5.09%) in the morning peak period and 1,752 vehicles (+4.72%) in the afternoon peak period, increasing the total number of vehicles that needs to be processed through the network. With the recommended mitigations, under the 2031 Mitigated Future scenario, the total number of vehicles processed increases by 1,570 vehicles (+4.96%) and 1,224 vehicles (+3.51%) in the morning and afternoon peak period, respectively.

### Simulated Vehicular Travel Times

Vehicular travel time is the amount of time it takes for a vehicle to travel from point A to point B. It is a direct reflection of motorist experience. The two (2) vehicular travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound Army Navy Drive from S Joyce Street to 12<sup>th</sup> Street S
2. Westbound Army Navy Drive from 12<sup>th</sup> Street S to S Joyce Street

Simulated travel time results for the two (2) vehicular travel time measurement segments that were analyzed using VISSIM in the 2031 Background and 2031 Mitigated Future analysis scenarios are shown in Table 25 for the AM peak and Table 26 for the PM Peak. The travel time along some segments reflect additional local traffic as well as adjustments to the corridor to accommodate a new signal. The 2031 Mitigated Future analysis includes a new signal at the Army Navy Drive and Parking Lot/Site Driveway intersection where the 2031 Background analysis does not.

### Simulated Transit Travel Times

Transit travel time is the amount of time it takes for a transit vehicle to travel from point A to point B. It is a direct reflection of motorist experience. The two (2) transit travel times that were analyzed as part of the VISSIM microsimulation analysis were:

1. Eastbound 12<sup>th</sup> Street S from S Hayes Street to Long Bridge Drive
2. Westbound 12<sup>th</sup> Street S from Long Bridge Drive to S Hayes Street

Simulated travel time results for the two (2) transit travel time measurement segments that were analyzed using VISSIM in the 2031 Background and 2031 Mitigated Future analysis scenarios are shown in Table 25 for the AM peak and Table 26 for the PM Peak. The travel time along some segments reflect additional local traffic as well as adjustments to the corridor to accommodate a new signal.

Due to capacity constraints elsewhere in the network, volumes have been re-routed in PM peak hour under 2031 Mitigated Future conditions. Therefore, the travel times in 2031 Mitigated Future conditions are improved compared to 2031 Background conditions.

### Simulated Vehicular Delay

Simulated vehicular delay results show the difference between the actual vehicle travel time due to stops at a signalized intersection (control delay) and is measured in seconds of delay per vehicle. Tables showing the simulated vehicular delay for study area intersections for the 2020 Existing, 2031 Background, and 2031 Mitigated Future analysis scenarios are included in the Technical Appendix and shown in Table 27 and Table 28. At the majority of intersections in the network, the vehicular delay results under the 2031 Mitigated Future scenario, with added site traffic and recommended mitigation measures, are comparable to that under the 2031 Background scenario. A comparison of the level of service (LOS) between scenarios is provided in Figure 75 and Figure 76 for Existing, 2031 Background, and 2031 Mitigated Future scenarios.

It is important to note that VISSIM is a microscopic analysis rather than a macroscopic analysis. Mitigation measures are recommended such that the results are comparable or better than the Background conditions throughout the network. The recommended mitigation measures are in place to address targeted issues at specific, as well as increase the vehicular throughput of the overall network, particularly at exterior intersections that are responsible for metering vehicles entering the network. Due to the increased number of vehicles being processed in the network compared to Background conditions, there may be locations where delays are higher than that seen under Background conditions.

#### 2031 Background

Based on the VISSIM results, the majority of intersections operate at acceptable levels of service (LOS E or better) in the 2031 Background scenario; however, three (3) intersections have one or more approach that operate beyond acceptable thresholds in one or more peak hour:

- 12<sup>th</sup> Street S & S Clark Street/Long Bridge Drive – PM
- S Eads Street & I-395 HOT Lanes (South Node) – AM
- S Eads Street & 14<sup>th</sup> Street S – PM

#### 2031 Mitigated Future

Based on the VISSIM results, the majority of intersections operate at acceptable levels of service (LOS E or better) in the 2031 Mitigated Future scenario; however, eight (8) intersections have one or more approach that operate beyond acceptable thresholds in one or more peak hour:

- Army Navy Drive & S Hayes Street – PM
- Army Navy Drive & Parking Lot/Site Driveway – PM
- S Eads Street & 12<sup>th</sup> Street S – AM/PM
- 12<sup>th</sup> Street S & S Clark Street/Long Bridge Drive – PM
- S Eads Street & I-395 HOT Lanes (South Node) – AM
- S Eads Street & I-395 HOT Lanes (North Node) – AM
- S Eads Street & 14<sup>th</sup> Street S – AM/PM
- S Fern Street & 11<sup>th</sup> Street S/Site Driveway – PM

Most vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. A Transportation Management Plan (TMP) will be provided for the project based on the County's requirements, and a framework for a TMP is included in this report, to further reduce vehicular trips generated by the proposed development during peak period travel times.

### Simulated Bicycle and Pedestrian Delay

Simulated intersection delay results show the difference between the actual pedestrian/bicycle travel time due to stops at a signalized intersection (control delay) and is measured in seconds of delay per pedestrian/bicycle. For example, a bicycle or pedestrian may experience roughly one minute of wait time at a signalized intersection due to longer cycle lengths or adjustments to signal timings to accommodate additional traffic on the roadway. Tables showing the simulated bicycle and pedestrian delay for study area intersections for the 2031 Background and 2031 Mitigated Future analysis scenarios are included in the Technical Appendix and shown in Table 29. Note that a number of movements do not report bicycle delays (i.e., along 12<sup>th</sup> Street S where sharrows are planned). Bicycle delay is reported for the bicycle facilities included in the VISSIM model, as agreed upon during the scoping process. Analyzed bicycle facilities include the cycle track along the south side of Army Navy Drive between S Joyce Street and 12<sup>th</sup> Street S, protected bicycle lanes along S Eads Street between Army Navy Drive and

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15<sup>th</sup> Street S, and protected bicycle lanes along S Fern Street between Army Navy Drive and 12<sup>th</sup> Street S.

The bicycle and pedestrian delay results under the 2031 Mitigated Future scenario, with added site traffic and recommended mitigation measures, are comparable to that under the 2031 Background scenario.

### **Evaluation of Recommended Mitigations**

Based on the results of the VISSIM microsimulation analysis, the recommended mitigation measures for 2031 are consistent with that of 2025 (Detailed in Table 1 and summarized in Figure 1).

Tables showing the simulated delay and maximum queues for study area intersections for the 2031 Background and 2031 Mitigated Future analysis scenarios are included in the Technical Appendix. In addition to the recommended mitigation measures, the analysis includes protected northbound and southbound bike lanes along S Fern Street and S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S.



**Table 24: Number Vehicles Entered into Network (2031)**

|   | Background (2031) |              | Mitigated Future (2031) |              |
|---|-------------------|--------------|-------------------------|--------------|
|   | AM Peak Hour      | PM Peak Hour | AM Peak Hour            | PM Peak Hour |
| Total Vehicle Input (veh/2 hrs)                     | 35,318            | 37,092       | 37,120                  | 38,844       |
| Number of Vehicles Entered into Network (veh/2 hrs) | 31,642            | 34,913       | 33,212                  | 36,137       |
| Percent Vehicles Entered (%)                        | 89.59%            | 94.13%       | 89.47%                  | 93.03%       |

**Table 25: AM Peak Hour Simulated Travel Time Results (2031)**

| Travel Time Segment                                      | Travel Time (sec) |                   |                         | Difference* (sec) |
|--|-------------------|-------------------|-------------------------|-------------------|
|  | Existing (2020)   | Background (2031) | Mitigated Future (2031) |                   |
| <b>Vehicular Travel Time</b>                             |                   |                   |                         |                   |
| EB Army Navy Dr from S Joyce St to 12 <sup>th</sup> St S | 339               | 177               | 225                     | +48               |
| WB Army Navy Dr from 12 <sup>th</sup> St S to S Joyce St | 159               | 201               | 200                     | -1                |
| <b>Transit Travel Time</b>                               |                   |                   |                         |                   |
| EB 12 <sup>th</sup> St from S Hayes St to Long Bridge Dr | --                | 182               | 213                     | +31               |
| WB 12 <sup>th</sup> St from Long Bridge Dr to S Hayes St | --                | 263               | 180                     | -83               |

\* Difference from Background (2031) scenario

**Table 26: PM Peak Hour Simulated Travel Time Results (2031)**

| Travel Time Segment  | Travel Time (sec) |                   |                         | Difference* (sec) |
|--|-------------------|-------------------|-------------------------|-------------------|
|  | Existing (2020)   | Background (2031) | Mitigated Future (2031) |                   |
| <b>Vehicular Travel Time</b>                               |                   |                   |                         |                   |
| EB Army Navy Dr from S Joyce St to 12 <sup>th</sup> St S   | 178               | 245               | 293                     | +48               |
| WB Army Navy Dr from 12 <sup>th</sup> St S to S Joyce St   | 185               | 255               | 270                     | +15               |
| <b>Transit Travel Time</b>                                 |                   |                   |                         |                   |
| EB 12 <sup>th</sup> St S from S Hayes St to Long Bridge Dr | --                | 240               | 181                     | -59               |
| WB 12 <sup>th</sup> St S from Long Bridge Dr to S Hayes St | --                | 269               | 167                     | -102              |

\* Difference from Background (2031) scenario

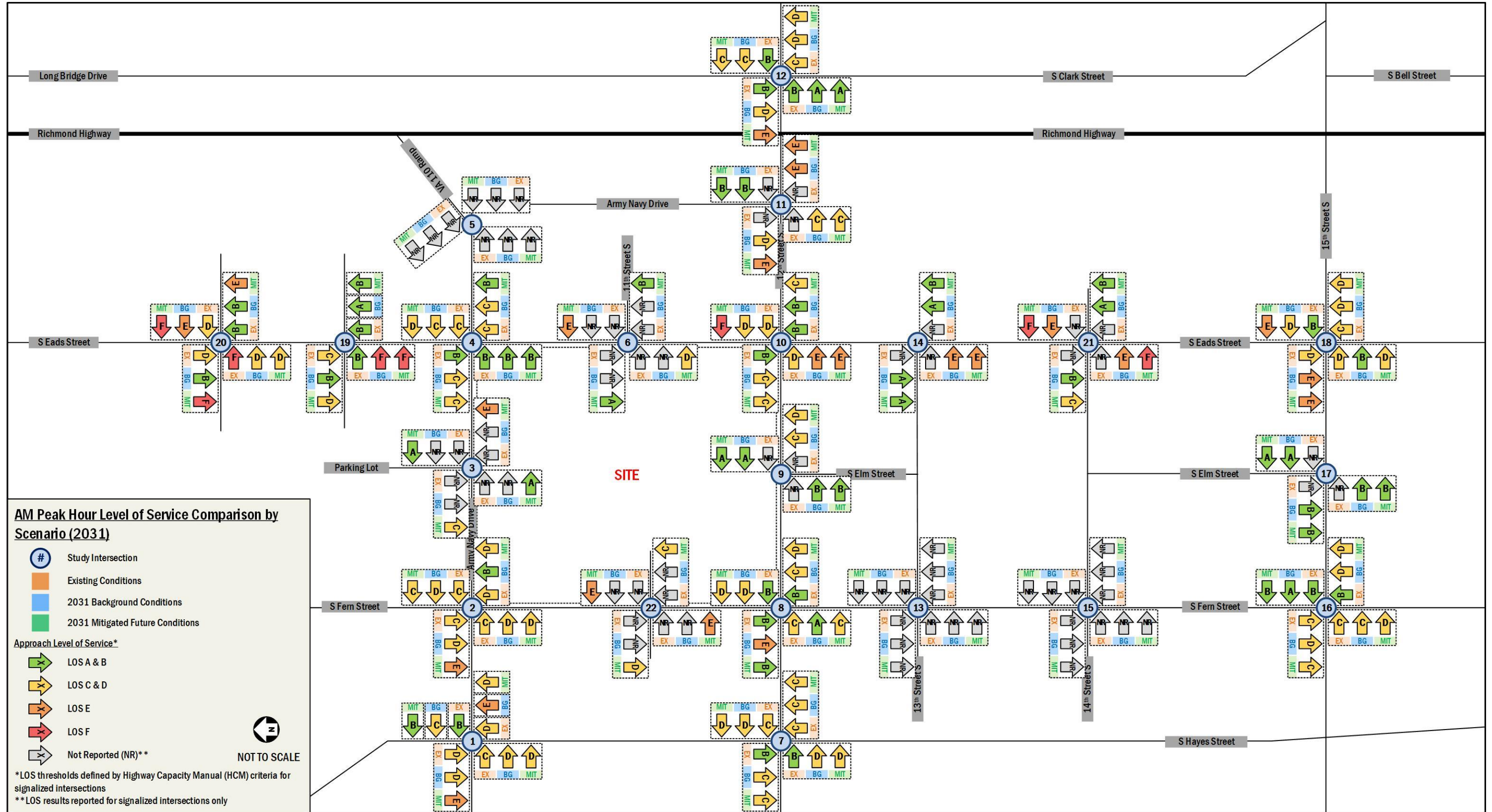


Figure 75: AM Peak Hour Level of Service Comparison by Scenario (2031)

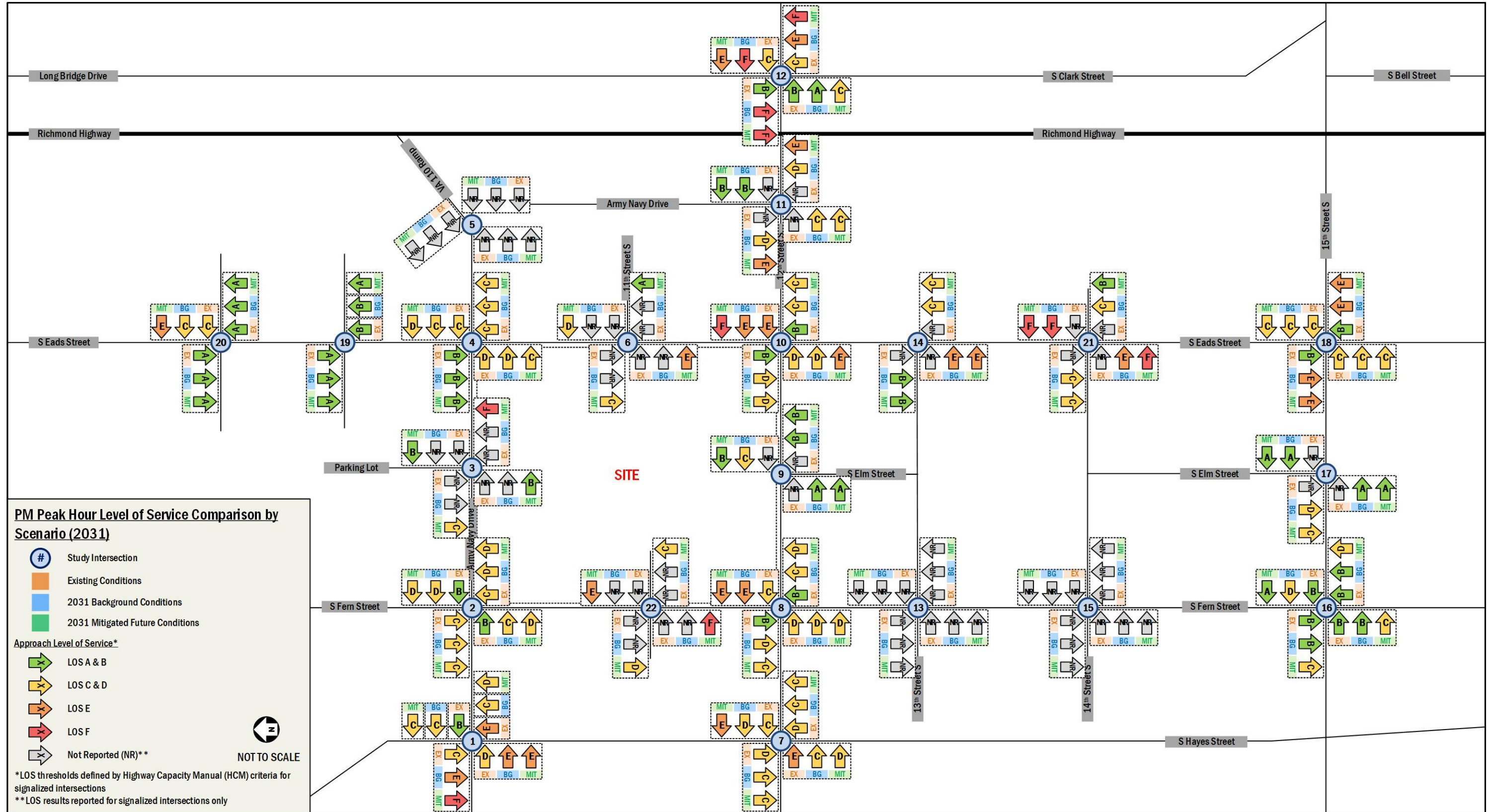


Figure 76: PM Peak Hour Level of Service Comparison by Scenario (2031)

**Table 27: AM Vehicular Delay and Maximum Queue Length (2031)**

| Intersection and Lane Group                    | Storage Length (ft) | AM Peak Hour                         |                     |                  |  |                     |                  |         |          |          |          |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|---------|----------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |         |          |          |          |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |         |          |          |          |
| <b>1. S Hayes Street &amp; Army Navy Drive</b> |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 260                 | 84                                   | 104                 | 110              | 30.8 (C)   | 82.5 (F)            | 82.6 (F)         |         |          |          |          |
| Eastbound Thru                                 | 450                 | 232                                  | 236                 | 275              | 36 (D)   | 53.9 (D)            | 51.7 (D)         |         |          |          |          |
| Eastbound Right                                | 450                 | 256                                  | 236                 | 275              | 32.1 (C)   | 47.8 (D)            | 54 (D)           |         |          |          |          |
| Westbound Left                                 | 190                 | 116                                  | 294                 | 185              | 24.9 (C)   | 181 (F)             | 80.8 (F)         |         |          |          |          |
| Westbound Thru                                 | 430                 | 136                                  | 166                 | 163              | 35.7 (D)   | 41 (D)              | 37.6 (D)         |         |          |          |          |
| Westbound Right                                | 430                 | 58                                   | 27                  | 16               | 0.5 (A)  | 0.9 (A)             | 0.6 (A)          |         |          |          |          |
| Northbound Left                                | 200                 | 133                                  | 190                 | 124              | 47 (D)   | 67.8 (E)            | 70.6 (E)         |         |          |          |          |
| Northbound Thru                                | 750                 | 153                                  | 229                 | 314              | 56.8 (E)   | 61.1 (E)            | 63.2 (E)         |         |          |          |          |
| Northbound Right                               | 115                 | 99                                   | 238                 | 149              | 9 (A)  | 66.7 (E)            | 17 (B)           |         |          |          |          |
| Southbound Left                                | 2050                | 952                                  | 3,781               | 2,708            | 52.7 (D)   | 132.5 (F)           | 110 (F)          |         |          |          |          |
| Southbound Thru                                | 1950                | 952                                  | 3,781               | 2,708            | 33.8 (C)   | 31.7 (C)            | 51.8 (D)         |         |          |          |          |
| Southbound Right                               | 1950                | 353                                  | 3,780               | 2,705            | 8.3 (A)  | 17.4 (B)            | 34 (C)           |         |          |          |          |
| Overall  | ---                 | ---                                  | ---                 | ---              | 32.3 (C)   | 50.4 (D)            | 55.9 (E)         |         |          |          |          |
| <b>2. S Fern Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 160                 | 156                                  | 112                 | 123              | 26.8 (C)   | 30.6 (C)            | 30.3 (C)         |         |          |          |          |
| Eastbound Thru                                 | 430                 | 421                                  | 443                 | 591              | 26.5 (C)   | 41.1 (D)            | 40 (D)           |         |          |          |          |
| Eastbound Right                                | 180                 | 153                                  | 318                 | 549              | 6.2 (A)  | 47.1 (D)            | 42.8 (D)         |         |          |          |          |
| Westbound Left                                 | 80                  | 312                                  | 304                 | 285              | 52.6 (D)   | 96.2 (F)            | 125.6 (F)        |         |          |          |          |
| Westbound Thru                                 | 260                 | 312                                  | 304                 | 285              | 21.1 (C)   | 27.7 (C)            | 8 (A)            |         |          |          |          |
| Westbound Right                                | 260                 | 317                                  | 309                 | 288              | 17.2 (B)   | 27.2 (C)            | 8.5 (A)          |         |          |          |          |
| Northbound Left                                | 280                 | 231                                  | 221                 | 186              | 45.8 (D)   | 22.6 (C)            | 49.2 (D)         |         |          |          |          |
| Northbound Thru                                | 390                 | 67                                   | 56                  | 61               | 27.5 (C)   | 9.5 (A)             | 24.1 (C)         |         |          |          |          |
| Northbound Right                               | 80                  | 75                                   | 56                  | 72               | 7.5 (A)  | 9.7 (A)             | 29.9 (C)         |         |          |          |          |
| Southbound Left                                | 75                  | 185                                  | 256                 | 387              | 31.8 (C)   | 45 (D)              | 52.4 (D)         |         |          |          |          |
| Southbound Thru                                | 560                 | 208                                  | 278                 | 431              | 27 (C)   | 45.6 (D)            | 55.8 (E)         |         |          |          |          |
| Southbound Right                               | 560                 | 215                                  | 285                 | 430              | 17.4 (B)   | 32.9 (C)            | 58.7 (E)         |         |          |          |          |
| Overall  | ---                 | ---                                  | ---                 | ---              | 26.1 (C)   | 37.7 (D)            | 40.3 (D)         |         |          |          |          |
| <b>3. Army Navy Drive &amp; Parking Lot</b>    |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 120                 |                                      |                     | 336              |  |                     | 3.5 (A)          |         |          |          |          |
| Eastbound Thru                                 | 260                 |                                      |                     | 336              |  |                     | 2.3 (A)          |         |          |          |          |
| Eastbound Right                                | 225                 |                                      |                     | 336              |  |                     | 62.9 (E)         |         |          |          |          |
| Westbound Thru                                 | 230                 |                                      |                     | 171              |  |                     | 3 (A)            |         |          |          |          |
| Westbound Right                                | 230                 |                                      |                     | 188              |  |                     | 4.5 (A)          |         |          |          |          |
| Northbound Left                                | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 86               | <i>Un-signalized</i>   | <i>Unsignalized</i> | 74.1 (E)         |         |          |          |          |
| Northbound Thru                                | 100                 |                                      |                     | 89               |  |                     | 0 (A)            |         |          |          |          |
| Northbound Right                               | 100                 |                                      |                     | 86               |  |                     | 74.2 (E)         |         |          |          |          |
| Southbound Left                                | 100                 |                                      |                     | 51               |  |                     | 71.6 (E)         |         |          |          |          |
| Southbound Thru                                | 100                 |                                      |                     | 51               |  |                     | 0 (A)            |         |          |          |          |
| Southbound Right                               | 100                 |                                      |                     | 56               |  |                     | 15.9 (B)         |         |          |          |          |
| Overall  | ---                 |                                      |                     | ---              |  |                     | ---              | 6.3 (A) |          |          |          |
| <b>4. S Eads Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |         |          |          |          |
| Eastbound Left                                 | 220                 |                                      |                     | 332              |  |                     | 287              | 237     | 24.2 (C) | 21.9 (C) | 16.8 (B) |
| Eastbound Thru                                 | 220                 |                                      |                     | 331              |  |                     | 286              | 238     | 16.7 (B) | 9.1 (A)  | 9.2 (A)  |
| Eastbound Right                                | 220                 | 359                                  | 272                 | 238              | 7.9 (A)  | 20 (B)              | 14.9 (B)         |         |          |          |          |
| Westbound Thru                                 | 1100                | 181                                  | 143                 | 181              | 48.9 (D)   | 36.1 (D)            | 55.7 (E)         |         |          |          |          |
| Westbound Right                                | 100                 | 181                                  | 153                 | 190              | 30.6 (C)   | 11.5 (B)            | 17.3 (B)         |         |          |          |          |

| Intersection and Lane Group                  | Storage Length (ft) | AM Peak Hour                         |                     |                  |  |                     |                  |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |
| Northbound Left                              | 100                 | 191                                  | 317                 | 301              | 18 (B)   | 29 (C)              | 72.9 (E)         |
| Northbound Thru                              | 240                 | 299                                  | 317                 | 251              | 35.4 (D)   | 23.9 (C)            | 13.9 (B)         |
| Northbound Right                             | 240                 | 299                                  | 317                 | 251              | 32.1 (C)   | 25.1 (C)            | 11.2 (B)         |
| Southbound Left                              | 140                 | 302                                  | 351                 | 361              | 32.1 (C)   | 34.6 (C)            | 26.4 (C)         |
| Southbound Thru                              | 140                 | 298                                  | 351                 | 361              | 30.2 (C)   | 39.6 (D)            | 40.6 (D)         |
| Southbound Right                             | 110                 | 298                                  | 351                 | 371              | 32.9 (C)   | 19.1 (B)            | 7.2 (A)          |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 6.3 (A)  | 24.7 (C)            | 25.5 (C)         |
| <b>5. Army Navy Drive &amp; 110 Ramp</b>     |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | ---                 |                                      |                     | 0                |  |                     | 0.1 (A)          |
| Westbound Thru                               | 1000                | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 85               | <i>Un-signalized</i>   | <i>Unsignalized</i> | 2.4 (A)          |
| Southbound Right                             | 900                 |                                      |                     | 0                |  |                     | 2.1 (A)          |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 1.1 (A)          |
| <b>6. S Eads Street &amp; 11th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 200                 |                                      |                     | 105              |  |                     | 54.2 (D)         |
| Eastbound Thru                               | 200                 |                                      |                     | 105              |  |                     | 0 (A)            |
| Eastbound Right                              | 200                 |                                      |                     | 105              |  |                     | 54 (D)           |
| Westbound Left                               | 300                 |                                      |                     | 112              |  |                     | 60.7 (E)         |
| Westbound Thru                               | 300                 |                                      |                     | 112              |  |                     | 0 (A)            |
| Westbound Right                              | 300                 |                                      |                     | 112              |  |                     | 57.6 (E)         |
| Northbound Left                              | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 266              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 18.6 (B)         |
| Northbound Thru                              | 250                 |                                      |                     | 232              |  |                     | 8 (A)            |
| Northbound Right                             | 250                 |                                      |                     | 235              |  |                     | 5.9 (A)          |
| Southbound Left                              | 250                 |                                      |                     | 368              |  |                     | 9.8 (A)          |
| Southbound Thru                              | 250                 |                                      |                     | 368              |  |                     | 10.3 (B)         |
| Southbound Right                             | 25                  |                                      |                     | 364              |  |                     | 6.2 (A)          |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 13.9 (B)         |
| <b>7. S Hayes Street &amp; 12th Street S</b> |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 450                 | 95                                   | 153                 | 134              | 30.3 (C)   | 50.2 (D)            | 51.6 (D)         |
| Eastbound Thru                               | 450                 | 95                                   | 153                 | 134              | 27.8 (C)   | 47.3 (D)            | 43.9 (D)         |
| Eastbound Right                              | 65                  | 94                                   | 151                 | 132              | 5.3 (A)  | 46.3 (D)            | 49.9 (D)         |
| Westbound Left                               | 100                 | 161                                  | 184                 | 204              | 31.6 (C)   | 40.2 (D)            | 56.1 (E)         |
| Westbound Thru                               | 620                 | 161                                  | 184                 | 204              | 27.8 (C)   | 39.8 (D)            | 52 (D)           |
| Westbound Right                              | 620                 | 171                                  | 184                 | 204              | 12.5 (B)   | 40.2 (D)            | 55.7 (E)         |
| Northbound Left                              | 75                  | 125                                  | 147                 | 177              | 59.2 (E)   | 77.5 (E)            | 77.3 (E)         |
| Northbound Thru                              | 775                 | 125                                  | 147                 | 177              | 21.1 (C)   | 19.9 (B)            | 26.6 (C)         |
| Northbound Right                             | 75                  | 129                                  | 150                 | 181              | 5.8 (A)  | 9.1 (A)             | 12.3 (B)         |
| Southbound Left                              | 250                 | 499                                  | 496                 | 494              | 71 (E)   | 63.9 (E)            | 68.3 (E)         |
| Southbound Thru                              | 770                 | 499                                  | 496                 | 494              | 7.1 (A)  | 11.9 (B)            | 13.4 (B)         |
| Southbound Right                             | 770                 | 506                                  | 496                 | 494              | 1.9 (A)  | 13.7 (B)            | 14.2 (B)         |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 22.9 (C)   | 26.7 (C)            | 30.7 (C)         |
| <b>8. S Fern Street &amp; 12th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | 640                 | 373                                  | 431                 | 606              | 31.4 (C)   | 10.6 (B)            | 33.4 (C)         |
| Eastbound Right                              | 640                 | 373                                  | 440                 | 615              | 28.6 (C)   | 7.8 (A)             | 31.7 (C)         |
| Westbound Left                               | 75                  | 379                                  | 221                 | 232              | 26 (C)   | 60.3 (E)            | 87.7 (F)         |
| Westbound Thru                               | 225                 | 126                                  | 221                 | 236              | 31.7 (C)   | 17.7 (B)            | 5.3 (A)          |
| Westbound Right                              | 225                 | 126                                  | 230                 | 235              | 19.3 (B)   | 11.6 (B)            | 10.7 (B)         |
| Northbound Left                              | 100                 | 135                                  | 406                 | 433              | 11.5 (B)   | 37.9 (D)            | 43.7 (D)         |
| Northbound Thru                              | 280                 | 257                                  | 373                 | 391              | 21 (C)   | 27.3 (C)            | 52.2 (D)         |

| Intersection and Lane Group                                  | Storage Length (ft) | AM Peak Hour                         |            |                  |  |            |                  |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |
| Northbound Right   | 280                 | 257                                  | 372        | 390              | 10.6 (B)   | 23.9 (C)   | 50 (D)           |
| Southbound Left  | 130                 | 257                                  | 526        | 310              | 10.1 (B)   | 83.8 (F)   | 52 (D)           |
| Southbound Thru  | 275                 | 415                                  | 526        | 430              | 19.3 (B)   | 74.2 (E)   | 20.1 (C)         |
| Southbound Right   | 275                 | 415                                  | 533        | 430              | 15.5 (B)   | 71.1 (E)   | 17.2 (B)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 14 (B)   | 37.4 (D)   | 38.7 (D)         |
| <b>9. S Elm Street &amp; 12th Street S</b>                   |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 225                 |                                      | 393        | 361              |  | 16.5 (B)   | 19.4 (B)         |
| Eastbound Right  | 225                 | <i>Un-signalized</i>                 | 386        | 363              | <i>Un-signalized</i>   | 10.5 (B)   | 15 (B)           |
| Westbound Thru   | 325                 |                                      | 125        | 37               |  | 6.4 (A)    | 0.9 (A)          |
| Northbound Right   | 270                 |                                      | 90         | 83               |  | 31.1 (C)   | 42.5 (D)         |
| Overall  | ---                 |                                      | ---        | ---              |  | ---        | 14.2 (B)         |
| <b>10. S Eads Street &amp; 12th Street S</b>                 |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 150                 | 413                                  | 373        | 382              | 38.3 (D)   | 98.6 (F)   | 104.8 (F)        |
| Eastbound Thru   | 320                 | 413                                  | 373        | 382              | 40.4 (D)   | 59.5 (E)   | 68 (E)           |
| Eastbound Right  | 320                 | 417                                  | 373        | 382              | 36.8 (D)   | 62.2 (E)   | 70.3 (E)         |
| Westbound Left   | 200                 | 231                                  | 202        | 404              | 63.7 (E)   | 94.3 (F)   | 97 (F)           |
| Westbound Thru   | 575                 | 231                                  | 202        | 404              | 33.8 (C)   | 28.9 (C)   | 81.6 (F)         |
| Westbound Right  | 575                 | 231                                  | 202        | 404              | 38.4 (D)   | 32.9 (C)   | 81.8 (F)         |
| Northbound Left  | 100                 | 195                                  | 183        | 359              | 17.6 (B)   | 24.9 (C)   | 31.5 (C)         |
| Northbound Thru  | 270                 | 195                                  | 183        | 359              | 11.2 (B)   | 13.6 (B)   | 28.3 (C)         |
| Northbound Right   | 100                 | 199                                  | 184        | 285              | 10.3 (B)   | 7.2 (A)    | 11 (B)           |
| Southbound Left  | 120                 | 343                                  | 350        | 305              | 20.5 (C)   | 32.3 (C)   | 32.7 (C)         |
| Southbound Thru  | 250                 | 343                                  | 350        | 284              | 19.1 (B)   | 29.8 (C)   | 14.4 (B)         |
| Southbound Right   | 250                 | 342                                  | 355        | 283              | 18.2 (B)   | 28.5 (C)   | 11.8 (B)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 31 (C)   | 37.1 (D)   | 42.3 (D)         |
| <b>11. 12th Street S &amp; Army Navy Drive</b>               |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 575                 |                                      | 609        | 658              |  | 25.6 (C)   | 28.5 (C)         |
| Eastbound Right  | 575                 |                                      | 620        | 658              |  | 21.4 (C)   | 34.7 (C)         |
| Westbound Thru   | 120                 |                                      | 216        | 238              |  | 13.6 (B)   | 17 (B)           |
| Westbound Right  | 120                 |                                      | 216        | 238              |  | 13.6 (B)   | 13.7 (B)         |
| Northbound Left  | 50                  | <i>Un-signalized</i>                 | 58         | 60               | <i>Un-signalized</i>   | 0 (A)      | 0 (A)            |
| Northbound Thru  | 50                  |                                      | 58         | 60               |  | 71.7 (E)   | 69 (E)           |
| Northbound Right   | 50                  |                                      | 58         | 60               |  | 66.2 (E)   | 55.1 (E)         |
| Southbound Left  | 1000                |                                      | 286        | 289              |  | 47.7 (D)   | 60.9 (E)         |
| Southbound Thru  | 1000                |                                      | 286        | 289              |  | 0 (A)      | 0 (A)            |
| Southbound Right   | 1000                |                                      | 286        | 289              |  | 45.4 (D)   | 64.4 (E)         |
| Overall  | ---                 | ---                                  | ---        | ---              |  | 28.6 (C)   | 33.7 (C)         |
| <b>12. S Clark Street/Long Bridge Dr &amp; 12th Street S</b> |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 120                 | 259                                  | 223        | 210              | 23 (C)   | 4.8 (A)    | 6.5 (A)          |
| Eastbound Thru   | 120                 | 259                                  | 223        | 210              | 13.5 (B)   | 2.3 (A)    | 2.8 (A)          |
| Eastbound Right  | 120                 | 260                                  | 223        | 210              | 7.2 (A)  | 2.8 (A)    | 3.2 (A)          |
| Westbound Left   | 100                 | 64                                   | 81         | 81               | 15.3 (B)   | 22.7 (C)   | 20 (B)           |
| Westbound Thru   | 1500                | 365                                  | 250        | 298              | 13.5 (B)   | 26.7 (C)   | 28.7 (C)         |
| Westbound Right  | 1500                | 368                                  | 261        | 309              | 13.2 (B)   | 20.4 (C)   | 23.6 (C)         |
| Northbound Left  | 100                 | 86                                   | 116        | 133              | 26.7 (C)   | 61.7 (E)   | 62.3 (E)         |
| Northbound Thru  | 1200                | 67                                   | 116        | 133              | 20.6 (C)   | 34.6 (C)   | 45.8 (D)         |
| Northbound Right   | 1200                | 69                                   | 121        | 138              | 10.4 (B)   | 16.5 (B)   | 18.3 (B)         |
| Southbound Left  | 450                 | 195                                  | 463        | 727              | 24 (C)   | 55.2 (E)   | 71.9 (E)         |

| Intersection and Lane Group                  | Storage Length (ft) | AM Peak Hour                         |            |                  |  |            |                  |          |          |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |          |          |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |          |          |
| Southbound Thru                              | 450                 | 195                                  | 463        | 727              | 22.1 (C)   | 52.7 (D)   | 65.6 (E)         |          |          |
| Southbound Right                             | 150                 | 80                                   | 341        | 691              | 7.1 (A)  | 56.3 (E)   | 66.9 (E)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 17.4 (B)   | 18.7 (B)   | 23 (C)           |          |          |
| <b>14. S Eads Street &amp; 13th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 350                 |                                      | 230        | 231              |  | 60.3 (E)   | 63.4 (E)         |          |          |
| Eastbound Right                              | 350                 |                                      | 230        | 231              |  | 68.5 (E)   | 65.8 (E)         |          |          |
| Northbound Left                              | 150                 | <i>Un-signalized</i>                 | 248        | 425              | <i>Un-signalized</i>   | 1.6 (A)    | 7.6 (A)          |          |          |
| Northbound Thru                              | 300                 |                                      | 248        | 425              |  | 1.9 (A)    | 20.7 (C)         |          |          |
| Southbound Thru                              | 280                 |                                      | 276        | 219              |  | 5.2 (A)    | 8.9 (A)          |          |          |
| Southbound Right                             | 280                 |                                      | 278        | 222              |  | 3 (A)      | 3.8 (A)          |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 11.4 (B)         | 20.4 (C) |          |
| <b>16. S Fern Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 130                 |                                      | 338        | 299              |  | 287        | 21.2 (C)         | 24.6 (C) | 35.5 (D) |
| Eastbound Thru                               | 630                 | 338                                  | 299        | 287              | 29.7 (C)   | 24.5 (C)   | 35.5 (D)         |          |          |
| Eastbound Right                              | 630                 | 340                                  | 301        | 289              | 17.2 (B)   | 22.7 (C)   | 32.5 (C)         |          |          |
| Westbound Left                               | 120                 | 114                                  | 131        | 192              | 21.1 (C)   | 15 (B)     | 32.5 (C)         |          |          |
| Westbound Thru                               | 260                 | 114                                  | 131        | 192              | 11.8 (B)   | 6.5 (A)    | 19.5 (B)         |          |          |
| Westbound Right                              | 260                 | 116                                  | 133        | 195              | 6.2 (A)  | 4.2 (A)    | 13.3 (B)         |          |          |
| Northbound Left                              | 750                 | 266                                  | 501        | 773              | 19.8 (B)   | 52.6 (D)   | 61.4 (E)         |          |          |
| Northbound Thru                              | 750                 | 266                                  | 501        | 773              | 16.9 (B)   | 48 (D)     | 64.2 (E)         |          |          |
| Northbound Right                             | 75                  | 272                                  | 506        | 778              | 8.4 (A)  | 20.6 (C)   | 31.3 (C)         |          |          |
| Southbound Left                              | 160                 | 214                                  | 331        | 268              | 30.2 (C)   | 60 (E)     | 40.7 (D)         |          |          |
| Southbound Thru                              | 300                 | 214                                  | 331        | 268              | 16 (B)   | 35.1 (D)   | 31.8 (C)         |          |          |
| Southbound Right                             | 300                 | 229                                  | 346        | 274              | 10.8 (B)   | 16 (B)     | 15.7 (B)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 20.3 (C)   | 27.6 (C)   | 34.7 (C)         |          |          |
| <b>17. 15th Street S &amp; S Elm Street</b>  |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 60                  |                                      | 374        | 318              |  | 13.9 (B)   | 7.5 (A)          |          |          |
| Eastbound Thru                               | 270                 |                                      | 374        | 318              |  | 13.8 (B)   | 10.6 (B)         |          |          |
| Westbound Thru                               | 300                 | <i>Un-signalized</i>                 | 162        | 143              | <i>Un-signalized</i>   | 4.4 (A)    | 1.5 (A)          |          |          |
| Westbound Right                              | 300                 |                                      | 162        | 143              |  | 5.8 (A)    | 2.3 (A)          |          |          |
| Southbound Left                              | 250                 |                                      | 55         | 55               |  | 43.5 (D)   | 43.6 (D)         |          |          |
| Southbound Right                             | 250                 |                                      | 67         | 66               |  | 8.1 (A)    | 8.5 (A)          |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 10.8 (B)         | 7.4 (A)  |          |
| <b>18. S Eads Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 170                 | 345                                  | 272        | 325              | 31.1 (C)   | 24.3 (C)   | 32.7 (C)         |          |          |
| Eastbound Thru                               | 300                 | 413                                  | 378        | 410              | 46.8 (D)   | 17.7 (B)   | 37.8 (D)         |          |          |
| Eastbound Right                              | 300                 | 418                                  | 378        | 410              | 8.6 (A)  | 18.9 (B)   | 42.5 (D)         |          |          |
| Westbound Left                               | 300                 | 169                                  | 339        | 363              | 38.1 (D)   | 53 (D)     | 45.7 (D)         |          |          |
| Westbound Thru                               | 300                 | 169                                  | 339        | 363              | 15.8 (B)   | 35.1 (D)   | 53.3 (D)         |          |          |
| Westbound Right                              | 300                 | 181                                  | 339        | 363              | 12.7 (B)   | 42.5 (D)   | 62.3 (E)         |          |          |
| Northbound Left                              | 130                 | 335                                  | 929        | 928              | 24 (C)   | 46.8 (D)   | 41.4 (D)         |          |          |
| Northbound Thru                              | 760                 | 335                                  | 929        | 928              | 20.1 (C)   | 59 (E)     | 51.3 (D)         |          |          |
| Northbound Right                             | 130                 | 399                                  | 884        | 926              | 20.5 (C)   | 33.5 (C)   | 30.9 (C)         |          |          |
| Southbound Left                              | 250                 | 377                                  | 388        | 397              | 89.7 (F)   | 77.3 (E)   | 90.2 (F)         |          |          |
| Southbound Thru                              | 300                 | 345                                  | 388        | 397              | 27 (C)   | 49.8 (D)   | 25.3 (C)         |          |          |
| Southbound Right                             | 75                  | 348                                  | 392        | 399              | 26.9 (C)   | 22.1 (C)   | 10.3 (B)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 34 (C)   | 38.3 (D)   | 46.9 (D)         |          |          |

| Intersection and Lane Group                             | Storage Length (ft) | AM Peak Hour                         |                            |                  |  |                            |                  |
|---|---------------------|--------------------------------------|----------------------------|------------------|--|----------------------------|------------------|
|   |                     | Average of Maximum Queue Length (ft) |                            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                            |                  |
|   |                     | Existing                             | Background                 | Mitigated Future | Existing   | Background                 | Mitigated Future |
| <b>19. S Eads Street &amp; I-395 Ramps (South Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Thru  | 1000                | 199                                  | 962                        | 926              | 34.5 (C)   | 75.6 (E)                   | 55.5 (E)         |
| Eastbound Right   | 1000                | 243                                  | 962                        | 926              | 12.1 (B)   | 159.5 (F)                  | 115.7 (F)        |
| Northbound Left   | 150                 | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Northbound Thru   | 170                 | 148                                  | 164                        | 224              | 19.3 (B)   | 10.6 (B)                   | 54.6 (D)         |
| Northbound Right  | 170                 | 206                                  | 223                        | 283              | 10.8 (B)   | 7.1 (A)                    | 6.9 (A)          |
| Southbound Left   | 100                 | 197                                  | 211                        | 237              | 33.8 (C)   | 2.9 (A)                    | 8.3 (A)          |
| Southbound Thru   | 100                 | 194                                  | 208                        | 237              | 9 (A)  | 26.6 (C)                   | 53.6 (D)         |
| Overall   | ---                 | ---                                  | ---                        | ---              | 14.3 (B)   | 57.1 (E)                   | 53.7 (D)         |
| <b>20. S Eads Street &amp; I-395 Ramps (North Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 875                 | 1,217                                | 472                        | 484              | 120.2 (F)  | 49.8 (D)                   | 50.7 (D)         |
| Westbound Left  | 1250                | 177                                  | 214                        | 840              | 57.5 (E)   | 67.4 (E)                   | 271 (F)          |
| Westbound Right   | 1250                | 224                                  | 214                        | 840              | 23.5 (C)   | 59.6 (E)                   | 36.9 (D)         |
| Northbound Thru   | 100                 | 178                                  | 207                        | 263              | 12 (B)   | 16.7 (B)                   | 56.3 (E)         |
| Southbound Thru   | 100                 | 151                                  | 137                        | 250              | 37.6 (D)   | 17 (B)                     | 130.4 (F)        |
| Southbound Right  | 100                 | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Overall   | ---                 | ---                                  | ---                        | ---              | 14.3 (B)   | 43.1 (D)                   | 89.1 (F)         |
| <b>21. S Eads Street &amp; 14th Street S</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 200                 |                                      | 43                         | 45               |  | 78.5 (E)                   | 85.3 (F)         |
| Eastbound Thru  | 200                 |                                      | 43                         | 45               |  | 0 (A)                      | 0 (A)            |
| Eastbound Right   | 200                 |                                      | 42                         | 45               |  | 0 (A)                      | 0 (A)            |
| Westbound Left  | 150                 |                                      | 96                         | 104              |  | 56.4 (E)                   | 74.7 (E)         |
| Westbound Thru  | 150                 |                                      | 96                         | 104              |  | 0 (A)                      | 0 (A)            |
| Westbound Right   | 150                 |                                      | 96                         | 104              |  | 95.3 (F)                   | 120.1 (F)        |
| Northbound Left   | 100                 | <i>Future Intersection</i>           | 179                        | 382              | <i>Future Intersection</i>   | 0 (A)                      | 0 (A)            |
| Northbound Thru   | 350                 |                                      | 179                        | 382              |  | 3 (A)                      | 14.3 (B)         |
| Northbound Right  | 350                 |                                      | 192                        | 390              |  | 3.1 (A)                    | 12.6 (B)         |
| Southbound Left   | 100                 |                                      | 188                        | 334              |  | 74.2 (E)                   | 74.6 (E)         |
| Southbound Thru   | 290                 |                                      | 188                        | 334              |  | 9.1 (A)                    | 17.9 (B)         |
| Southbound Right  | 290                 |                                      | 191                        | 337              |  | 7.8 (A)                    | 15.3 (B)         |
| Overall   | ---                 |                                      | ---                        | ---              |  | 11.4 (B)                   | 20.8 (C)         |
| <b>22. S Fern Street &amp; Site Driveway</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 450                 |                                      |                            | 74               |  |                            | 68.7 (E)         |
| Eastbound Thru  | 450                 |                                      |                            | 73               |  |                            | 0 (A)            |
| Eastbound Right   | 450                 |                                      |                            | 73               |  |                            | 70.2 (E)         |
| Westbound Left  | 150                 |                                      |                            | 74               |  |                            | 54.5 (D)         |
| Westbound Thru  | 150                 |                                      |                            | 74               |  |                            | 0 (A)            |
| Westbound Right   | 150                 |                                      |                            | 74               |  |                            | 65.4 (E)         |
| Northbound Left   | 140                 | <i>Future Intersection</i>           | <i>Future Intersection</i> | 181              | <i>Future Intersection</i>   | <i>Future Intersection</i> | 60.5 (E)         |
| Northbound Thru   | 275                 |                                      |                            | 321              |  |                            | 25.6 (C)         |
| Northbound Right  | 275                 |                                      |                            | 321              |  |                            | 20.4 (C)         |
| Southbound Left   | 75                  |                                      |                            | 346              |  |                            | 29.1 (C)         |
| Southbound Thru   | 390                 |                                      |                            | 532              |  |                            | 44.8 (D)         |
| Southbound Right  | 390                 |                                      |                            | 536              |  |                            | 34.5 (C)         |
| Overall   | ---                 |                                      |                            | ---              |  |                            | 35.9 (D)         |



**Table 28: PM Vehicular Delay and Maximum Queue Length (2031)**

| Intersection and Lane Group                    | Storage Length (ft) | PM Peak Hour                         |                     |                  |  |                     |                  |          |          |          |          |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|----------|----------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |          |          |          |          |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |          |          |          |          |
| <b>1. S Hayes Street &amp; Army Navy Drive</b> |                     |                                      |                     |                  |  |                     |                  |          |          |          |          |
| Eastbound Left                                 | 260                 | 223                                  | 349                 | 366              | 40.1 (D)   | 66.7 (E)            | 66.4 (E)         |          |          |          |          |
| Eastbound Thru                                 | 450                 | 460                                  | 365                 | 560              | 37.1 (D)   | 65.7 (E)            | 54.1 (D)         |          |          |          |          |
| Eastbound Right                                | 450                 | 483                                  | 365                 | 560              | 35.8 (D)   | 37.3 (D)            | 101.1 (F)        |          |          |          |          |
| Westbound Left                                 | 190                 | 101                                  | 176                 | 358              | 33.7 (C)   | 76.5 (E)            | 235.7 (F)        |          |          |          |          |
| Westbound Thru                                 | 430                 | 239                                  | 288                 | 312              | 32.1 (C)   | 66.5 (E)            | 47.7 (D)         |          |          |          |          |
| Westbound Right                                | 430                 | 206                                  | 169                 | 106              | 1.1 (A)  | 1.4 (A)             | 2.1 (A)          |          |          |          |          |
| Northbound Left                                | 200                 | 366                                  | 329                 | 280              | 234 (F)  | 59.2 (E)            | 64.1 (E)         |          |          |          |          |
| Northbound Thru                                | 750                 | 345                                  | 337                 | 364              | 47.2 (D)   | 29.3 (C)            | 37.8 (D)         |          |          |          |          |
| Northbound Right                               | 115                 | 208                                  | 215                 | 361              | 13.1 (B)   | 5.5 (A)             | 30.2 (C)         |          |          |          |          |
| Southbound Left                                | 2050                | 716                                  | 2,927               | 1,499            | 37.7 (D)   | 149.2 (F)           | 212.5 (F)        |          |          |          |          |
| Southbound Thru                                | 1950                | 716                                  | 2,927               | 1,499            | 44.4 (D)   | 41.3 (D)            | 47.5 (D)         |          |          |          |          |
| Southbound Right                               | 1950                | 274                                  | 2,926               | 1,498            | 7.9 (A)  | 24.8 (C)            | 30.7 (C)         |          |          |          |          |
| Overall  | ---                 | ---                                  | ---                 | ---              | 36.4 (D)   | 44.3 (D)            | 59.2 (E)         |          |          |          |          |
| <b>2. S Fern Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |          |          |          |          |
| Eastbound Left                                 | 160                 | 218                                  | 305                 | 449              | 33.5 (C)   | 37 (D)              | 56.5 (E)         |          |          |          |          |
| Eastbound Thru                                 | 430                 | 303                                  | 505                 | 514              | 20.4 (C)   | 34.5 (C)            | 45.2 (D)         |          |          |          |          |
| Eastbound Right                                | 180                 | 96                                   | 137                 | 268              | 5 (A)  | 9.7 (A)             | 24.8 (C)         |          |          |          |          |
| Westbound Left                                 | 80                  | 383                                  | 408                 | 367              | 18.2 (B)   | 88.4 (F)            | 99.2 (F)         |          |          |          |          |
| Westbound Thru                                 | 260                 | 383                                  | 408                 | 367              | 18 (B)   | 33.3 (C)            | 35.1 (D)         |          |          |          |          |
| Westbound Right                                | 260                 | 388                                  | 412                 | 372              | 24.5 (C)   | 37.5 (D)            | 44 (D)           |          |          |          |          |
| Northbound Left                                | 280                 | 274                                  | 263                 | 442              | 35.5 (D)   | 44.8 (D)            | 50.8 (D)         |          |          |          |          |
| Northbound Thru                                | 390                 | 140                                  | 134                 | 220              | 25 (C)   | 28.7 (C)            | 17.8 (B)         |          |          |          |          |
| Northbound Right                               | 80                  | 148                                  | 134                 | 111              | 10.8 (B)   | 31.2 (C)            | 19.4 (B)         |          |          |          |          |
| Southbound Left                                | 75                  | 73                                   | 166                 | 124              | 47.6 (D)   | 41.1 (D)            | 36.9 (D)         |          |          |          |          |
| Southbound Thru                                | 560                 | 174                                  | 245                 | 207              | 24 (C)   | 41.3 (D)            | 42 (D)           |          |          |          |          |
| Southbound Right                               | 560                 | 181                                  | 252                 | 218              | 15.7 (B)   | 25.3 (C)            | 12.7 (B)         |          |          |          |          |
| Overall  | ---                 | ---                                  | ---                 | ---              | 22.6 (C)   | 33.7 (C)            | 38.7 (D)         |          |          |          |          |
| <b>3. Army Navy Drive &amp; Parking Lot</b>    |                     |                                      |                     |                  |  |                     |                  |          |          |          |          |
| Eastbound Left                                 | 120                 |                                      |                     | 381              |  |                     | 15.1 (B)         |          |          |          |          |
| Eastbound Thru                                 | 260                 |                                      |                     | 381              |  |                     | 10.6 (B)         |          |          |          |          |
| Eastbound Right                                | 225                 |                                      |                     | 381              |  |                     | 54.5 (D)         |          |          |          |          |
| Westbound Thru                                 | 230                 |                                      |                     | 346              |  |                     | 13.5 (B)         |          |          |          |          |
| Westbound Right                                | 230                 |                                      |                     | 363              |  |                     | 12.8 (B)         |          |          |          |          |
| Northbound Left                                | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 245              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 85.5 (F)         |          |          |          |          |
| Northbound Thru                                | 100                 |                                      |                     | 245              |  |                     | 0 (A)            |          |          |          |          |
| Northbound Right                               | 100                 |                                      |                     | 245              |  |                     | 84.6 (F)         |          |          |          |          |
| Southbound Left                                | 100                 |                                      |                     | 130              |  |                     | 67.2 (E)         |          |          |          |          |
| Southbound Thru                                | 100                 |                                      |                     | 130              |  |                     | 0 (A)            |          |          |          |          |
| Southbound Right                               | 100                 |                                      |                     | 129              |  |                     | 23.9 (C)         |          |          |          |          |
| Overall  | ---                 |                                      |                     | ---              |  |                     | ---              | 18.4 (B) |          |          |          |
| <b>4. S Eads Street &amp; Army Navy Drive</b>  |                     |                                      |                     |                  |  |                     |                  |          |          |          |          |
| Eastbound Left                                 | 220                 |                                      |                     | 354              |  |                     | 335              | 292      | 59.5 (E) | 64.7 (E) | 40.5 (D) |
| Eastbound Thru                                 | 220                 |                                      |                     | 354              |  |                     | 333              | 292      | 20.7 (C) | 11.4 (B) | 21.3 (C) |
| Eastbound Right                                | 220                 | 382                                  | 327                 | 292              | 13.8 (B)   | 9.3 (A)             | 23.6 (C)         |          |          |          |          |
| Westbound Thru                                 | 1100                | 212                                  | 199                 | 207              | 32 (C)   | 30.5 (C)            | 48.9 (D)         |          |          |          |          |
| Westbound Right                                | 100                 | 212                                  | 209                 | 217              | 30.4 (C)   | 20.7 (C)            | 27.4 (C)         |          |          |          |          |

| Intersection and Lane Group                  | Storage Length (ft) | PM Peak Hour                         |                     |                  |  |                     |                  |
|--|---------------------|--------------------------------------|---------------------|------------------|--|---------------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |                     |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                     |                  |
|  |                     | Existing                             | Background          | Mitigated Future | Existing   | Background          | Mitigated Future |
| Northbound Left                              | 100                 | 229                                  | 330                 | 159              | 27.4 (C)   | 25.7 (C)            | 37.1 (D)         |
| Northbound Thru                              | 240                 | 325                                  | 330                 | 327              | 31.2 (C)   | 24.6 (C)            | 29.2 (C)         |
| Northbound Right                             | 240                 | 325                                  | 330                 | 327              | 31.8 (C)   | 20.2 (C)            | 27.2 (C)         |
| Southbound Left                              | 140                 | 331                                  | 204                 | 283              | 24.2 (C)   | 22.2 (C)            | 32.9 (C)         |
| Southbound Thru                              | 140                 | 167                                  | 204                 | 283              | 58.4 (E)   | 23.9 (C)            | 30.4 (C)         |
| Southbound Right                             | 110                 | 167                                  | 204                 | 283              | 27.3 (C)   | 5.1 (A)             | 2.4 (A)          |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 6.1 (A)  | 26.7 (C)            | 30.8 (C)         |
| <b>5. Army Navy Drive &amp; 110 Ramp</b>     |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | ---                 |                                      |                     | 0                |  |                     | 0.1 (A)          |
| Westbound Thru                               | 1000                | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 638              | <i>Un-signalized</i>   | <i>Unsignalized</i> | 28.8 (C)         |
| Southbound Right                             | 900                 |                                      |                     | 298              |  |                     | 9.3 (A)          |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 16.3 (B)         |
| <b>6. S Eads Street &amp; 11th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 200                 |                                      |                     | 364              |  |                     | 52.1 (D)         |
| Eastbound Thru                               | 200                 |                                      |                     | 364              |  |                     | 0 (A)            |
| Eastbound Right                              | 200                 |                                      |                     | 364              |  |                     | 72.3 (E)         |
| Westbound Left                               | 300                 |                                      |                     | 92               |  |                     | 33.7 (C)         |
| Westbound Thru                               | 300                 |                                      |                     | 88               |  |                     | 0 (A)            |
| Westbound Right                              | 300                 |                                      |                     | 88               |  |                     | 54.4 (D)         |
| Northbound Left                              | 100                 | <i>Un-signalized</i>                 | <i>Unsignalized</i> | 40               | <i>Un-signalized</i>   | <i>Unsignalized</i> | 10.2 (B)         |
| Northbound Thru                              | 250                 |                                      |                     | 332              |  |                     | 9.4 (A)          |
| Northbound Right                             | 250                 |                                      |                     | 334              |  |                     | 7.7 (A)          |
| Southbound Left                              | 250                 |                                      |                     | 322              |  |                     | 33.6 (C)         |
| Southbound Thru                              | 250                 |                                      |                     | 322              |  |                     | 27 (C)           |
| Southbound Right                             | 25                  |                                      |                     | 322              |  |                     | 13.7 (B)         |
| Overall                                      | ---                 |                                      |                     | ---              |  |                     | 27 (C)           |
| <b>7. S Hayes Street &amp; 12th Street S</b> |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Left                               | 450                 | 281                                  | 212                 | 236              | 99.5 (F)   | 45.8 (D)            | 60.8 (E)         |
| Eastbound Thru                               | 450                 | 281                                  | 212                 | 217              | 97.5 (F)   | 41 (D)              | 52.1 (D)         |
| Eastbound Right                              | 65                  | 291                                  | 210                 | 215              | 17.8 (B)   | 2.3 (A)             | 3 (A)            |
| Westbound Left                               | 100                 | 302                                  | 381                 | 404              | 43.5 (D)   | 56.5 (E)            | 70.7 (E)         |
| Westbound Thru                               | 620                 | 302                                  | 381                 | 404              | 33.6 (C)   | 47.2 (D)            | 65.7 (E)         |
| Westbound Right                              | 620                 | 313                                  | 381                 | 404              | 19.1 (B)   | 50.3 (D)            | 66.4 (E)         |
| Northbound Left                              | 75                  | 529                                  | 269                 | 384              | 93.1 (F)   | 77.7 (E)            | 69.5 (E)         |
| Northbound Thru                              | 775                 | 529                                  | 269                 | 384              | 44.1 (D)   | 22.9 (C)            | 24.7 (C)         |
| Northbound Right                             | 75                  | 533                                  | 273                 | 388              | 13.8 (B)   | 11.7 (B)            | 14.9 (B)         |
| Southbound Left                              | 250                 | 606                                  | 392                 | 460              | 78.9 (E)   | 77.4 (E)            | 54.5 (D)         |
| Southbound Thru                              | 770                 | 607                                  | 392                 | 460              | 35.5 (D)   | 10.2 (B)            | 19.7 (B)         |
| Southbound Right                             | 770                 | 607                                  | 392                 | 460              | 9.5 (A)  | 9.7 (A)             | 19.7 (B)         |
| Overall                                      | ---                 | ---                                  | ---                 | ---              | 43.1 (D)   | 26.3 (C)            | 30.7 (C)         |
| <b>8. S Fern Street &amp; 12th Street S</b>  |                     |                                      |                     |                  |  |                     |                  |
| Eastbound Thru                               | 640                 | 533                                  | 571                 | 477              | 46.7 (D)   | 49.8 (D)            | 42.9 (D)         |
| Eastbound Right                              | 640                 | 533                                  | 580                 | 487              | 43.8 (D)   | 44.8 (D)            | 35.9 (D)         |
| Westbound Left                               | 75                  | 540                                  | 357                 | 369              | 40.2 (D)   | 115.4 (F)           | 94.4 (F)         |
| Westbound Thru                               | 225                 | 261                                  | 357                 | 369              | 39.2 (D)   | 42.9 (D)            | 41.4 (D)         |
| Westbound Right                              | 225                 | 261                                  | 367                 | 369              | 24.6 (C)   | 35.9 (D)            | 48 (D)           |
| Northbound Left                              | 100                 | 271                                  | 373                 | 383              | 19.5 (B)   | 26.9 (C)            | 42 (D)           |
| Northbound Thru                              | 280                 | 324                                  | 373                 | 383              | 21.7 (C)   | 19.5 (B)            | 38 (D)           |

| Intersection and Lane Group                                  | Storage Length (ft) | PM Peak Hour                         |            |                  |  |            |                  |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |
| Northbound Right   | 280                 | 324                                  | 372        | 383              | 12.8 (B)   | 16.6 (B)   | 35.4 (D)         |
| Southbound Left  | 130                 | 329                                  | 510        | 163              | 14 (B)   | 47.5 (D)   | 37 (D)           |
| Southbound Thru  | 275                 | 383                                  | 510        | 438              | 20.1 (C)   | 35.5 (D)   | 29.8 (C)         |
| Southbound Right   | 275                 | 383                                  | 516        | 437              | 15.7 (B)   | 27.8 (C)   | 28.4 (C)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 13.5 (B)   | 40.3 (D)   | 38.2 (D)         |
| <b>9. S Elm Street &amp; 12th Street S</b>                   |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 225                 |                                      | 212        | 235              |  | 8.3 (A)    | 8.9 (A)          |
| Eastbound Right  | 225                 | <i>Un-signalized</i>                 | 204        | 237              | <i>Un-signalized</i>   | 5 (A)      | 6.1 (A)          |
| Westbound Thru   | 325                 |                                      | 336        | 279              |  | 28.1 (C)   | 13 (B)           |
| Northbound Right   | 270                 |                                      | 93         | 91               |  | 12.7 (B)   | 17.2 (B)         |
| Overall  | ---                 |                                      | ---        | ---              |  | ---        | 16.7 (B)         |
| <b>10. S Eads Street &amp; 12th Street S</b>                 |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 150                 | 350                                  | 338        | 367              | 69.6 (E)   | 62.7 (E)   | 97.7 (F)         |
| Eastbound Thru   | 320                 | 350                                  | 338        | 367              | 39.1 (D)   | 46.7 (D)   | 51.5 (D)         |
| Eastbound Right  | 320                 | 354                                  | 338        | 367              | 31.4 (C)   | 52.1 (D)   | 50.9 (D)         |
| Westbound Left   | 200                 | 497                                  | 494        | 576              | 55.6 (E)   | 85.2 (F)   | 205.4 (F)        |
| Westbound Thru   | 575                 | 497                                  | 494        | 576              | 55.1 (E)   | 62 (E)     | 78.9 (E)         |
| Westbound Right  | 575                 | 510                                  | 494        | 576              | 67.2 (E)   | 66 (E)     | 80.6 (F)         |
| Northbound Left  | 100                 | 369                                  | 388        | 313              | 19.4 (B)   | 37.2 (D)   | 41.1 (D)         |
| Northbound Thru  | 270                 | 369                                  | 388        | 313              | 20.5 (C)   | 34 (C)     | 29.3 (C)         |
| Northbound Right   | 100                 | 374                                  | 389        | 165              | 6.9 (A)  | 10.7 (B)   | 16.5 (B)         |
| Southbound Left  | 120                 | 296                                  | 334        | 275              | 25.4 (C)   | 57.4 (E)   | 53.3 (D)         |
| Southbound Thru  | 250                 | 296                                  | 334        | 352              | 18.5 (B)   | 42.4 (D)   | 34.6 (C)         |
| Southbound Right   | 250                 | 299                                  | 339        | 352              | 15.9 (B)   | 39.6 (D)   | 32.9 (C)         |
| Overall  | ---                 | ---                                  | ---        | ---              | 35.2 (D)   | 47.2 (D)   | 56.4 (E)         |
| <b>11. 12th Street S &amp; Army Navy Drive</b>               |                     |                                      |            |                  |  |            |                  |
| Eastbound Thru   | 575                 |                                      | 186        | 210              |  | 33.4 (C)   | 27.7 (C)         |
| Eastbound Right  | 575                 |                                      | 197        | 210              |  | 20.9 (C)   | 25.9 (C)         |
| Westbound Thru   | 120                 |                                      | 250        | 251              |  | 15.2 (B)   | 17.9 (B)         |
| Westbound Right  | 120                 |                                      | 250        | 251              |  | 10 (A)     | 9.7 (A)          |
| Northbound Left  | 50                  | <i>Un-signalized</i>                 | 57         | 63               | <i>Un-signalized</i>   | 54.4 (D)   | 56.3 (E)         |
| Northbound Thru  | 50                  |                                      | 57         | 63               |  | 0 (A)      | 0 (A)            |
| Northbound Right   | 50                  |                                      | 57         | 63               |  | 45.6 (D)   | 58.4 (E)         |
| Southbound Left  | 1000                |                                      | 203        | 234              |  | 36.7 (D)   | 60.5 (E)         |
| Southbound Thru  | 1000                |                                      | 203        | 234              |  | 46.1 (D)   | 63.6 (E)         |
| Southbound Right   | 1000                |                                      | 203        | 234              |  | 36.5 (D)   | 66.8 (E)         |
| Overall  | ---                 | ---                                  | ---        | ---              | ---  | 20.1 (C)   | 25.3 (C)         |
| <b>12. S Clark Street/Long Bridge Dr &amp; 12th Street S</b> |                     |                                      |            |                  |  |            |                  |
| Eastbound Left   | 120                 | 191                                  | 141        | 225              | 34.9 (C)   | 18.9 (B)   | 42.1 (D)         |
| Eastbound Thru   | 120                 | 191                                  | 141        | 225              | 15 (B)   | 1.7 (A)    | 8.2 (A)          |
| Eastbound Right  | 120                 | 192                                  | 141        | 225              | 5.4 (A)  | 2.6 (A)    | 2.2 (A)          |
| Westbound Left   | 100                 | 43                                   | 493        | 354              | 28 (C)   | 65.2 (E)   | 50.3 (D)         |
| Westbound Thru   | 1500                | 509                                  | 1,429      | 1,344            | 25.7 (C)   | 89.7 (F)   | 71.2 (E)         |
| Westbound Right  | 1500                | 513                                  | 1,440      | 1,354            | 23.7 (C)   | 96.2 (F)   | 80 (E)           |
| Northbound Left  | 100                 | 263                                  | 378        | 397              | 35.8 (D)   | 92.8 (F)   | 100.2 (F)        |
| Northbound Thru  | 1200                | 116                                  | 378        | 397              | 16.2 (B)   | 59.1 (E)   | 64.5 (E)         |
| Northbound Right   | 1200                | 118                                  | 383        | 402              | 9.4 (A)  | 47.1 (D)   | 50.6 (D)         |
| Southbound Left  | 450                 | 177                                  | 949        | 1,146            | 21.2 (C)   | 85.2 (F)   | 167.6 (F)        |

| Intersection and Lane Group                  | Storage Length (ft) | PM Peak Hour                         |            |                  |  |            |                  |          |          |
|--|---------------------|--------------------------------------|------------|------------------|--|------------|------------------|----------|----------|
|  |                     | Average of Maximum Queue Length (ft) |            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |            |                  |          |          |
|  |                     | Existing                             | Background | Mitigated Future | Existing   | Background | Mitigated Future |          |          |
| Southbound Thru                              | 450                 | 177                                  | 949        | 1,146            | 17.1 (B)   | 77.7 (E)   | 162.6 (F)        |          |          |
| Southbound Right                             | 150                 | 169                                  | 965        | 1,149            | 11.1 (B)   | 99.9 (F)   | 111.1 (F)        |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 24.6 (C)   | 68.1 (E)   | 72.4 (E)         |          |          |
| <b>14. S Eads Street &amp; 13th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 350                 |                                      | 453        | 336              |  | 79.2 (E)   | 67.5 (E)         |          |          |
| Eastbound Right                              | 350                 |                                      | 453        | 336              |  | 74.7 (E)   | 53.3 (D)         |          |          |
| Northbound Left                              | 150                 | <i>Un-signalized</i>                 | 429        | 423              | <i>Un-signalized</i>   | 7.7 (A)    | 6.7 (A)          |          |          |
| Northbound Thru                              | 300                 |                                      | 429        | 423              |  | 26.3 (C)   | 33.1 (C)         |          |          |
| Southbound Thru                              | 280                 |                                      | 315        | 349              |  | 14.5 (B)   | 20.5 (C)         |          |          |
| Southbound Right                             | 280                 |                                      | 318        | 352              |  | 6.2 (A)    | 10 (A)           |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 31.9 (C)         | 31.6 (C) |          |
| <b>16. S Fern Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 130                 |                                      | 121        | 147              |  | 159        | 23.2 (C)         | 26 (C)   | 32 (C)   |
| Eastbound Thru                               | 630                 | 121                                  | 147        | 159              | 12.8 (B)   | 12.9 (B)   | 22.9 (C)         |          |          |
| Eastbound Right                              | 630                 | 121                                  | 149        | 161              | 9.4 (A)  | 9.8 (A)    | 15.5 (B)         |          |          |
| Westbound Left                               | 120                 | 297                                  | 361        | 167              | 16.5 (B)   | 54.6 (D)   | 7.3 (A)          |          |          |
| Westbound Thru                               | 260                 | 297                                  | 361        | 167              | 9.9 (A)  | 41.2 (D)   | 4.4 (A)          |          |          |
| Westbound Right                              | 260                 | 300                                  | 364        | 171              | 10.1 (B)   | 35.1 (D)   | 4.5 (A)          |          |          |
| Northbound Left                              | 750                 | 203                                  | 270        | 376              | 25.7 (C)   | 25.9 (C)   | 53.9 (D)         |          |          |
| Northbound Thru                              | 750                 | 203                                  | 270        | 376              | 18.5 (B)   | 19.7 (B)   | 53.8 (D)         |          |          |
| Northbound Right                             | 75                  | 209                                  | 275        | 381              | 8.9 (A)  | 6.1 (A)    | 19.3 (B)         |          |          |
| Southbound Left                              | 160                 | 365                                  | 346        | 414              | 21.9 (C)   | 21.2 (C)   | 41 (D)           |          |          |
| Southbound Thru                              | 300                 | 365                                  | 346        | 414              | 15.3 (B)   | 16 (B)     | 32.5 (C)         |          |          |
| Southbound Right                             | 300                 | 379                                  | 360        | 420              | 11.7 (B)   | 13.5 (B)   | 27 (C)           |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 16.8 (B)   | 26 (C)     | 23.6 (C)         |          |          |
| <b>17. 15th Street S &amp; S Elm Street</b>  |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 60                  |                                      | 173        | 147              |  | 2.7 (A)    | 12.1 (B)         |          |          |
| Eastbound Thru                               | 270                 |                                      | 173        | 147              |  | 4.1 (A)    | 7.4 (A)          |          |          |
| Westbound Thru                               | 300                 | <i>Un-signalized</i>                 | 122        | 236              | <i>Un-signalized</i>   | 3.8 (A)    | 3.4 (A)          |          |          |
| Westbound Right                              | 300                 |                                      | 125        | 239              |  | 2.6 (A)    | 4.7 (A)          |          |          |
| Southbound Left                              | 250                 |                                      | 146        | 138              |  | 57.2 (E)   | 45.8 (D)         |          |          |
| Southbound Right                             | 250                 |                                      | 149        | 141              |  | 12.4 (B)   | 8.9 (A)          |          |          |
| Overall                                      | ---                 |                                      | ---        | ---              |  | ---        | 8 (A)            | 7.9 (A)  |          |
| <b>18. S Eads Street &amp; 15th Street S</b> |                     |                                      |            |                  |  |            |                  |          |          |
| Eastbound Left                               | 170                 |                                      | 162        | 215              |  | 112        | 46.5 (D)         | 50.2 (D) | 17.4 (B) |
| Eastbound Thru                               | 300                 | 244                                  | 289        | 341              | 20.5 (C)   | 19.6 (B)   | 24.2 (C)         |          |          |
| Eastbound Right                              | 300                 | 227                                  | 289        | 341              | 9.1 (A)  | 24.5 (C)   | 30.9 (C)         |          |          |
| Westbound Left                               | 300                 | 395                                  | 364        | 313              | 43.8 (D)   | 27.3 (C)   | 24.5 (C)         |          |          |
| Westbound Thru                               | 300                 | 395                                  | 364        | 313              | 20.8 (C)   | 20.4 (C)   | 32.4 (C)         |          |          |
| Westbound Right                              | 300                 | 408                                  | 364        | 313              | 19.1 (B)   | 37.6 (D)   | 39.3 (D)         |          |          |
| Northbound Left                              | 130                 | 193                                  | 914        | 845              | 21.6 (C)   | 84.8 (F)   | 68.6 (E)         |          |          |
| Northbound Thru                              | 760                 | 193                                  | 914        | 845              | 13.1 (B)   | 87.5 (F)   | 83.7 (F)         |          |          |
| Northbound Right                             | 130                 | 62                                   | 508        | 83               | 5.7 (A)  | 42.7 (D)   | 35.5 (D)         |          |          |
| Southbound Left                              | 250                 | 212                                  | 462        | 472              | 22.9 (C)   | 68.7 (E)   | 65.4 (E)         |          |          |
| Southbound Thru                              | 300                 | 278                                  | 462        | 472              | 17.7 (B)   | 63.5 (E)   | 55.4 (E)         |          |          |
| Southbound Right                             | 75                  | 282                                  | 462        | 475              | 17.8 (B)   | 41.4 (D)   | 35.2 (D)         |          |          |
| Overall                                      | ---                 | ---                                  | ---        | ---              | 24 (C)   | 44.5 (D)   | 43.8 (D)         |          |          |

| Intersection and Lane Group                             | Storage Length (ft) | PM Peak Hour                         |                            |                  |  |                            |                  |
|---|---------------------|--------------------------------------|----------------------------|------------------|--|----------------------------|------------------|
|   |                     | Average of Maximum Queue Length (ft) |                            |                  | Average of Vehicular Movement Delay (sec/veh) and Level of Service |                            |                  |
|   |                     | Existing                             | Background                 | Mitigated Future | Existing   | Background                 | Mitigated Future |
| <b>19. S Eads Street &amp; I-395 Ramps (South Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Thru  | 1000                | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Eastbound Right   | 1000                | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Northbound Left   | 150                 | 335                                  | 309                        | 325              | 30.6 (C)   | 27.6 (C)                   | 5.7 (A)          |
| Northbound Thru   | 170                 | 335                                  | 309                        | 325              | 16.4 (B)   | 6.1 (A)                    | 6 (A)            |
| Northbound Right  | 170                 | 393                                  | 353                        | 325              | 12.8 (B)   | 7.2 (A)                    | 3.8 (A)          |
| Southbound Left   | 100                 | 160                                  | 216                        | 177              | 14.1 (B)   | 3.2 (A)                    | 10.6 (B)         |
| Southbound Thru   | 100                 | 157                                  | 213                        | 174              | 5.5 (A)  | 3.8 (A)                    | 4.3 (A)          |
| Overall   | ---                 | ---                                  | ---                        | ---              | 14.7 (B)   | 8.6 (A)                    | 5.4 (A)          |
| <b>20. S Eads Street &amp; I-395 Ramps (North Node)</b> |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 875                 | ---                                  | ---                        | ---              | ---  | ---                        | ---              |
| Westbound Left  | 1250                | 270                                  | 212                        | 384              | 24.1 (C)   | 33.4 (C)                   | 63 (E)           |
| Westbound Right   | 1250                | 339                                  | 212                        | 384              | 26.3 (C)   | 26.1 (C)                   | 53.4 (D)         |
| Northbound Thru   | 100                 | 179                                  | 174                        | 198              | 8.6 (A)  | 5.7 (A)                    | 6.8 (A)          |
| Southbound Thru   | 100                 | 217                                  | 161                        | 180              | 13.8 (B)   | 4.9 (A)                    | 8.1 (A)          |
| Southbound Right  | 100                 | 139                                  | 158                        | 176              | 0.7 (A)  | 0.3 (A)                    | 0.4 (A)          |
| Overall   | ---                 | ---                                  | ---                        | ---              | 7.7 (A)  | 6.7 (A)                    | 12.6 (B)         |
| <b>21. S Eads Street &amp; 14th Street S</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 200                 |                                      | 128                        | 133              |  | 73.1 (E)                   | 79.7 (E)         |
| Eastbound Thru  | 200                 |                                      | 128                        | 133              |  | 0 (A)                      | 0 (A)            |
| Eastbound Right   | 200                 |                                      | 127                        | 133              |  | 74.7 (E)                   | 91.1 (F)         |
| Westbound Left  | 150                 |                                      | 121                        | 165              |  | 57.5 (E)                   | 205.9 (F)        |
| Westbound Thru  | 150                 |                                      | 125                        | 169              |  | 0 (A)                      | 0 (A)            |
| Westbound Right   | 150                 |                                      | 121                        | 165              |  | 114.1 (F)                  | 158 (F)          |
| Northbound Left   | 100                 | <i>Future Intersection</i>           | 438                        | 401              | <i>Future Intersection</i>   | 0 (A)                      | 0 (A)            |
| Northbound Thru   | 350                 |                                      | 438                        | 401              |  | 24.1 (C)                   | 10.5 (B)         |
| Northbound Right  | 350                 |                                      | 452                        | 411              |  | 21.7 (C)                   | 8.3 (A)          |
| Southbound Left   | 100                 |                                      | 379                        | 367              |  | 91.6 (F)                   | 91.3 (F)         |
| Southbound Thru   | 290                 |                                      | 379                        | 367              |  | 30.7 (C)                   | 23.9 (C)         |
| Southbound Right  | 290                 |                                      | 382                        | 371              |  | 28 (C)                     | 24.2 (C)         |
| Overall   | ---                 |                                      | ---                        | ---              |  | 32.6 (C)                   | 29.5 (C)         |
| <b>22. S Fern Street &amp; Site Driveway</b>            |                     |                                      |                            |                  |  |                            |                  |
| Eastbound Left  | 450                 |                                      |                            | 312              |  |                            | 294.1 (F)        |
| Eastbound Thru  | 450                 |                                      |                            | 312              |  |                            | 0 (A)            |
| Eastbound Right   | 450                 |                                      |                            | 312              |  |                            | 295 (F)          |
| Westbound Left  | 150                 |                                      |                            | 264              |  |                            | 56.3 (E)         |
| Westbound Thru  | 150                 |                                      |                            | 264              |  |                            | 0 (A)            |
| Westbound Right   | 150                 |                                      |                            | 264              |  |                            | 71.9 (E)         |
| Northbound Left   | 140                 | <i>Future Intersection</i>           | <i>Future Intersection</i> | 7                | <i>Future Intersection</i>   | <i>Future Intersection</i> | 27.7 (C)         |
| Northbound Thru   | 275                 |                                      |                            | 305              |  |                            | 22 (C)           |
| Northbound Right  | 275                 |                                      |                            | 307              |  |                            | 20 (B)           |
| Southbound Left   | 75                  |                                      |                            | 68               |  |                            | 43.8 (D)         |
| Southbound Thru   | 390                 |                                      |                            | 416              |  |                            | 44.8 (D)         |
| Southbound Right  | 390                 |                                      |                            | 419              |  |                            | 25.9 (C)         |
| Overall   | ---                 |                                      |                            | ---              |  |                            | 62.8 (E)         |

**Table 29: Bicycle and Pedestrian Delay (2031)**

| Intersection/<br>Approach                               | Average Pedestrian Delay (sec/ped) |         |                   |             |                         |             | Average Bicycle Delay (sec/bike) |         |                   |             |                         |             |
|---|------------------------------------|---------|-------------------|-------------|-------------------------|-------------|----------------------------------|---------|-------------------|-------------|-------------------------|-------------|
|   | Existing (2020)                    |         | Background (2025) |             | Mitigated Future (2025) |             | Existing (2020)                  |         | Background (2025) |             | Mitigated Future (2025) |             |
|   | AM Peak                            | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     | AM Peak                          | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     |
| <b>1. Army Navy Drive and S Hayes Street</b>            |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | <b>70.3</b>       | <b>65.8</b> | <b>76.4</b>             | <b>62.8</b> | ---                              | ---     | <b>71.3</b>       | <b>51.4</b> | <b>50.7</b>             | <b>49.0</b> |
| Eastbound   | 46.5                               | 49.9    | 70.9              | 65.7        | 76.7                    | 63.0        | ---                              | ---     | 86.8              | 43.7        | 52.4                    | 54.5        |
| Westbound   | 0.0                                | 0.2     | 57.9              | 67.7        | 62.6                    | 54.6        | ---                              | ---     | 61.6              | 63.2        | 48.8                    | 44.2        |
| Northbound  | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>2. Army Navy Drive and S Fern Street</b>             |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | <b>65.5</b>       | <b>62.9</b> | <b>65.9</b>             | <b>65.0</b> | ---                              | ---     | <b>16.3</b>       | <b>6.3</b>  | <b>14.7</b>             | <b>18.0</b> |
| Eastbound   | 49.4                               | 46.9    | 67.6              | 66.0        | 67.2                    | 65.6        | ---                              | ---     | 2.3               | 4.0         | 25.6                    | 35.8        |
| Westbound   | 49.6                               | 47.2    | 66.5              | 61.3        | 64.1                    | 64.8        | ---                              | ---     | 24.1              | 9.3         | 4.7                     | 10.3        |
| Northbound  | 51.3                               | 50.7    | 65.7              | 61.3        | 64.5                    | 64.2        | ---                              | ---     | ---               | ---         | 14.5                    | 6.4         |
| Southbound  | 50.0                               | 49.5    | 64.6              | 62.9        | 66.6                    | 64.9        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>3. Army Navy Drive and Parking Lot</b>               |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | ---               | ---         | <b>61.2</b>             | <b>61.4</b> | ---                              | ---     | ---               | ---         | <b>1.9</b>              | <b>5.8</b>  |
| Eastbound   | ---                                | ---     | ---               | ---         | 66.3                    | 63.4        | ---                              | ---     | ---               | ---         | 4.3                     | 8.6         |
| Westbound   | ---                                | ---     | ---               | ---         | 32.1                    | 50.0        | ---                              | ---     | ---               | ---         | 0.8                     | 0.4         |
| Northbound  | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>4. Army Navy Drive and S Eads Street</b>             |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | <b>70.1</b>       | <b>70.0</b> | <b>66.1</b>             | <b>66.8</b> | ---                              | ---     | <b>19.1</b>       | <b>10.6</b> | <b>24.5</b>             | <b>21.5</b> |
| Eastbound   | 52.4                               | 51.1    | 90.3              | 75.4        | 67.9                    | 65.9        | ---                              | ---     | 29.5              | 2.3         | 10.7                    | 16.3        |
| Westbound   | 50.4                               | 50.9    | 69.5              | 63.8        | 67.3                    | 65.9        | ---                              | ---     | 1.0               | 3.3         | 29.8                    | 47.0        |
| Northbound  | 49.6                               | 51.8    | 64.1              | 72.9        | 65.8                    | 68.9        | ---                              | ---     | 22.9              | 27.1        | 27.5                    | 12.2        |
| Southbound  | 50.7                               | 49.4    | 62.1              | 73.4        | 63.9                    | 68.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>5. Army Navy Drive and 110 Ramp</b>                  | <i>Unsignalized Intersection</i>   |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>6. S Eads Street and 11th Street S/Site Driveway</b> |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | ---               | ---         | <b>65.9</b>             | <b>63.7</b> | ---                              | ---     | ---               | ---         | <b>5.3</b>              | <b>7.8</b>  |
| Eastbound   | ---                                | ---     | ---               | ---         | 65.1                    | 65.3        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | ---               | ---         | 63.6                    | 63.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---         | 66.1                    | 64.6        | ---                              | ---     | ---               | ---         | 0.5                     | 3.4         |
| Southbound  | ---                                | ---     | ---               | ---         | 67.6                    | 62.3        | ---                              | ---     | ---               | ---         | 9.5                     | 12.3        |
| <b>7. 12th Street S and S Hayes Street</b>              |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | <b>63.5</b>       | <b>64.0</b> | <b>64.2</b>             | <b>65.3</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | 51.6                               | 49.7    | 64.6              | 64.6        | 64.3                    | 64.7        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 49.7                               | 50.7    | 63.8              | 60.8        | 64.9                    | 66.0        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | 50.6                               | 48.5    | 53.8              | 62.9        | 64.8                    | 66.0        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | 0.0                                | 0.0     | 0.0               | 0.0         | 62.7                    | 66.3        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>8. 12th Street S and S Fern Street</b>               |                                    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>Overall</b>  | ---                                | ---     | <b>64.4</b>       | <b>64.7</b> | <b>64.5</b>             | <b>64.3</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | 35.0                               | 34.4    | 63.9              | 64.6        | 64.2                    | 64.4        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 34.9                               | 34.5    | 65.3              | 65.1        | 64.5                    | 64.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |

| Intersection/<br>Approach                                   | Average Pedestrian Delay (sec/pe'd) |         |                   |             |                         |             | Average Bicycle Delay (sec/bike) |         |                   |             |                         |             |
|---|-------------------------------------|---------|-------------------|-------------|-------------------------|-------------|----------------------------------|---------|-------------------|-------------|-------------------------|-------------|
|   | Existing (2020)                     |         | Background (2025) |             | Mitigated Future (2025) |             | Existing (2020)                  |         | Background (2025) |             | Mitigated Future (2025) |             |
|   | AM Peak                             | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     | AM Peak                          | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     |
| Northbound  | 34.6                                | 34.3    | 65.8              | 65.4        | 64.2                    | 64.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | 34.9                                | 34.2    | 64.1              | 64.4        | 65.0                    | 64.5        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>9. 12th Street S and S Elm Street</b>                    |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>24.6</b>       | <b>65.2</b> | <b>36.0</b>             | <b>64.7</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | ---                                 | ---     | 3.3               | 65.2        | 3.5                     | 65.0        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                 | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                 | ---     | 65.0              | 65.5        | 64.6                    | 64.4        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>10. 12th Street S and S Eads Street</b>                  |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>64.5</b>       | <b>65.4</b> | <b>64.9</b>             | <b>65.5</b> | ---                              | ---     | <b>6.9</b>        | <b>24.4</b> | <b>17.5</b>             | <b>27.5</b> |
| Eastbound   | 50.0                                | 34.9    | 65.0              | 66.6        | 64.7                    | 65.7        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 48.3                                | 36.0    | 64.7              | 65.2        | 65.4                    | 66.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | 51.0                                | 34.9    | 63.4              | 64.0        | 64.0                    | 64.4        | ---                              | ---     | 8.4               | 34.3        | 17.5                    | 40.8        |
| Southbound  | 25.3                                | 34.7    | 63.4              | 64.2        | 66.1                    | 65.7        | ---                              | ---     | 5.2               | 19.7        | 17.5                    | 22.3        |
| <b>11. 12th Street S and Army Navy Drive</b>                |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>63.3</b>       | <b>63.9</b> | <b>65.7</b>             | <b>64.3</b> | ---                              | ---     | <b>42.2</b>       | <b>49.8</b> | <b>34.3</b>             | <b>51.0</b> |
| Eastbound   | ---                                 | ---     | 63.9              | 65.6        | 65.3                    | 65.4        | ---                              | ---     | 37.2              | 48.0        | 27.5                    | 50.2        |
| Westbound   | ---                                 | ---     | 62.8              | 63.6        | 65.8                    | 64.0        | ---                              | ---     | 46.7              | 51.1        | 37.1                    | 52.4        |
| Northbound  | ---                                 | ---     | 0.0               | 0.1         | 0.0                     | 0.0         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                 | ---     | 0.0               | 65.2        | 0.0                     | 55.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>12. 12th Street and Long Bridge Drive/S Clark Street</b> |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>65.7</b>       | <b>64.0</b> | <b>63.9</b>             | <b>64.7</b> | ---                              | ---     | <b>44.3</b>       | <b>40.6</b> | <b>43.8</b>             | <b>42.0</b> |
| Eastbound   | 34.8                                | 34.3    | 64.5              | 63.7        | 64.2                    | 64.9        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 34.3                                | 34.8    | 65.7              | 64.4        | 64.1                    | 64.4        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | 35.5                                | 34.7    | 68.4              | 61.8        | 62.8                    | 64.4        | ---                              | ---     | 31.2              | 23.5        | 32.2                    | 28.8        |
| Southbound  | 31.7                                | 35.7    | 63.3              | 68.1        | 64.5                    | 66.7        | ---                              | ---     | 61.9              | 54.5        | 57.1                    | 54.3        |
| <b>13. S Fern Street and 13th Street S</b>                  | <i>Unsignalized Intersection</i>    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>14. 13th Street S and S Eads Street</b>                  |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>60.5</b>       | <b>30.6</b> | <b>61.1</b>             | <b>59.3</b> | ---                              | ---     | <b>0.7</b>        | <b>1.9</b>  | <b>0.5</b>              | <b>1.7</b>  |
| Eastbound   | ---                                 | ---     | 69.4              | 38.1        | 67.4                    | 66.0        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                 | ---     | ---               | ---         | ---                     | ---         | ---                              | ---     | 0.1               | 0.1         | 0.1                     | 0.1         |
| Southbound  | ---                                 | ---     | 50.9              | 26.7        | 58.9                    | 57.5        | ---                              | ---     | 1.4               | 3.5         | 1.3                     | 2.5         |
| <b>15. S Fern Street and 14th Street S</b>                  | <i>Unsignalized Intersection</i>    |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| <b>16. 15th Street S and S Fern Street</b>                  |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>67.1</b>       | <b>64.6</b> | <b>66.7</b>             | <b>65.1</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | 34.8                                | 35.2    | 68.8              | 63.3        | 66.0                    | 64.5        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 38.0                                | 34.5    | 64.1              | 64.5        | 66.1                    | 65.4        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | 36.8                                | 34.8    | 67.7              | 65.7        | 67.3                    | 65.1        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | 35.2                                | 34.6    | 66.1              | 64.1        | 67.2                    | 65.2        | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>17. 15th Street S and S Elm Street</b>                   |                                     |         |                   |             |                         |             |                                  |         |                   |             |                         |             |
| Overall   | ---                                 | ---     | <b>62.6</b>       | <b>51.3</b> | <b>65.1</b>             | <b>63.7</b> | ---                              | ---     | ---               | ---         | ---                     | ---         |

| Intersection/<br>Approach                                 | Average Pedestrian Delay (sec/ped) |         |                   |              |                         |              | Average Bicycle Delay (sec/bike) |         |                   |             |                         |             |
|---|------------------------------------|---------|-------------------|--------------|-------------------------|--------------|----------------------------------|---------|-------------------|-------------|-------------------------|-------------|
|   | Existing (2020)                    |         | Background (2025) |              | Mitigated Future (2025) |              | Existing (2020)                  |         | Background (2025) |             | Mitigated Future (2025) |             |
|   | AM Peak                            | PM Peak | AM Peak           | PM Peak      | AM Peak                 | PM Peak      | AM Peak                          | PM Peak | AM Peak           | PM Peak     | AM Peak                 | PM Peak     |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | 63.0              | 44.9         | 65.5                    | 63.6         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | 61.4              | 75.4         | 61.4                    | 65.2         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>18. 15th Street S and S Eads Street</b>                |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | <b>128.0</b>      | <b>127.3</b> | <b>127.8</b>            | <b>127.1</b> | ---                              | ---     | <b>43.6</b>       | <b>34.5</b> | <b>23.9</b>             | <b>39.3</b> |
| Eastbound   | 33.6                               | 35.2    | 64.6              | 64.9         | 64.6                    | 64.5         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | 32.7                               | 35.8    | 64.9              | 64.0         | 64.7                    | 64.9         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | 39.1                               | 34.8    | 187.7             | 185.4        | 186.9                   | 185.8        | ---                              | ---     | 37.5              | 43.5        | 27.7                    | 36.0        |
| Southbound  | 35.3                               | 34.4    | 190.3             | 186.9        | 189.4                   | 187.5        | ---                              | ---     | 47.3              | 23.0        | 18.5                    | 42.3        |
| <b>19. S Eads Street and I-395 HOT Lanes (South Node)</b> |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>20. S Eads Street and I-395 HOT Lanes (North Node)</b> |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Southbound  | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| <b>21. 14th Street S and S Eads Street</b>                |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | <b>58.2</b>       | <b>65.7</b>  | <b>58.8</b>             | <b>65.9</b>  | ---                              | ---     | <b>2.0</b>        | <b>2.1</b>  | <b>4.3</b>              | <b>13.0</b> |
| Eastbound   | ---                                | ---     | ---               | ---          | ---                     | ---          | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | 65.3              | 66.0         | 66.4                    | 65.7         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | 52.0              | 65.4         | 51.8                    | 66.1         | ---                              | ---     | 0.8               | 1.9         | 0.5                     | 9.3         |
| Southbound  | ---                                | ---     | 60.6              | 65.4         | 66.4                    | 65.2         | ---                              | ---     | 3.4               | 2.4         | 12.0                    | 15.9        |
| <b>22. S Fern Street and 11th Street S/Site Driveway</b>  |                                    |         |                   |              |                         |              |                                  |         |                   |             |                         |             |
| Overall   | ---                                | ---     | ---               | ---          | <b>64.8</b>             | <b>65.2</b>  | ---                              | ---     | ---               | ---         | <b>16.3</b>             | <b>13.6</b> |
| Eastbound   | ---                                | ---     | ---               | ---          | 66.6                    | 64.8         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Westbound   | ---                                | ---     | ---               | ---          | 65.7                    | 64.4         | ---                              | ---     | ---               | ---         | ---                     | ---         |
| Northbound  | ---                                | ---     | ---               | ---          | 62.7                    | 66.8         | ---                              | ---     | ---               | ---         | 13.4                    | 16.6        |
| Southbound  | ---                                | ---     | ---               | ---          | 63.6                    | 64.2         | ---                              | ---     | ---               | ---         | 18.2                    | 10.6        |



## Transportation Management Plan

A Transportation Management Plan (TMP) has many components that are tailored to accommodate a given facility with the goal being the reduction of automobile trips by encouraging alternative forms of transportation. A few of the typical TMP components include the establishment of a TMP coordinator, the distribution of transit literature, the establishment of ride-sharing programs, and the on-site sale of discounted fare media. Management measures taken by the proposed PenPlace development can be monitored and adjusted as needed to continually create opportunities to reduce the amount of vehicular traffic generated by the site.

The TMP will include a schedule and details of implementation and continued operation of the elements in the plan. The location of the site near the Pentagon City Metro Station, Pentagon Metro Station, and Crystal City Metro Station allows for a TMP that may include, but not be limited to, the following:

### **Participation and Funding**

1. Establish and maintain an active, ongoing relationship with Arlington Transportation Partners (ATP), or successor entity, at no cost to the developer, on behalf of the property owner, as directed by applicable adopted Site Plan Conditions.
2. Designate and keep current a member of building management as Property Transportation Coordinator (PTC) to be primary point of contact with the County and undertake the responsibility for coordinating and completing all Transportation Management Plan (TMP) obligations, as directed by applicable adopted Site Plan Conditions. The PTC shall be trained, to the satisfaction of ACCS, to provide transit, bicycle, walk, rideshare and other information provided by Arlington County intended to assist with transportation to and from the site.
3. Contribute annually to ACCS, or successor, to sustain direct and indirect on-site and off-site services in support of TMP activities. Payment on this commitment shall begin as a condition of issuance of the First Partial Certificate of Occupancy for Tenant Occupancy for each respective building or phase of construction, or as directed by applicable adopted Site Plan Conditions. Subsequent payments shall be made annually.

### **Facilities and Improvements**

1. Provide transportation information such as nearby transit routes, stop locations, transit schedules, on-site bike amenities, off-site bike facilities and connections, carpool

options, and other services. The format and mechanism to distribute information may change over time, and could include displays, electronic kiosks, on-site staff, or alternative electronic formats such as intranet and/or smart phones. The information provided and distribution mechanism shall be approved by ACCS. The developer agrees that the required transportation information displays shall meet the Arlington County Neighborhood Transportation Information Display Standards in effect on the date of the site plan approval, or equivalent as approved by the County Manager.

2. Comply with requirements of the Site Plan Conditions to provide bicycle parking/storage facilities, a Parking Management Plan (PMP), a Bicycle Facilities Management Plan, and construction worker parking.

### **Carpool and Vanpool Parking**

1. Operate a carpool/vanpool program with elements including:
  - Reserved, signed spaces for carpools/vanpools located near main entrances/elevators
  - Parking subsidy for two-person or more carpools
  - Free parking for vanpools (recognized by Internal Revenue Service)

### **Promotions, Services, Policies**

1. Prepare, reproduce and distribute, in digital or hard copy, materials provided by Arlington County, which includes site-specific transit, bicycle, walk, and rideshare related information, to each new office, retail, property management, or maintenance employee, from initial occupancy through the life of the site plan. These materials shall be distributed as a part of prospective tenant marketing materials, as well as communications associated with lease signing, on-boarding, or similar activities.
2. Provide one time, per person, to each new office, retail, property management, or maintenance employee, whether employed part-time or full-time, directly employed or contracted, who begins employment in the building throughout initial occupancy, the choice of one of the following:
  - Metro fare on a SmarTrip card or successor fare medium (amount to be determined)
  - A one-year bikeshare membership

- A one-year carshare membership
3. Implement a guaranteed ride home program for employees who are part of a registered carpool, a registered vanpool, or take transit to work and need to return home in an emergency.
  4. The County Manager may approve additions to, or substitution of one or more of these choices with a comparable transportation program incentive, as technology and service options change, if he/she finds that an incentive shall be designed to provide the individual with an option other than driving alone in a personal vehicle, either by removing a barrier to program entry, such as a membership cost, or by providing a similar level of subsidized access to a public or shared transportation system, program or service.
  5. Provide, administer, or cause the provision of a sustainable commute benefit program for each employee, whether employed part-time or full-time, directly employed or contracted. This commute benefit program shall offer, at a minimum, a monthly pre-tax transit benefit or a monthly subsidized/direct transit benefit.
  6. Provide, under a "transportation information" heading on the Developer and property manager's websites regarding this development:
    - Links to the most appropriate Arlington County Commuter Services and/or external transportation-related web page(s). Confirmation of most appropriate link will be obtained from ACCS.
    - A description of key transportation benefits and services provided at the building, pursuant to the TMP.

shall be produced as specified below by the County. The study may include building occupancy rates, average vehicle occupancy, average garage occupancy for various days of the week and times of day, parking availability by time of day, average duration of stay for short term parkers on various days of the week and times of day, pedestrian traffic, a seven-day count of site-generated vehicle traffic, a voluntary mode-split survey, and hourly, monthly, and special event parking rates.

The building owner and/or operator shall notify, assist, and encourage building occupants and visitors on site to participate in mode-split surveys which may be of an on-line or email variety.

### ***Performance and Monitoring***

1. During the first year of start-up of the TMP and on an annual basis thereafter, the Developer shall submit an annual report, which may be of an online, or e-mail variety, to the County Manager, describing completely and correctly, the TDM related activities of the site and changes in commercial tenants during each year.
2. The Developer agrees to conduct and/or participate in, a transportation and parking performance monitoring study at two years, five years, and each subsequent five years (at the County's option), after issuance of the First Certificate of Occupancy for Tenant Occupancy. The County may conduct the study or ask the owner to conduct the study (in the latter case, no reimbursement payment shall be required). As part of the study, a report

## Summary and Conclusions

This report concludes that the proposed development will have a manageable impact on the surrounding transportation and roadway assuming that all planned site design elements and recommended mitigation measures are implemented.

The PenPlace site is well served by transit and is surrounded by a well-connected pedestrian and bicycle network. The site is located near several principal arterials such as Route 1, VA-27 (Washington Boulevard), VA-244 (Columbia Pike), and VA-110. The arterials create connections to I-395, I-66, George Washington Memorial Parkway, and ultimately the Capital Beltway (I-495) and I-95.

The proposed development will consist of four (4) buildings with approximately 2.8 million square feet of office space, 388,000 square feet of amenity space, 14,500 square feet of daycare, 82,600 square feet of neighborhood-serving ground floor retail space, and 27,000 square feet of community space. The proposed development will provide 1,984 parking spaces in a below-grade parking garage shared between the four (4) buildings.

The proposed development will provide seven (7) large loading berths and six (6) van parking stalls, for a total of 13 loading spaces, in shared loading area. The number of loading facilities on-site will accommodate the practical needs of the site. Vehicular parking will be provided via Army Navy Drive, S Fern Street and S Eads Street for the four (4) buildings. Loading access will be provided via Army Navy Drive for the four (4) buildings. While the loading dock and ramp have been designed to accommodate a WB-67, trucks of this size will be very infrequent. The arrival of a WB-67 would be scheduled and permitted during off-peak only.

A number of significant infrastructure improvements are being proposed as part of this development:

1. Improving pedestrian facilities along the perimeter of the site to meet or exceed Arlington County and ADA standards;
2. The signalization of two (2) existing intersections and the addition of one (1) new signalized intersection within the vicinity of the proposed development, providing access to the on-site loading facilities and below-grade garage, allowing streets to function as a complete network rather than a series of major corridors for commuter traffic, and providing signalized pedestrian crossings where none currently exist;

3. The reconfiguration of S Eads Street adjacent to the site, to include southbound protected bicycle lanes and on-street parking; and
4. The reconfiguration of S Fern Street adjacent to the site, to include northbound protected bicycle lanes between Army Navy Drive and 12<sup>th</sup> Street S and southbound protected bicycle lanes between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway, new striped medians, and on-street parking.
5. The reconfiguration of the Army Navy Drive and S Eads Street intersection to add a northbound thru lane.
6. The reconfiguration of the 12<sup>th</sup> Street S and S Eads Street intersection to add a dedicated southbound left-turn lane.
7. The reconfiguration of the 12<sup>th</sup> Street S and S Fern Street intersection to add a dedicated southbound left-turn lane.

A number of planned transportation improvements in the vicinity of the PenPlace development are expected to be complete by 2031. The full list of improvements is detailed in the report, but examples include (detailed in Table 1 and Figure 1):

- Army Navy Drive Complete Street
- 12th Street S Complete Street
- 15th Street S/S Clark-Bell Street Realignment
- Crystal City Transitway Extension
- Route 1 Multimodal Improvements Study

A capacity analysis was developed, using the VISSIM microsimulation modelling tool, to compare the future roadway network with and without the proposed development. Compared to typical macroscopic analysis tools, such as Synchro, VISSIM is a microsimulation modelling tool that measures the performance of individual vehicles as they travel through the network while accounting for the influence that other vehicles, transit, pedestrians, and cyclists. Given the multimodal nature of Pentagon City and planned improvements, particularly streets directly adjacent to the site where a cycle track, protected bicycle lanes, and a dedicated transit lanes will be in place, VISSIM was determined to be the appropriate analysis tool for this development as agreed upon during the scoping process.

Traffic projections for 2025 and 2031 are based on existing volumes, plus traffic generated by approved nearby background developments, regional growth on the roadway, and traffic generated by the proposed PenPlace development.

As described in the Geometry and Operations section of this report, the proposed development will include several improvements to adjacent roadways, including the signalization

of three (3) intersections and the addition of protected bike facilities. In addition to the improvements outlined above, mitigation measures recommended based on the MOEs outlined in the approved scoping document.

Based on the results of the VISSIM analysis, potential mitigation measures were explored at study area intersections and included the following recommendations for both 2025 and 2031 Mitigated Future Conditions:

- Adjustments to signal timings at nine (9) intersections
- Modifications to signal phasing and adjustments to signal timings at seven (7) intersections
- Signal modifications at seven (7) intersections
- Re-striping at eight (8) intersections
- Relocating one (1) existing bus stop along S Eads Street
- Adding new signals at three (3) intersections, including Army Navy Drive/Parking Lot/Site Driveway, S Eads Street/11th Street S/Site Driveway, and S Fern Street/Site Driveway
- Providing a protected southbound bike lane along S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, a northbound protected bike lane along S Fern Street between Army Navy Drive and 12<sup>th</sup> Street S, and a southbound bike lane along S Fern Street between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway

With the recommended mitigations in place, the VISSIM analysis shows, at the majority of intersections in the network, the vehicular delay results under the 2025 and 2031 Mitigated Future scenarios, with added site traffic and recommended mitigation measures, are comparable to that under the 2025 and 2031 Background scenarios. Nevertheless, as can be expected of urban infill there are still certain locations that are projected to experience delay and queuing issues where traffic is concentrated, especially along Army Navy Drive and S Eads Street, which funnel traffic to/from I-395, where congestion exists today. A comparison of the level of service (LOS) between scenarios is provided in Figure 73 and Figure 74 for 2025 and Figure 75 and Figure 76 for 2031.

It is important to note that VISSIM is a microscopic analysis rather than a macroscopic analysis. Mitigation measures are recommended such that the results are comparable or better than the Background conditions throughout the network. The recommended mitigation measures are in place to address targeted issues at specific, as well as increase the vehicular throughput of the overall network, particularly at exterior

intersections that are responsible for metering vehicles entering the network. Due to the increased number of vehicles being processed in the network compared to Background conditions, there may be locations where delays are higher than that seen under Background conditions.

Most vehicular capacity concerns in the study area can be alleviated through signal timing changes that adapt to changes in volume patterns, but at some locations, operational changes alone cannot mitigate future delays. As part of the proposed PenPlace project, a Transportation Management Plan (TMP) will be provided based on the County's requirements, and a framework for a TMP is included in this report, to further reduce vehicular trips generated by the proposed development during peak period travel times.

The development has many positive elements contained within its design that minimize potential transportation impacts, including:

- The proposed development's close proximity to the Pentagon City Metro Station, Pentagon Metro Station, Crystal City Metro and VRE Stations, and multiple bus lines.
- Improvements to the pedestrian facilities adjacent to the site that meet or exceed Arlington County and ADA requirements.
- Limited on-site parking, which will promote the use of non-auto modes of travel to and from the proposed development.
- The installation of new signals on Army Navy Drive, S Fern Street, and S Eads Street which provide additional signalized pedestrian crossing points, significantly improving pedestrian infrastructure near the site.
- The inclusion of publicly accessible plazas, parks, a north-south forest walk, and an east-west multimodal path that improve pedestrian circulation and break-up a superblock.
- The provision of protected southbound bike lanes along the western side of S Eads Street between Army Navy Drive and 12<sup>th</sup> Street S, northbound protected bike lanes on S Fern Street S between Army Navy Drive and 12<sup>th</sup> Street S, and southbound protected bike lanes on S Fern Street between Army Navy Drive and 11<sup>th</sup> Street S/Site Driveway.
- The inclusion of secure-long-term bicycle parking significantly exceeding zoning requirements.
- The installation of short-term bicycle parking spaces within and around the perimeter of the site that meet zoning requirements.

- The inclusion of shower and locker facilities within each building that meet or exceed zoning requirements.
- A Transportation Management Plan (TMP) that aims to reduce the demand of single-occupancy, private vehicles to/from the proposed development during peak period travel times or shifts single-occupancy vehicular demand to off-peak periods.

As mentioned, this report concludes that the proposed development will have a manageable impact on the surrounding transportation and roadway network assuming that all planned site design elements and recommended mitigation measures are implemented.